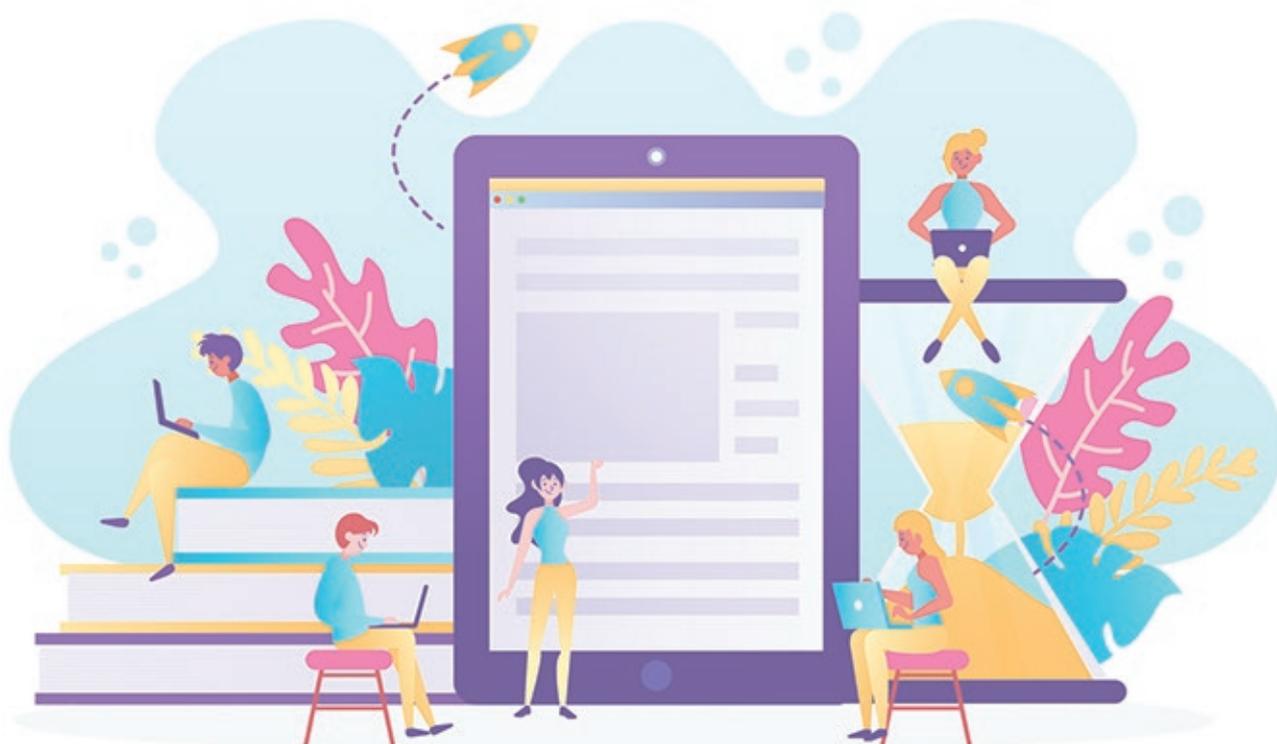


# Education and new developments 2020

Edited by  
Mafalda Carmo



# **Education and New Developments**

## **2020**

**Edited by**  
**Mafalda Carmo**

*Edited by* Mafalda Carmo, World Institute for Advanced Research and Science (WIARS), Portugal

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## BRIEF CONTENTS

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Foreword	v
Organizing and Scientific Committee	vii
Keynote Lecture	xi
Index of Contents	xiii



## FOREWORD

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This book contains the full text of papers and posters presented at the International Conference on Education and New Developments (END 2020), organized by the World Institute for Advanced Research and Science (W.I.A.R.S.), that this year had to be transformed into a fully Virtual Conference as a result of the Coronavirus (COVID 19) pandemic.

Education, in our contemporary world, is a right since we are born. Every experience has a formative effect on the constitution of the human being, in the way one thinks, feels and acts. One of the most important contributions resides in what and how we learn through the improvement of educational processes, both in formal and informal settings.

The International Conference seeks to provide some answers and explore the processes, actions, challenges and outcomes of learning, teaching and human development. The goal is to offer a worldwide connection between teachers, students, researchers and lecturers, from a wide range of academic fields, interested in exploring and giving their contribution in educational issues. We take pride in having been able to connect and bring together academics, scholars, practitioners and others interested in a field that is fertile in new perspectives, ideas and knowledge.

We counted on an extensive variety of contributors and presenters, which can supplement our view of the human essence and behavior, showing the impact of their different personal, academic and cultural experiences. This is, certainly, one of the reasons we have many nationalities and cultures represented, inspiring multi-disciplinary collaborative links, fomenting intellectual encounter and development.

END 2020 received 459 submissions, from more than 40 different countries, reviewed by a double-blind process. Submissions were prepared to take form of Virtual Presentations and Posters. The conference accepted for presentation 125 submissions (27% acceptance rate), from which, 106 submissions are published in full text in this book.

The conference also includes a keynote presentation from an internationally distinguished researcher, Prof. Dr. Joy Kutaka-Kennedy (Ed. D., Department of Special Education, Sanford College of Education, National University, San Jose Campus, USA), to whom we express our most gratitude.

This conference addressed different categories inside the Education area and papers are expected to fit broadly into one of the named themes and sub-themes. To develop the conference program, we have chosen four main broad-ranging categories, which also covers different interest areas:

- In **TEACHERS AND STUDENTS**: Teachers and Staff training and education; Educational quality and standards; *Curriculum* and Pedagogy; Vocational education and Counseling; Ubiquitous and lifelong learning; Training programs and professional guidance; Teaching and learning relationship; Student affairs (learning, experiences and diversity); Extra-curricular activities; Assessment and measurements in Education.
- In **PROJECTS AND TRENDS**: Pedagogic innovations; Challenges and transformations in Education; Technology in teaching and learning; Distance Education and eLearning; Global and sustainable developments for Education; New learning and teaching models; Multicultural and (inter)cultural communications; Inclusive and Special Education; Rural and indigenous Education; Educational projects.
- In **TEACHING AND LEARNING**: Critical Thinking; Educational foundations; Research and development methodologies; Early childhood and Primary Education; Secondary Education; Higher Education; Science and technology Education; Literacy, languages and Linguistics (TESL/TEFL); Health Education; Religious Education; Sports Education.
- In **ORGANIZATIONAL ISSUES**: Educational policy and leadership; Human Resources development; Educational environment; Business, Administration, and Management in Education; Economics in Education; Institutional accreditations and rankings; International Education and Exchange programs; Equity, social justice and social change; Ethics and values; Organizational learning and change, Corporate Education.

This book contains the results of the research and developments conducted by authors who focused on what they are passionate about: to promote growth in research methods intimately related to teaching, learning and applications in Education nowadays. It includes an extensive variety of contributors and presenters, who will extend our view in exploring and giving their contribution in educational issues, by sharing with us their different personal, academic and cultural experiences.

We would like to express thanks to all the authors and participants, the members of the academic scientific committee, and of course, to our organizing and administration team for making and putting this conference together.

Hoping to continue the collaboration in the future,

Respectfully,

Mafalda Carmo  
World Institute for Advanced Research and Science (WIARS), Portugal  
*Conference and Program Chair*

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## KEYNOTE LECTURE

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### NEW POSSIBILITIES IN EDUCATION AT THE NEXUS OF GENERATIONAL CHANGE AND TECHNOLOGICAL INNOVATION

**Prof. Dr. Joy Kutaka-Kennedy**

*(Ed. D.)*

*Department of Special Education, Sanford College of Education,  
National University, San Jose Campus (USA)*

#### Abstract

One thing is certain in life and that is change, something we all experience in big and little ways every day. We all emerged as newborns into families of varying sorts, progressed through a multiplicity of childhoods, and finally achieved and survived teenage years. We began renegotiating our relationship with parents who had their ideas of who we should be and how we should live, which more often than not clashed with our own emerging definition of ourselves in the changing world. Younger generations have struggled with older generations for possibly as long as human history. Each new generation challenged the norms, expectations, and perspectives of their predecessors in light of the latest social, environmental and technological changes that developed. Game-changing innovations have shaped and influenced the context of social evolution as well as cultural revolution. With these generational differences nuanced by ever evolving technological innovations, how can we in higher education best prepare our students to meet the needs of the changing workplace and communities? How do we bridge the gaps between the older-generation academics who grew up using typewriters and the younger generation student body using Facetime, social media and text messaging? Besides becoming more adept and proficient in using technology, which is a crucial step in the right direction, we need to harness more of the vast resources available in online education to offer course work to an increasingly demanding student body who wants instant access, quick responses and on-demand mobility. Online education is here to stay with demand growing each year. We in higher education need to become highly skilled and more effective in meeting students where they are with what they need and want. We must teach and engage them more efficiently and effectively, especially in light of upcoming innovations in augmented and virtual reality, artificial intelligence, and other innovations. Higher education needs to embrace the forces of innovation which will continually impact how people learn, adapt and go forward.

---

#### Biography

Prior to entering higher education Dr. Joy Kutaka-Kennedy spent over fifteen years teaching pre-school through high school students in regular education, gifted education, at-risk education, and special education. After earning her doctorate in Special Education, she has taught over fifteen years at the university level, emphasizing special education teacher preparation in academic course work and clinical practice supervision. Having extensive experience with online education, course development and program evaluation, she won Quality Matters recognition for innovative course design and student engagement. She has given numerous national and international presentations on creativity and collaboration in the online venue; individual accountability in online group work; emerging technological trends in higher education; implications of generational differences and technological innovation in higher education; and the future of Artificial Intelligence, machine learning and deep learning in education. Her university faculty responsibilities include course design and assessment oversight, field work supervision, and mentoring new faculty in higher education. Dr. Joy Kutaka-Kennedy serves as an officer of the California Association of Professors of Special Education, completes program reviews for state and national accreditation, and performs editorial reviews for professional publications. She currently is working on designing new curricula to align with new state credentialing standards.

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## INDEX OF CONTENTS

---

### VIRTUAL PRESENTATIONS

---

#### Teachers and Students

<b>Assessing TPACK integration in senior phase science teaching and learning at South African township schools</b> <i>Hlulani Shilenge, &amp; Sam Ramaila</i>	<b>3</b>
<b>Music curriculum integration practices - “accountability” as policy translation in professional music training: the case of the tut</b> <i>Hua Hui Tseng</i>	<b>8</b>
<b>Factors influencing teachers’ inclination to use improvised resources in life sciences classrooms</b> <i>Mahlatse Ramothwala, &amp; Sam Ramaila</i>	<b>12</b>
<b>Improving university students’ perceptions of peer assessment</b> <i>Elizabeth Ruiz Esparza Barajas</i>	<b>16</b>
<b>The affordances of improvised resources in physical sciences classrooms</b> <i>Koketso Ntladi, &amp; Sam Ramaila</i>	<b>20</b>
<b>The relationship between teacher-student relationship, self-confidence, and academic achievement in the Chinese context</b> <i>Tianxue Cui, Qimong Liu, Jian Liu, &amp; Chuang Wang</i>	<b>24</b>
<b>Mapping disability representation in primary school youth literature</b> <i>Nikoletta Gulya, &amp; Anikó Fehérvári</i>	<b>29</b>
<b>The relationship between students’ approaches toward learning and academic achievement in the Chinese context</b> <i>Chuang Wang, Qimong Liu, Jian Liu, &amp; Tianxue Cui</i>	<b>34</b>
<b>A grounded theoretical study on the influence mechanism of verbal abuse by teachers</b> <i>Jinnan Li, &amp; Yuheng Zhang</i>	<b>39</b>
<b>Evaluation in scientific advisors’ commentaries as a means to develop students’ writing skills</b> <i>Albina Vodyanitskaya</i>	<b>44</b>
<b>Czech curricular reform in the rear-view mirror: the case of foreign language learning</b> <i>Pavel Brebera</i>	<b>48</b>
<b>Basis of architectural survey between geometry and representation. A first educative approach</b> <i>Eugenia Comparetto, Martino Pavignano, Ursula Zich, Ornella Bucolo, &amp; Daniela Miron</i>	<b>53</b>
<b>Creating authentic learning and assessment environments</b> <i>Katerina Kasimatis, &amp; Theodora Papageorgiou</i>	<b>58</b>
<b>Design based on ICF The training courses for in-service teachers</b> <i>Laura Sara Agrati</i>	<b>63</b>

<b>The use of computer simulations as an intervention to address misconceptions of grade 11 physical sciences learners in South African township schools</b>	<b>68</b>
<i>James Mphafudi, &amp; Sam Ramaila</i>	
<b>Beyond gamification: <i>Classcraft</i> as an engagement tool in the teaching of English as a second language</b>	<b>73</b>
<i>Verónica Membrive, &amp; Madalina Armie</i>	
<b>South African grade 11 physical sciences learners' perceptions of scientific inquiry</b>	<b>77</b>
<i>Rosemary Zunga, &amp; Sam Ramaila</i>	
<b>Prospective teachers' coping with mathematical algorithms in a flipped class setting</b>	<b>81</b>
<i>Ilana Lavy, &amp; Atara Shriki</i>	
<b>Exploring South African in-service teachers' baseline knowledge of mathematics: a case of further education and training phase</b>	<b>86</b>
<i>Sam Ramaila, &amp; Philemon Seloane</i>	
<b>Does self-assessment of creativity and its development support the development of creativity?</b>	<b>91</b>
<i>Atara Shriki, &amp; Ilana Lavy</i>	
<b>South African at-risk undergraduate engineering students' perceptions of the remedial intervention designed to enhance their academic performance in mathematics as a key knowledge domain</b>	<b>96</b>
<i>Sam Ramaila, &amp; Philemon Seloane</i>	
<b>Skilling for tomorrow at school: a training project for IVET and technical students' soft skills</b>	<b>100</b>
<i>Francesco Tommasi, Ioris Franceschinis, Marco Perini, &amp; Giuseppe Tacconi</i>	
<b>Pedagogical practices adopted by teachers when using improvised resources in life sciences classrooms</b>	<b>105</b>
<i>Syamthanda Zondi, &amp; Sam Ramaila</i>	
<b>Work ethics of special education teachers in South Korea</b>	<b>108</b>
<i>HwaChoon Park</i>	
<b>CoAstro: @n astronomy condo – teachers' attitudes and epistemological beliefs towards science in a citizen science project</b>	<b>113</b>
<i>Ilídio André Costa, Carla Morais, &amp; Mário João P. F. G. Monteiro</i>	
<b>Effects of experience-based credit-bearing courses on college students' career adaptability and employment skills in Korea</b>	<b>118</b>
<i>HwaChoon Park, &amp; Cheonsoo Park</i>	
<b>Students in research - experience with research-based teaching</b>	<b>122</b>
<i>Marcin Fojcik, Martyna K. Fojcik, &amp; Bjarte Pollen</i>	
<b>The Chinese experience in promoting teacher professional development in disadvantaged areas</b>	<b>127</b>
<i>Gong Chen</i>	
<b>Pre-service engineer educators learning mathematics: Mapping the lived complexity</b>	<b>131</b>
<i>Katerina Kasimatis, Andreas Moutsios-Rentzos, Nikolaos Matzakos, Varvara Rozou, &amp; Dionisios Kouloumpis</i>	
<b>Evaluation of factors that influence school failure in a group of adolescents in Iasi county</b>	<b>136</b>
<i>Adriana Albu, Mihaela Vlada, &amp; Florin Dima</i>	

<b>The contribution of drama as an alternative teaching approach to refugee students</b> <i>Kyriaki Chatzikonstantinou</i>	<b>141</b>
<b>Teachers' preparedness and experiences in teaching meiosis to grade 12 learners in Limpopo province</b> <i>Thapelo Manaka, &amp; Lydia Mavuru</i>	<b>145</b>
<b>Value of effective feedback to candidates leads to improving the learning goal</b> <i>Ann Toler Hilliard, &amp; Renee Foose</i>	<b>150</b>
<b>TOEIC score prediction according to student's learning performance on university English courses</b> <i>Yi-Jie Ju, &amp; Cheng-Hsuan Li</i>	<b>155</b>
<b>Teacher enhancement of interactions in life sciences English-second-language learners classes</b> <i>Vuyo Kamati, &amp; Lydia Mavuru</i>	<b>159</b>
<b>Investigating the impact of learn by doing in civil technology class: Students action</b> <i>Khojane Geoffrey Mokhothu</i>	<b>164</b>
<b>A 'digital pedagogies'–based learning platform</b> <i>Matthew Montebello</i>	<b>168</b>
<b>Historical analysis of students' performance: An age and gender perspective</b> <i>Silvia B. González-Brambila, Lourdes Sánchez-Guerrero, Beatriz A. González-Beltrán, &amp; Josué Figueroa-González</i>	<b>173</b>
<b>Improving knowledge transfer in simulation games based on cognitive load theory</b> <i>Christian Ploder, Thomas Dilger, &amp; Reinhard Bernsteiner</i>	<b>178</b>
<b>Effect of students that must repeat a course in the distribution and capacity of groups</b> <i>Lourdes Sánchez-Guerrero, Beatriz A. González-Beltrán, Josué Figueroa-González, &amp; Silvia B. González-Brambila</i>	<b>183</b>
 <b><u>Projects and Trends</u></b>	
<b>Self-produced videos in flipped classroom for pre-course engineering students, engineering students and nursing students</b> <i>Joar Sande, Ingvild Leite, &amp; Lars Kyte</i>	<b>188</b>
<b>Service-learning at university: Addressing social challenges from the education</b> <i>Elena M<sup>a</sup> Díaz-Pareja, Juana M<sup>a</sup> Ortega-Tudela, &amp; África M<sup>a</sup> Cámara-Estrella</i>	<b>193</b>
<b>Fostering creativity of students with intellectual disabilities through music listening activities</b> <i>Marina Wai-yee Wong</i>	<b>198</b>
<b>Developing domestic students' intercultural competence — a case study: Immersion program of Sichuan University, China</b> <i>Xianghan Liao</i>	<b>203</b>
<b>Digitalisation of higher education – teachers and students experience</b> <i>Marcin Fojcik, &amp; Martyna K. Fojcik</i>	<b>206</b>
<b>Innovative use of ICT in early years curriculum based on 5E instructional model</b> <i>Christina Kalaitzi, &amp; Christina Volioti</i>	<b>211</b>

<b>Augmented reality in intervention with people with autism spectrum disorder: Protocol activities</b>	<b>216</b>
<i>Alba Gilabert Cerdá, Eva García Albaladejo, Elena Pérez Vázquez, Gonzalo Lorenzo Lledó, Asunción Lledó Carreres, &amp; Alejandro Lorenzo Lledó</i>	
<b>The contemporary educational agenda _ education and reality</b>	<b>221</b>
<i>Khalid Aada</i>	
<b>Differences between traditional and augmented reality teaching</b>	<b>226</b>
<i>Eva García Albaladejo, Alba Gilabert Cerdá, Asunción Lledó Carreres, Gonzalo Lorenzo Lledó, Alejandro Lorenzo Lledó, &amp; Elena Pérez Vázquez</i>	
<b>MOOCs for bridging the school - university gap</b>	<b>231</b>
<i>Ilaria Merciai, &amp; Ruth Kerr</i>	
<b>Physiotherapist students' perceptions in a gamification project</b>	<b>236</b>
<i>Carolina Jiménez-Sánchez, Pablo Gargallo-Aguaron, María Pilar López-Royo, &amp; Fani Alfaro-Gervon</i>	
<b>Is knowledge priceless? A case study on the changing face of education</b>	<b>241</b>
<i>Joanna Peksa, &amp; Faith Dillon-Lee</i>	
<b>Catching two birds with one stone - the case of music and programming fundamentals</b>	<b>246</b>
<i>Ilana Lavy</i>	
<b>Teaching discourse analysis of the category of subject</b>	<b>251</b>
<i>Marina Fomina</i>	
<b>Interdisciplinary innovation camp for nursing and engineering students at WNUAS</b>	<b>256</b>
<i>Eivind Standal Husabø, Dagrun Kyrkjebø, &amp; Joar Sande</i>	
<b>Glocality as instrument of cultural policy and its ability to preserve cultural capital</b>	<b>261</b>
<i>Kamo Chilingaryan, &amp; Ekaterina Zvereva</i>	
<b>Communication revolutions that marked the history of education. Proverbs in education - theses and paradoxes</b>	<b>266</b>
<i>Cezar Scarlat</i>	
<b>Children with vision impairment and multiple disabilities: Issues of communication skills and professionals' challenges</b>	<b>271</b>
<i>Vassilis Argyropoulos, Charikleia Kanari, Andrea Hathazi, Maria Kyriacou, Maria Papazafiri, &amp; Magda Nikolarazi</i>	
<b>Today's higher education at a crossroads: Is the educator's role undergoing a paradigm shift?</b>	<b>276</b>
<i>Cezar Scarlat</i>	
<b>Special education teachers: Training and intervention strategies for internet risks of students with intellectual disabilities in Spanish centres</b>	<b>281</b>
<i>Marcos Gómez-Puerta, Esther Chiner, Santiago Mengual-Andrés, &amp; Esther Villegas</i>	
<b>Dimensions of students' engagement and self-insight in upper secondary education</b>	<b>286</b>
<i>Peter Grandits</i>	
<b>Creating an interactive tool for student communication: Lessons learnt</b>	<b>291</b>
<i>David Cutting, Andrew McDowell, Neil Anderson, Paul Sage, Matthew Collins, &amp; Angela Allen</i>	

<b>Evaluation of immersion program from student’ perspective in Sichuan University, China</b>	<b>295</b>
<i>Yu Man</i>	
<b>Life in the bonds of social exclusion as a disadvantageous factor of education</b>	<b>299</b>
<i>Helena Skarupská, &amp; Iva Staňková</i>	
<b>Personalized learning in math, throw problem-solving, and the use of ICT</b>	<b>304</b>
<i>Diana Starja, Nikolina Nikolova, &amp; Bederiana Shyti</i>	
<b>Ditch the plastic Trinidad &amp; Tobago: The dynamics of a multi-sectoral school-community partnership</b>	<b>309</b>
<i>Rowena Kalloo, &amp; Shahiba Ali</i>	
<b>Educational and therapeutic benefits of “content-focused accessible e-learning material” for visually impaired university students</b>	<b>314</b>
<i>Chikako Ota</i>	
 <b><u>Teaching and Learning</u></b>	
<b>Analyzing experiences of using effective feedback in the ESL classroom through the use of digital technologies</b>	<b>319</b>
<i>Roberto Mesén-Hidalgo, &amp; Juan Carlos Sandí-Delgado</i>	
<b>The methodology of action research (AR) and the impact on teachers' professional development</b>	<b>324</b>
<i>Michal Nachshon, &amp; Amira Rom</i>	
<b>Impact of maker-space project to provide computer science education to middle school students in the Alabama black belt region</b>	<b>329</b>
<i>Linda P. Thurston, Martha Escobar, &amp; Mohammed Qazi</i>	
<b>Does parental involvement really make a difference? A study with parents of primary school students in urban context</b>	<b>334</b>
<i>Raquel Barroso, &amp; Diana Dias</i>	
<b>Teacher and peer feedback in an EFL writing course: What do students need?</b>	<b>339</b>
<i>Thanakorn Weerathai, &amp; Ratsawadee Belardo</i>	
<b>When it rains while the sun is shining: School climate as an echo of the (future) social climate</b>	<b>344</b>
<i>Diana Dias, &amp; Raquel Barroso</i>	
<b>Digital engines at work: Promoting research skills in students</b>	<b>349</b>
<i>Olga Suleimanova, Albina Vodyanitskaya, Vera Yaremenko, &amp; Marina Fomina</i>	
<b>Old techniques, new competences: Rebuilding historical instruments to teach and learn physics</b>	<b>353</b>
<i>Ana Paula B. Silva, José Antonio F. Pinto, Samira Arruda Vicente, &amp; Gerson Gonçalves</i>	
<b>A systematic literature review of methodologies used for the design of serious games. A comparative analysis</b>	<b>358</b>
<i>Juan Carlos Sandí Delgado, &amp; Patricia Alejandra Bazán</i>	
<b>Investigating factors hindering the implementation of e-learning at Motheo technical and vocational education and training (TVET) college: A case study of the national vocational certificate (NCV) programme</b>	<b>363</b>
<i>Mmatau Zwane, &amp; Wendy N. Setlalentoa</i>	

<b>The effects of drinking and smoking among undergraduates on academic performance and transition to employment</b>	<b>366</b>
<i>Cheonsoo Park, &amp; HwaChoon Park</i>	
<b>The toiling single mother: Does her education attainment level matter in a learner's academic performance? Evidence from some South African high schools</b>	<b>370</b>
<i>Ruth O. Adesokan, &amp; Alfred H. Makura</i>	
<b>An effective method of teaching English tense and aspect through time adverbs</b>	<b>375</b>
<i>Chikako Takahashi, &amp; Akemi Matsuya</i>	
<b>The influence of mother tongue in second language learning in primary school</b>	<b>380</b>
<i>Pule Phindane</i>	
<b>Investigation on teaching critical thinking in English course to young ESL learners in China</b>	<b>385</b>
<i>Shu Jia</i>	
<b>Exploring student teachers' learning strategies and the relationship with academic achievement and demographic variables</b>	<b>389</b>
<i>Esther Chiner, Marcos Gómez-Puerta, &amp; María Cristina Cardona-Moltó</i>	
<b>Nature of science interdisciplinary teaching based on symmetry and the search of invariants</b>	<b>394</b>
<i>Simone Brasili, &amp; Riccardo Piergallini</i>	
<b>An assessment of curriculum-specific learning difficulties in natural sciences within the South African context</b>	<b>399</b>
<i>Mafor Penn, &amp; Ramnarain Umesh</i>	
<b>Visual literacy for the 21<sup>st</sup> century: the required ability to understand the power of modern images</b>	<b>404</b>
<i>Bozena Supsakova</i>	
<b>A cloud in a cupboard: How to teach modern technologies in a resource-constrained environment</b>	<b>409</b>
<i>David Cutting, Andrew McDowell, Neil Anderson, Paul Sage, Matthew Collins, &amp; Angela Allen</i>	
<b>Early year teachers' understanding and implementation of science process skills</b>	<b>414</b>
<i>Ayodele Ogegbo, &amp; Umesh Ramnarain</i>	
<b>The relevance of leadership styles in the quality of early childhood educators: a multiple cases study</b>	<b>419</b>
<i>Emilio Rodríguez-Ponce, &amp; Liliana Pedraja-Rejas</i>	
<b>Drawing vs. Design: A study on industrial design BSC in Italy</b>	<b>423</b>
<i>Fausto Brevi, &amp; Flora Gaetani</i>	
<b>Development of an animated video for pre- and postoperative learning for osteoarthritis patients</b>	<b>428</b>
<i>Erik Kylén, Joel Stenholm, &amp; Ann Svensson</i>	
 <b><u>Organizational Issues</u></b>	
<b>EHEA international students mobility and transparency</b>	<b>433</b>
<i>Tijmen Weber, Florentin Popescu, &amp; Roman Iskandaryan</i>	

<b>Research on the causes of the "undergraduate migrant worker" phenomenon based on the theory of labor market segmentation</b> <i>Yuheng Zhang</i>	<b>438</b>
<b>The evolution of china's private education policy: historical review and path analysis</b> <i>Yang Li</i>	<b>443</b>
<b>Teachers' opinions on professional support measures for novice teachers in Latvia</b> <i>Anda Grinfelde, Inga Vanaga, &amp; Liga Paula</i>	<b>448</b>
<b>Employer branding as recruitment and retention tool for the universities</b> <i>Asta Radzevičienė, &amp; Aleksandra Sokolova</i>	<b>453</b>
<b>Analysis of Chinese policy of tuition-free normal college students: purpose, content and effect</b> <i>Xue Yuankang</i>	<b>458</b>

## POSTERS

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### **Teachers and Students**

**Subject teachers and enhancement of students' English proficiency in selected senior six classrooms in Rwanda** 465  
*Speciose N. Ndimurugero, & Gloriose Mugirase*

**The effects of local-specialized career experience programs on Korean students' career maturity and community awareness** 468  
*HwaChoon Park, & JangHoe Ku*

### **Projects and Trends**

**Active methodologies and aware education for future secondary schools teachers** 471  
*Consolacion Gil, & Maria Dolores Gil-Montoya*

**A systematic scoping review on skills variety for vet in the industry 4.0** 474  
*Francesco Tommasi, Ioris Franceschinis, Marco Perini, & Riccardo Sartori*

### **Teaching and Learning**

**ICT competencies of first-year university students** 477  
*Daiva Rimkuvienė*

**Eugenics today: An interdisciplinary teaching for higher education** 480  
*Andreas-Evangelia Spathi, Afroditi Kalemi, Athina Kontostavlaki, Evridiki Efstathiou, & Lefkothea-Vasiliki Andreou*

**Building integrated pathways to independence for diverse biomedical researchers: project pathways** 483  
*Maryam Foroozesh, Kathleen Morgan, Marguerite Giguette, Kelly Johanson, & Clair Wilkins-Green*

**Brain music: introducing research thinking to the secondary education curriculum** 486  
*Athina Malliou, Spyretta Vaxevanidi, & Lefkothea-Vasiliki Andreou*

**AUTHOR INDEX** 489

The background features a light blue, cloud-like shape on the left side, with various colorful geometric shapes (circles, polygons) scattered across it. The colors include pink, orange, purple, green, and teal. The text 'VIRTUAL PRESENTATIONS' is centered in a bold, dark blue font.

# **VIRTUAL PRESENTATIONS**



# ASSESSING TPACK INTEGRATION IN SENIOR PHASE SCIENCE TEACHING AND LEARNING AT SOUTH AFRICAN TOWNSHIP SCHOOLS

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## Abstract

As a complex dichotomy, the advent of the fourth industrial revolution poses enormous challenges while providing practical pedagogical benefits for science teaching and learning within the broader South African educational context. While the need to integrate technology as a catalyst for pedagogic innovation in science teaching and learning is paramount, considerable attention ought to be devoted to meaningful teacher professional development on the effective utilization of appropriate information and communication technology tools. In view of this key strategic imperative, this study primarily examined the effectiveness of the technological pedagogical content knowledge (TPACK) integration in Senior Phase science teaching and learning at selected South African township schools. The study adopted a generic qualitative design located within the interpretive research paradigm. Data was collected through semi-structured interviews and lesson observations involving three purposively selected Natural Sciences teachers at South African township schools. The study demonstrated that general lack of essential resources and appropriate technological skills hampered teachers' ability to meaningfully integrate TPACK in Senior Phase science teaching and learning at the selected South African township schools. In addition, teachers' lack of topic specific pedagogical content knowledge served as an impediment to effective integration of TPACK in Senior Phase science teaching and learning. Moreover, teachers' inability to identify and deploy appropriate information and communication technology tools reflected inadequate understanding of the TPACK framework. Implications for technology-enhanced learning are discussed.

**Keywords:** *TPACK, technology-enhanced learning, pedagogic innovation.*

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## 1. Introduction

The implementation of technology-enhanced learning is a curriculum reform imperative which is in line with digital transformation in its broadest sense. The South African government is poised to introduce technology-based education in all schools with a view to provide every learner with digital workbooks and textbooks (Matiwane, 2019). Innovative use of technology in the classrooms to enhance meaningful learning remains an extremely difficult and complex undertaking for teachers (Webb & Cox, 2004). Teachers find it increasingly difficult to integrate technology into their own teaching practices (Voogt & McKenney, 2017). Yet, the integration of technology into teachers' pedagogical practices is vital for the enhancement of their pedagogical content knowledge. At another pragmatic level, the application of technology in the classroom for lesson presentation and assessment proved to be an arduous undertaking for teachers (Koehler & Mishra, 2009).

According to Koehler and Mishra (2009), effective delivery of content using technology ought to be underpinned by a coherent blending of three key components, namely, content, pedagogy and technology. These components constitute the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Koehler and Mishra (2009). The TPACK framework is essentially an extension of Shulman's (1987) conceptualization of the pedagogical content knowledge construct and serves to underscore the significance of various lesson presentations and concomitant key ingredients required to deliver effective lessons (Harris & Hofer, 2011). There is a critical need to address the pervasive disjuncture between content-based curriculum and technology-enhanced learning. To this end, the TPACK framework can serve as a specialized way of effectively integrating technology into content-based curriculum (Harris & Hofer, 2011). Given the crucial need to implement technology-enhanced learning with a view to foster pedagogic innovation, this study explored TPACK integration in Senior Phase science teaching and learning at South African township schools.

## 2. Research design and methodology

This study adopted a generic qualitative design located within the interpretive research paradigm. Qualitative design was appropriate for this study as it provides rich data in respect of a phenomenon or context and provides an understanding of the factors being observed (McLeod, 2017). In addition, qualitative research provides multiple perspectives and makes it possible for the issue under empirical investigation to be studied in greater detail. Data was collected through semi-structured interviews and lesson observations involving three purposively selected Natural Sciences teachers at South African township schools. Analysis of qualitative data was guided by the Coding Manual for Qualitative Researchers developed by Saldana (2009).

## 3. Findings

The study involved three Natural Sciences teachers as participants. The demographic profile of the participants is provided in Table 1 below.

*Table 1. Demographic profile of the participants.*

	<b>Gender</b>	<b>Age</b>	<b>Teaching experience</b>	<b>Qualifications</b>
Teacher A	Male	52 years	24 years	College Diploma Advanced Certificate in Education
Teacher B	Male	30 years	6 years	University Degree
Teacher C	Female	30 years	3 years	University Degree

The key findings in this study are clustered according to the themes that emerged during data analysis.

### 3.1. Theme 1: Resources and skills required to integrate TPACK in Senior Phase science teaching and learning

Analysis of data obtained from lesson observations revealed that teachers at selected township schools investigated do not have relevant resources required to integrate TPACK in Senior Phase science teaching and learning. Out of the three schools observed, only one school had an interactive white board and a white board with no additional technological devices. The participants indicated that they do not have the skills required for meaningful technology integration in science teaching and learning. The following excerpt captures the sentiment expressed by Teacher A.

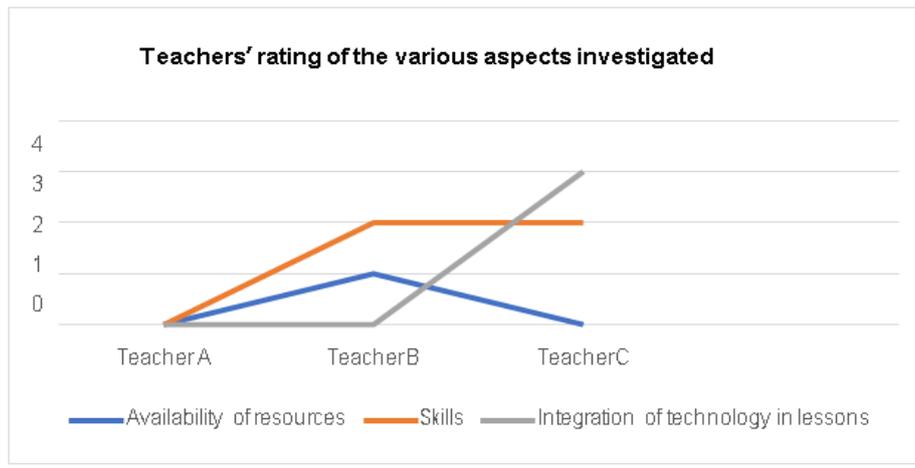
*I do not have knowledge of the use of technologies in teaching and learning and I never received training about the use of technology for teaching and learning.*

This sentiment was corroborated by Teacher B who also expressed frustration about the lack of relevant resources required for meaningful technology integration in science teaching and learning as encapsulated in the following excerpt.

*There are few resources in my classroom and I do not have adequate knowledge of the use of those resources in teaching and learning.*

Figure 1 below provides a depiction of teachers' rating on a scale of 0-4 of the various aspects investigated. Lack of resources and appropriate technological skills appeared to have a detrimental impact on meaningful integration of TPACK in Senior Phase science teaching and learning as evidenced by the teachers' rating of the various aspects investigated. Thus, it is imperative for the South African Department of Basic Education to provide requisite resources while ensuring that appropriate technological training for teachers is provided in a sustainable manner. This implies that deployment of resources ought to be accompanied by provision of relevant technological training required to facilitate the integration of technology in Senior Phase science teaching and learning in particular.

Figure 1. Teachers' rating of the various aspects investigated.



### 3.2. Theme 2: Overall understanding of TPACK framework

The teachers demonstrated adequate mastery of content knowledge. However, their pedagogical content knowledge appeared to be inadequate. The three teachers detailed how they use pedagogical illustrations and content representations during their lessons to ensure learners understand the content without enacting inquiry-based learning as a contemporary pedagogic approach. In essence, teachers experienced difficulties with the implementation of the pedagogical content knowledge (PCK) framework as evidenced by the sentiment expressed by Teacher A encapsulated in the following excerpt.

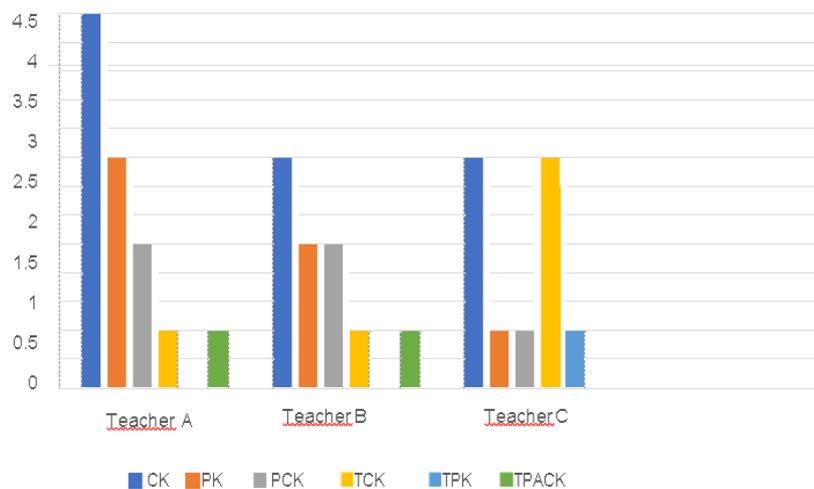
*I have no knowledge of the PCK framework and could not recall having ever heard of the term before.*

The selection of appropriate ICT tools to teach specific topics proved increasingly difficult for teachers. The manifestation of this challenge is reflected in the sentiments expressed by Teacher A as encapsulated in the following excerpt.

*I do not have an idea of any kind of technology that can be integrated into my lessons when teaching the solar system for instance. I never integrate any technology when teaching the solar system, I only show learners a model of the earth.*

The teachers portrayed inadequate technological knowledge which is exacerbated by severe lack of essential resources. In addition, lack of appropriate technological skills served to impede meaningful integration of TPACK in Senior Phase science teaching and learning. Figure 2 below reflects teachers' rating of their own professional competence in terms of TPACK framework on a scale of 0-5.

Figure 2. Teachers' rating of their own professional competence in terms of TPACK framework.



#### 4. Discussion

This study revealed that teachers at selected South African township schools do not have relevant resources required to integrate TPACK in Senior Phase science teaching and learning at their disposal. General lack of essential resources and appropriate technological skills appeared to have a detrimental impact on meaningful integration of TPACK in Senior Phase science teaching and learning. This finding is consistent with a study conducted by Alhababi (2017) which demonstrated that meaningful teaching and learning is adversely affected by limited availability of technological resources and appropriate technological skills to use these resources. This state of affairs is exacerbated by the fact that availability of technological resources in rural schools is not always supported by the provision of internet access (Madangopal & Madangopal, 2018). It has also been established that limited internet access serves to stifle effective implementation of TPACK framework in rural schools (Ghavifekr, Kunjappan, Ramasamy, Anthony, 2016). In addition, Nkula and Krauss (2014) identified lack of access to resources as one of the main barriers to ICT integration.

The teachers demonstrated adequate mastery of content knowledge although their pedagogical content knowledge was not firmly established. The teachers portrayed inadequate technological knowledge which appeared to be exacerbated by severe lack of essential resources. Furthermore, lack of appropriate technological skills served to impede meaningful integration of TPACK in Senior Phase science teaching and learning. In this regard, Dalal, Archambault and Shelton (2017) posit that teachers with adequate technological pedagogical knowledge often encounter challenges with the integration of technological content knowledge in teaching and learning. In support of this notion, Chai, Koh and Tsai (2013) maintain that the complex disjuncture between technology integration and content-based curriculum remains a fundamental challenge to teachers.

The selection and deployment of appropriate ICT tools to teach specific topics appeared to be an arduous task for teachers. As observed by Koehler, Mishra, Kereluik, Shin and Graham (2014), most teachers cannot select appropriate technological applications to use as they lack sufficient knowledge on how to integrate these applications into their lessons. Technology integration poses significant challenges to teachers at each level of the school system (Johnson, Jacovina, Russel & Soto, 2016). Ramorola (2010) noted that the effectiveness of ICT integration is crucially dependent on teachers' ability to use technology. The challenges encountered by teachers in relation to technology integration in Senior Phase science teaching and learning ought to be addressed as an integral part of sustainable teacher professional development interventions. As a member of the global community of nations, South Africa is faced with the key strategic imperative to provide a globally competitive curriculum in order to ensure sustainable enhancement of human capacity development.

#### 5. Conclusion

The integration of TPACK in Senior Phase science teaching and learning remains a fundamental challenge for teachers at South African township schools within the context of this study. There is a crucial need to create increased opportunities for teachers to fully embrace technology integration as a key curriculum reform imperative for purposes of fostering meaningful development of scientific literacy. This mission can be accomplished by harnessing the practical pedagogic benefits associated with the advent of the fourth industrial revolution as a game changer.

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# MUSIC CURRICULUM INTEGRATION PRACTICES - “ACCOUNTABILITY” AS POLICY TRANSLATION IN PROFESSIONAL MUSIC TRAINING: THE CASE OF THE TUT

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## **Abstract**

Music curriculum integration in professional music training is a process in which policy and practical issues associated with using student achievement and music teachers' professionalism is considered so that “accountability” may more readily support curriculum integration needs. One of the realities of music education is how government-led implementation of policies influences arts teaching and learning in unintended ways. The purpose of this paper is to use Bate's (2017) three musical experiences of critical social class theory as the enquiry lens. Three contextual variables are highlighted for their impact on teachers and schools: Tolerance, inter-cultural dialogue, and respect for diversity. The focus is music education policy and its aims and strategies that need to be shaped in different ways that are appropriate to the diversity of musical practices and contexts of music education. Insights into the results of policy translation are gained through using the Music Department at the Tainan University of Technology, Taiwan, as an example. The findings demonstrate that music curriculum integration with a function-based approach to accountability helps with successfully implementing policies.

**Keywords:** *Curriculum integration, accountability.*

---

## **1. Introduction**

Music curriculum integration is performed by people who legislate, create, teach, and learn music and other school subjects. Music curriculum integration, then, is more than just a technical exercise; it is also always social and sociological (Bates, 2016). A growing consensus has evolved that various kinds of arts integration teaching and professional development programs are positively linked to improved student learning (Burnaford, Brown, Doherty, & McLaughlin, 2007; Catterall, Chapleau, & Iwanaga, 1999; Catterall & Waldorf, 1999; Deasy, 2002; Gardiner, 2000). Music curriculum integration in professional music training means the combination of three musical experiences of critical social class theory, namely, tolerance, inter-cultural dialogue, and respect for diversity, within complex learning experiences. Bates (2017) noted that a critical social class theory not only leads to serious acknowledgement, but also looks beyond marginalization. As Perrine (2017) noted, within music education, various themes emerge when discussing music education from a critical perspective: A critique of capitalism as an economic system and its disparate impact on musical opportunities for children; concern regarding neoliberal political policies, which tend to devalue music and the arts as a curricular area; the negative influence on large corporations on mass culture and students' musical horizons; and a concern for minority and disadvantaged students and their musical values. Herbert Marcuse's (1898-1979) discussion and approach to understanding tolerance in 1965 is grounded in the language and ideas of critical theory as a whole. The representation of conservative viewpoints on curriculum theory and philosophical discourse on the role of the large instrumental ensembles in the music curriculum have the capacity to engage all music education practitioners, exciting the imagination and encouraging them to reach the ordinary notion of education (Perrine, 2017). For disadvantaged students, Shared Training Activities for Music Professionals (STAMP) (2018) noted that the Hungarian composer, ethnomusicologist, and teacher Kodály (1882-1967) believed that music should be part and parcel of daily education and accessible to all. The concept of musical youth as intercultural phenomenon celebrates human diversity and social inclusivity. Therefore, in this paper, it is advocated that an intercultural approach must be based on musical meaning theorization and the uses and functions of music and musical identities (participation in the musical experience). Inter-cultural dialogue illustrates the ways that learning in and through trainers/educators' experiences offers the potential and possibility for changing trainers/educators' perceptions of both self and others (Skoutella, 2018).

Professional music training programs are challenged by major changes in the sociocultural and educational landscape. In response to Taiwan's societal challenges, such as current issues about Music Education Policy, the Ministry of Education, Taiwan, amended the Arts Education Act (AEA) that outlined the curriculum for study in the performing arts in 1997. The AEA of 1997 was related directly to Taiwan's art education reform (Lau & Li, 2013). This new milestone provided a solid foundation in music education in Taiwan for all students (Ministry of Education, Taiwan, 1997).

Examination of the mismatch is undertaken on three levels. First, on the macro level, Marcuse's philosophy of tolerance that pervades education in Taiwan and other similar Western countries is identified. Second, on the meso level, "accountability" as policy translation is at the center of this paper and therefore, the contextual dimensions (inter-cultural dialogue and respect for diversity) that impact on professional music learning opportunities are identified. Recognizing their contribution to the ecology of higher education will highlight the focus of music curriculum implementation (Mishook & Kornhaber, 2006). Finally, at the micro level, the intended and unintended results of implementation policy and what this has meant for music education in this scenario is identified.

## **2. Background**

### **2.1. Music education and practice in the Taiwan's context**

Two main channels of higher education exist in Taiwan: Academic and vocational technology. Tainan, Taiwan, hosts 11 universities: Four are academic, and the remaining seven are vocational technology institutions (Ministry of Education, Taiwan, 2008). Only three of the universities have music departments: Two are academic universities, the National University of Tainan (NUTN) and Tainan National University of the Arts (TNNUA), and one is vocational technology university, namely, Tainan University of Technology (TUT). NUTN, located in the southern metropolitan area of Taiwan, is an historic university with a distinguished academic legacy (National University of Tainan, 2007). TNNUA is the only professional school of the arts located outside of the Taipei metropolitan area. TUT, founded in August 1964, places its emphasis on home economics and arts and is located in Yongkang City, Tainan County's geographic center. There are 30 fulltime faculty in the music department of TUT; 19 faculty are piano majors, which is 63% of the staff in the music department. In 2020, 9,474 daytime program students were registered in 5 colleges, 6 graduate institutes, 21 departments, and 4 bachelor's degree programs; 497 students are music majors, which is 5.2%. of the students in at the school.

### **3. Macro forces: Political engagement by music education practitioners**

As a macro force influencing education across the globe, political engagement by music education practitioners is considerable. The current politicized curriculum in music education has resulted in what Chapmana, Wrighta, and Pascoea (2018) and Chen and Huang (2017) suggested is a rescaling of educational accountability. This rescaling shifts the focus of performance from a predefined false consciousness towards specific political ends, namely, the transformation of capitalist society and the development of "authentic" consciousness (Perrine, 2017) and is being experienced most in Western post-industrialized countries such as the United Kingdom, United States, Canada, Australia, and Taiwan (Chapmana et al., 2018; Chen & Huang, 2017). Cross-disciplinary work bringing in sources from political science, sociology, law, or economics can help shed light on both alternative and traditional approaches within the discipline of music education (Perrine, 2017). This is important because these political perspectives inform policy and its enactment (Chapmana et al., 2018; Chen & Huang, 2017).

### **4. Meso forces: "Accountability" as policy**

At a meso level, the policy central to this paper is colloquially known as "accountability." In this context, "accountability and performance" recognize policy components to be implemented as published by the Curriculum Mapping, National Taiwan University (NTU), whereas "competition and deregulation" (Chou, 2015) indicates components focused on three values: Spontaneity, interaction, and common good in Taiwan schools (Chen & Huang, 2017). This policy phrase was introduced by the General Curriculum Guidelines and endorsed by the Ministry of Education, Taiwan, for the purpose of translation from central government to localized responsibility. In this parlance, translation implies taking policy from its written to enacted context. In considering policy as both text and enactment, music education practitioners can better understand the notion of "accountability" as a tool to manage the introduction of a curriculum and discuss why this may or may not produce the intended outcomes for teacher and student engagement with music integration practices in and through the new curriculum. The purpose of the "accountability" policy is to implement the curriculum in such a way as to actually reach students in schools and increase their engagement with a coequal, cognitive style of music curriculum integration.

## 5. Micro forces: Understanding of the “accountability” message

The “accountability” message has been a powerful tool for higher education institutes (HEIs) in outlining their plans for governance change to increase efficiency in Taiwan’s schools. Market-oriented higher education is becoming primarily focused on structures and actions tailored to “competition and deregulation” (Chou, 2015, p.11). Students are expected see connections and walk away with bigger ideas. Policy activities in music education are required to be rooted in a theoretical basis of aims and strategies. Music teachers need to be encouraged to develop their abilities to participate in music education policymaking (Jank, 2009). In addition, Scripp, Ulibarri, and Flax (2013) noted administrators have the power to require accountability measures to show that all of the music programs in their school employ a deep and deliberate practice model for music development. Understanding the “accountability” purpose, to make curriculum more accessible to students, is one component of this paper and highlights the intended outcomes of the “accountability” message.

## 6. Conclusion

Most of the interest groups agree with Hope (2002) that “A policy is a decision about how to proceed, based in part on knowledge or research and in part on values and opinion. Its existence presupposes potential action aligned with the decision reached. Policy is made because of a perceived need to act” (p. 5). However, it is clear that groups of people throughout history and throughout the world have their own associated musics and musicings with music curriculum and its integration with social studies. It is an educator’s responsibility to ensure that integration “seeks cost-effective behavior among HEIs, increased efficiency, and eventually better educational quality” (Chou, 2015, p.11) and encourage a more constructivist learning environment when implemented.

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# **FACTORS INFLUENCING TEACHERS' INCLINATION TO USE IMPROVISED RESOURCES IN LIFE SCIENCES CLASSROOMS**

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## **Abstract**

A substantial number of schools in South Africa are still under-resourced and this predicament poses fundamental challenges to the provision of quality education for all. The use of improvised low-cost resources as an integral part of pedagogic innovation can be adopted as a viable and sustainable alternative to harness affordable resources to foster meaningful science teaching and learning. In view of this crucial imperative, this study primarily focused on the use of improvised low-cost resources in Life Sciences classrooms at selected South African township schools. The study adopted a case study design located within the interpretive research paradigm. Data was collected through semi-structured interviews and lesson observations involving ten purposively selected Life Sciences teachers. The study revealed that key factors influencing teachers' inclination to use improvised resources include general lack of essential laboratory resources, the need to demystify complex scientific concepts to ensure meaningful conceptual understanding by using available affordable alternative resources as well as harnessing the affordances of improvisation as an innovative means to stimulate meaningful teaching and learning. While the affordances associated with the use of improvised resources have been duly acknowledged by the participants in this study, fundamental challenges and limitations afflicting the deployment of improvised resources remain. In particular, Life Sciences teachers involved in the study postulated that the use of improvised resources may serve to perpetuate misconceptions and that lack of requisite creativity can adversely affect the crafting of improvised resources necessary for teaching difficult topics. Implications for pedagogic innovation are discussed.

**Keywords:** *Improvisation, low-cost resources, pedagogic innovation.*

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## **1. Introduction**

The availability of essential resources is a key requirement for provision of quality education for all. However, the South African basic education system is largely characterised by inequitable access to resources (Sedibe, 2011). In addition, a substantial number of schools in South Africa are still under-resourced. This predicament calls for pedagogic innovation on the part of teachers as key agents of educational change to harness the affordances of improvised resources to demystify abstract scientific concepts. Obawuiké (2018) explains improvisation in science education as the process of creating alternative materials of teaching by replicating standard materials to function similarly as the original ones using locally sourced materials. Improvisation is essentially the act of construction of instructional materials from locally available materials that can adequately replace or function in place of the original material which otherwise may be very expensive or in short supply or unavailable (Samba & Eriba, 2011). Given the need to harness the affordances of improvised resources within the broader South African educational context, this study primarily explored factors influencing teachers' inclination to use improvised resources in Life Sciences classrooms.

## **2. Research design and methodology**

The study adopted a case study design located within the interpretive research paradigm. Data was collected through semi-structured interviews and lesson observations involving ten purposively selected Life Sciences teachers in South African township schools. These township schools were largely under-resourced.

### 3. Findings

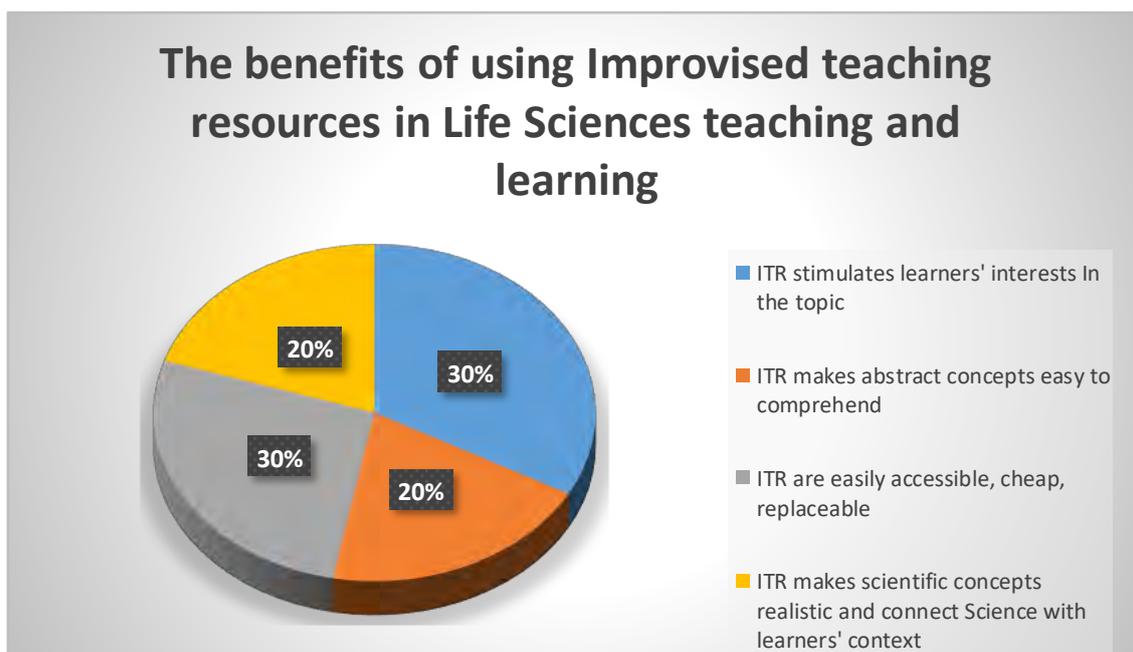
Table 1 below provides teachers' responses on factors influencing their inclination to use improvised resources in Life Sciences classrooms. A likert scale was used to categorise the distribution of teachers' responses: Strongly Agree = SA, Agree = A, Neutral = N, Disagree = DA and Strongly Disagree = SD.

Table 1. Factors influencing teachers' inclination to use improvised resources in Life Sciences classrooms.

Factors influencing teachers' inclination to use improvised resources in Life Sciences classrooms	Distribution of teachers' responses				
	SA	A	N	DA	SD
Lack of teaching aids in schools	70%	10%	20%	0%	0%
Lack of well-equipped science laboratories	60%	20%	20%	0%	0%
Improvised resources make it easy for learners to understand complex scientific phenomena and to relate it to everyday life.	70%	20%	10%	0%	0%
Improvised resources are cheap, easily accessible and manufactured	80%	20%	0%	0%	0%
Improvised resources can adequately replace and function in place of original materials	20%	20%	0%	30%	30%

As reflected in Table 1 above, the vast majority of the teachers indicated that general lack of essential resources in township schools is one of the key factors influencing their inclination to use improvised resources in Life Science classrooms. In addition, the teachers expressed positive sentiments about the affordances of improvised resources. However, the teachers were ambivalent about the use of improvised resources as a replacement of original materials. This implies that improvised resources can essentially be used to complement original materials. As illustrated in Figure 1 below, some of the pedagogical affordances of improvised resources in Life Sciences teaching and learning include stimulation of learners' interest in various topics, enhancement of meaningful conceptual understanding of abstract scientific concepts, accessibility of improvised resources to stimulate pedagogic innovation and provision of context-specific science instruction.

Figure 1. Teachers' perceptions about the pedagogical affordances of improvised resources in Life Sciences teaching and learning.



The teachers demonstrated fundamental appreciation of the pedagogical affordances of improvised resources as reflected in the following excerpt.

*When conducting experiments with grade 10 learners, I ask them to come along with transparent, small (300-500 ml) plastic bottles to use as beakers. When teaching blood circulatory system, I use charts with flow diagrams to illustrate oxygenated blood and deoxygenated blood.*

The teachers bemoaned general lack of resources as a key impediment to the enhancement of meaningful teaching and learning as the following excerpt demonstrates.

*In this school we do not have Labs, nor a science budget. I had to use a chart with a kidney drawing to illustrate the internal structure of the kidney.*

#### **4. Discussion**

The key findings of study revealed that key factors influencing teachers' inclination to use improvised resources include general lack of essential laboratory resources, the need to demystify complex scientific concepts to enhance meaningful conceptual understanding by using available affordable alternative resources as well as harnessing the pedagogical affordances of improvisation as an innovative means to stimulate meaningful teaching and learning. While the pedagogical affordances associated with the use of improvised resources in Life Sciences teaching and learning have been duly acknowledged by the teachers, fundamental challenges and limitations afflicting the deployment of improvised resources remain. In particular, the teachers postulated that the use of improvised resources may serve to perpetuate misconceptions if they are not properly integrated and that lack of requisite creativity can adversely affect the design of improvised resources necessary for teaching difficult topics. Olagunju and Abiona (2008) argue that the inadequacy of teaching materials or resources, laboratory equipment and laboratory space has been a key area of concern for teachers. Obawuike (2018) posits that the driving-force for adopting improvisation-based teaching approaches is the lack of standard science equipment in schools. In navigating this complex predicament, teachers resort to utilization of improvised resources to reduce and save costs (Obawuike, 2018). The provision of quality science education within the South African context is largely hampered by lack of essential resources. In support of this notion, Parker (2018) postulates that effective teaching and learning of sciences requires the incorporation of instructional materials to foster pedagogic innovation rather than undue reliance on traditional instructional methods.

The teachers demonstrated fundamental appreciation of the pedagogical affordances of improvised resources in Life Sciences teaching and learning. This finding is consistent with a research study conducted by Mboti, Ndem and Stephen (2011) which established that the use of improvised instructional materials makes learners to understand better, perform well, enhances teaching and learning of science as they make the learning process interesting and enjoyable. A study conducted by Obawuike (2018) demonstrated that science learners taught using improvised instructional materials performed better than those taught using traditional approaches. Parker (2018) concurs by affirming that the use of improvised materials for experiments enables learners to take part in hands-on construction of apparatus. Parker (2018) further asserts that the use of improvised instructional resources provides meaningful platforms to demystify abstract scientific concepts for learners.

#### **5. Conclusion**

Improvised instructional resources can be used to circumvent general lack of resources in South African township schools. There is a crucial need to harness the pedagogical affordances of improvised instructional resources with a view to foster meaningful science teaching and learning through pedagogical innovation.

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## IMPROVING UNIVERSITY STUDENTS' PERCEPTIONS OF PEER ASSESSMENT

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### Abstract

Peer assessment is crucial in modern education which emphasizes students' active participation at every aspect of their learning. However, studies have evidenced problems in the implementation of this type of assessment and resistance towards these methods caused by students' negative perceptions. This paper describes an action research study that set out to find out and improve the perceptions about peer assessment in a group of 30 university students from the third semester of a Bachelor of Arts in English Language Teaching program in Northwest Mexico. The instruments used for data collection were observations and written interviews. Activities and strategies were designed and implemented following the stages of action research. Data was analyzed and the results suggested that the students' perceptions about peer evaluation improved in relation to the credibility and value of peer assessment.

*Keywords: Peer assessment, perceptions, training university students, action research.*

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### 1. Introduction

Modern approaches to education and their methodologies emphasize the need for students to be active learners and responsible of their own learning. They need to be able to search for information, share knowledge with their peers, discuss and debate the different information and points of view. Then, they should continue to analyze and evaluate what was debated to come up with new understandings. In addition, the 21<sup>st</sup> century competencies, which are clustered in three basic domains and are the cognitive, intrapersonal and interpersonal competencies, expect students to become citizens that can transform society, address inequalities, help social justice and protect the environment (UNESCO, 2013). Therefore, high quality university education should address these three domains and develop a diversity of skills to achieve these purposes in their students. Pellegrino (2017) explains that the cognitive domain clusters the knowledge, cognitive processes and creativity competencies while the intrapersonal domain is the one that develops the conscientiousness, intellectual openness, work ethic and self-regulation competencies. He also adds that the interpersonal domain includes teamwork, collaboration and leadership.

In this scenario where decision-making, collaborative work, information sharing and innovations are key factors to function in a globalized world (Binkley, Erstad, Herman, Raizen, Ripley, Miller-Ricci, & Rumble, 2012), modern methodologies which make use of current methods of assessment are crucial to optimize learning and reach the 21<sup>st</sup> century agenda goals. Studies have proved the need for engaging students in peer and self-assessment. Logan (2009) claims that these methods enhance the development of self-confidence, reflection and critical thinking skills while De Grez, Valcke and Roozen (2012) observed important learning gains in students after being involved in this type of assessment. And Ndoye (2017) found out that it created a more open and supportive learning environment. Therefore, peer assessment helps develop the three broad competencies: the cognitive, intrapersonal and interpersonal domains.

However, literature shows that many students have negative perceptions about peer assessment methods. Liu and Carless' (2006) found out in their study that not only students but also teachers were resistant to the use of peer assessment. They claim that the reasons for the students' resistance are their perceptions of lack of reliability and knowledge from peers as well as the power relations among peers. In another study, Carvalho (2013) reports on students' perceptions of unfairness and conflicts of friendships in peer evaluation. As peer assessment needs to be "...brought into the heart of teaching and learning processes and decision-making" as James and Pedder (2006, p. 28) suggest, steps need to be taken for training students and teachers in these methods of assessment. Therefore, this study set out to investigate the perceptions about peer assessment of a group of students that are studying to be teachers at earlier stages in the Bachelor of Arts in English Language Teaching (BA in ELT) program.

## 2. Design and role of the researcher

The design of this study followed the qualitative approach to research and used the action research methodology. Sagor's (2000) defined action research as "a disciplined process of inquiry conducted by and for those taking the action...[in order to] assist the "actor" in improving and/or refining his or her actions" (p. 3). In this sense, the role of the researcher was participatory since the researcher implemented the steps, activities and strategies in her own classroom. The spiral steps that were followed were first the diagnosis stage in which the focus was established and literature was read. In the second step of planning, the strategies to make students understand the concept of peer evaluation in practice and the activities for the strategies to happen were planned. In the third stage of execution, the activities and strategies were implemented and observed, notes were taken. In the fourth stage of reflection and evaluation, data was analyzed, reflected upon and the strategies and activities were evaluated for implementing another cycle.

## 3. Objectives

As the studies in the literature section of this paper suggested mixed perceptions about peer assessment, the objective of this study was to find out whether the students from the third semester of the BA in ELT program shared positive and negative perceptions about this type of assessment. Then the second objective was to see whether negative perceptions surfaced and if these could be improved. Therefore, the research questions were:

- What are the perceptions of the students from the third semester of the BA in ELT program?
- To what extent can the negative perceptions of the third semester of the BA in ELT program be improved, if any?

## 4. Participants

The participants in this study were 30 students from the third semester of the BA in ELT program in a northwest public state university in Mexico. Their ages ranged from 19 to 26 years old and the group consisted of 13 males and 17 females. The course was Introduction to teaching practice, which is a combination of theory and practice. In this introductory course, the students learn about classroom management techniques and strategies in a collaborative and simulated environment. Examples of the course content are the use of the voice, gestures, eye contact, setting groups, giving instructions, lead-ins, eliciting from students, elements in a lesson plan, etc. At the end of the course, the students present in groups a short lesson plan in which they have to include the techniques and strategies practiced in class in a microteaching session.

## 5. Discussion of results

For the diagnosis stage, the students were given a written interview with questions about their experience with peer assessment, types of peer assessment they have experienced, their opinions about this type of assessment and reasons for these opinions. The results of their experience were that 68 percent said that they had experienced peer assessment a few times during their junior and high school education and 5 percent of students said that their experience had started at elementary school. The percentage of students that had not experienced peer assessment until entering the BA in ELT program was 27. However, when analyzing the results from the type of peer assessment they had carried out, there was a diversity of situations in which most of them said that they had exchanged and graded exams (multiple choice, fill in the blanks, true or false, matching, short answer, etc.) while the teacher was dictating the correct answers. A few others said they had peer evaluated written papers in this program such as essays, proofreading them and correcting grammar, spelling and punctuation marks. Other few commented that they had given feedback after oral presentations and assessed peers, mostly in this program. Therefore, this analysis suggested that most of the students' experience before this program was summative, mechanic and guided by the teacher.

In relation to the students' opinions and their reasons, 48 percent said that they did not perceive any real value of this type of assessment. Three students shared the same perception that "the teacher was lazy" because "he wanted help" and "teachers do not want to do their job". 39 percent said that they did not mind correcting exams but they did not mention having benefitted from the experience. Another 13 percent stated "I like to be taken into account by the teacher", "I like to see what others write about" and "it helps listening to what peers say about my work". Therefore, these statements suggest that

students view formative assessment as more positive than summative practices which some perceive as giving them the feeling of having power. These findings are in line with Liu and Carless' (2006) suggestion that it is better to involve students in giving peer feedback without giving marks.

For the planning stage of this action research project, the themes that were chosen to be peer-assessed were eye contact, gestures and the use of the voice since the students had practiced each of these topics in class and the activity would give them further practice but combining the three topics. The activity designed to introduce peer assessment was a short poem competition. A rubric with several elements of eye contact, gestures and the use of the voice was made. The rubric contained the elements of performance, the names of the contestants and a scale ranging from 1 to 4, being 4 the grade for excellent performance. The criterion for the marks in the scale was discussed by all of the students together and a consensus was reached before the competition began.

In the execution stage, most of the students were excited about the activity but some were nervous and two of these students even refused to participate. Their decision was respected; however they did peer assess their classmates. After the competition, the students were given the same rubric to place each of the marks given by their classmates and add them to see which elements of performance were their strong points and which ones they had to practice more. Some of the students excelled in their performance and a prize for the highest marks was awarded which consisted of chocolates. They were asked to keep in their portfolio of classroom activities their two rubrics; the ones that they graded and the ones with the marks given by their classmates.

For the reflection and evaluation stage, a written interview was given to the students to take home with questions about their opinions of the activity, the peer assessing experience, being peer assessed and the reasons for these opinions. The students' answers were positive in general. They stated "I really liked the activity", "more activities like this one should be done in other courses", "I found the experience really good because I could see my strong skills", "I liked to see what my classmates thought about my performance", "I was surprised to discover that my classmates graded me similar", "It was [a] successful experience because we discussed the criteria" and "the teacher took us into account". However on the negative side, there were also many comments about students feeling "nervous", which did not really influence their comments of not having liked the experience. In regards to the students that did not participate and as the written interview was anonymous, their answers could not be detected. However at the end of the course, they seemed more integrated because during the course they had to practice and participate in small groups in front of the classmates.

## 6. Conclusion

The action research study was successful in answering both research questions since the students' mixed perceptions about peer assessment surfaced and the negative perceptions were improved. Reflecting on the study, the main points for the success of this experience was first finding a motivating and challenging activity for students to put into practice the theory in course contents. The second point is training students to give and receive peer assessment so that they can perceive a feedback that is credible, honest, knowledgeable and unbiased. A third point is making the students part of the process by discussing or deciding together the criteria to be used. Finally, respecting the students' decisions is an important issue. As the experience was successful, it is important to continue in the training of these students and plan more experiences. In this context, improving negative perceptions is crucial since the participants will be the future teachers of English at all levels of instruction and should be expected to implement peer assessment in their own lessons with their future students. In this field of English language teaching as in other fields of education, it is necessary for teachers to engage in this type of assessment to promote deep learning and to develop critical and responsible human beings who can work in collaboration with others and are able to accept and give feedback.

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# THE AFFORDANCES OF IMPROVISED RESOURCES IN PHYSICAL SCIENCES CLASSROOMS

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## Abstract

The development of meaningful conceptual understanding in science teaching and learning is a key ingredient required for the development of scientifically literate citizenry. The use of improvised resources to demystify the complexity of scientific phenomena is of crucial significance. In recognition of this crucial imperative, the study explored the pedagogical affordances associated with the use of improvised resources in Physical Sciences classrooms at a selected South African township school. The study adopted a case study design located within the interpretive research paradigm. Data was collected through semi-structured interviews and lesson observations involving three purposively selected Physical Sciences teachers. The study demonstrated that the use of improvised resources promotes active learner participation, sustained intellectual engagement in the teaching and learning activity, enhancement of teachers' pedagogical content knowledge, development of learners' reflective and cognitive skills as well as the provision of meaningful opportunities for collaborative learning and development of meaningful conceptual understanding. Key findings of the study have profound implications for pedagogic innovation within the broader South African educational context.

**Keywords:** *Improvisation, low-cost resources, pedagogic innovation.*

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## 1. Introduction

The significance of pedagogic innovation as a means to enhance meaningful science teaching and learning cannot be over-emphasized. A substantial number of schools in South Africa are still under-resourced and this predicament adversely affects the provision of quality education for all. The use of improvised instructional resources can be adopted as part of pedagogic innovation to demystify abstract scientific concepts. Teacher professional development interventions ought to provide sustainable opportunities for teachers to enhance their expertise on the integration of improvised instructional resources in science teaching and learning. There is a critical need to grapple with the complex disjuncture between theoretical teaching and practical teaching with a view to meaningfully implement contemporary pedagogic approaches such as inquiry-based learning. Ong'amo, Ondigi and Omariba (2017) posit that students frequently taught using improvised resources performed better than those rarely taught using improvised resources. Yet, teachers lack appropriate skills to use improvised teaching resources in schools (Akuma & Callaghan, 2016). This study primarily explored the pedagogical affordances of improvised resources in physical sciences classrooms in South African township schools.

## 2. Research design and methodology

The study adopted a case study design located within the interpretive research paradigm. Data was collected through semi-structured interviews and lesson observations involving three purposively selected Physical Sciences teachers in South African township schools. These township schools were largely under-resourced.

## 3. Findings

Table 1 below provides teachers' views on the pedagogical affordances of improvised resources in physical science classrooms. While the teachers expressed fundamental appreciation of the pedagogical affordances of improvised resources in physical sciences teaching and learning, they further outlined challenges associated with the integration of improvised resources in their lessons. The prevalence of these challenges may be attributed to lack of appropriate professional training on the integration of improvised resources in physical sciences teaching and learning.

Table 1. Teachers' views on the affordances of improvised resources in physical sciences classrooms.

Teachers	Key areas of investigation						
	Improved resources and the challenges	Using improvised resources in classroom	How to develop lessons based on improvised resources	Can improvised resources improve pedagogical content Knowledge?	How can improvised resources stimulate learner engagement?	How can improvised resources be used to enhance learner conceptual understanding?	Assessment of cognitive skills after using improvised resources in practical lessons
Teacher 1	Challenge is cost-free teaching resources may not be user-friendly	By doing experiments with improvised resources	By diversifying improvised resources	Yes as improvised resources broaden content of subject	Interest of learners is stimulated	Learners can relate to importance of resources used	Summative assessment
Teacher 2	They don't resemble real life scenario	Make models to resemble real life scenario and demonstrations	Outcomes must match models Align objectives with lesson plan	Yes, can help interpret situations and improve communication	By discussions Visuals participation	Different interpretations of each situation	Group Work
Teacher 3	Specifications may not be met precision may be missed	Use material dyes	Titration lessons based on natural dyes	Yes, but one may find self stranded without standard equipment	Excites learners, Standard equipment make learners feel subject is hard	Enhances its applicability in their daily lives	Comparisons have to be done with standard equipment

### 3.1. Examples of improvised resources designed by the teachers

The teachers demonstrated remarkable creativity in relation to the design of improvised resources used in physical sciences teaching and learning. Examples of improvised resources designed to demonstrate filtration as a key experimental mechanism are illustrated in Figure 1 below.

Figure 1. Improvised resources designed to demonstrate filtration.



Electric motors play an increasingly important role in everyday life. Figure 2 below depicts improvised resources that were designed to explain the operation of a direct current motor.

Figure 2. *Improvised resources designed to explain the operation of a direct current motor.*



The development of learners' understanding of electromagnetic phenomena can be a daunting task for teachers. An improvised resource designed to explain the mapping of a magnetic field is illustrated in Figure 3 below.

Figure 3. *Improvised resource designed to explain the mapping of a magnetic field.*



Electrolysis is a fundamental chemical phenomena that ought to be fully understood by learners in physical sciences classrooms. An improvised resource designed to demystify the complexity of electrolysis is depicted in Figure 4 below.

Figure 4. *Improvised resource designed to demystify the complexity of electrolysis.*



#### 4. Discussion

The study demonstrated that the use of improvised resources promotes active learner participation, sustained intellectual engagement in the teaching and learning activity, enhancement of teachers' pedagogical content knowledge, development of learners' reflective and cognitive skills as well as the provision of meaningful opportunities for collaborative learning and development of meaningful conceptual understanding. The teachers expressed fundamental appreciation of the pedagogical affordances of improvised resources in physical sciences teaching and learning. However, they outlined challenges associated with the integration of improvised resources in their lessons. The prevalence of these challenges may be attributed to lack of appropriate professional training on the integration of improvised resources in physical sciences teaching and learning. Behrendt and Franklin (2014) posit that improvised resources enhance science learning and development of meaningful conceptual understanding. In addition, improvised resources help teachers deliver information more accurately especially in instances where repetitions are required for concrete learning to occur (Ong'amo, Ondigi & Omariba, 2017). However, many science teachers are not equipped with skills to incorporate new ideas in the teaching of science in the classroom (Silverstein, Dubner, Glied & Loike, 2009). Harnessing the pedagogical affordances of improvised resources requires the provision of sustainable teacher development opportunities on the integration of improvised resources in science lessons. The key advantage of using improvised resources is that they can be produced from readily available materials within the environment (Asare, Parker & Osei-Himah, 2018). According to Asare, Parker and Osei-Himah (2018), the whole purpose of using improvised teaching resources is to achieve the same desired outcomes that could be achieved with the traditional laboratory resources. The key goal is essentially to get learners actively engaged in science teaching and learning in order to acquire necessary scientific skills through involvement in hands-on learning activities. Improvised resources are often produced to address learning difficulties (Akuma & Callaghan, 2016). The use of improvised resources has profound implications for the enhancement of the overall quality of science education and human capital development within the broader South African context.

#### 5. Conclusion

The use of improvised instructional resources appears to promote active learner participation, sustained intellectual engagement in the teaching and learning activity, enhancement of teachers' pedagogical content knowledge, development of learners' reflective and cognitive skills as well as the provision of meaningful opportunities for collaborative learning and development of meaningful conceptual understanding. There is a critical need to harness the pedagogical affordances of improvised resources to foster pedagogical innovation that is responsive to the critical needs of learners.

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# THE RELATIONSHIP BETWEEN TEACHER-STUDENT RELATIONSHIP, SELF-CONFIDENCE, AND ACADEMIC ACHIEVEMENT IN THE CHINESE CONTEXT

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## Abstract

This study examined the relationship between teacher-student relationship, self-confidence in learning, and academic achievement of high school students in China. In this study, 14,021 11th graders in China took part in the National Standardized Tests in three subject areas: Chinese language, mathematics, and English language. Teacher-student relationship and self-confidence in learning were measured with the questionnaires adapted from PISA2012, the psychometric properties of which have been examined in large-scale assessments. Results showed that teacher-student relationship in each subject area, self-confidence in learning, and their corresponding academic achievement were all statistically significantly related to each other. Structural equation models were used to verify the mediating effect of self-confidence in learning between teacher-student relationship and students' academic achievement in each subject area. Results indicated that self-confidence in learning mediated the significant associations between teacher-student relationship and students' academic achievement. This mediating effect was the largest in the subject area of Chinese language, which was 8.1% greater than that in the subject area of English language, and 3.9% greater than that in the subject area of mathematics. This study suggests that good teacher-student relationship is conducive to enhancing students' self-confidence in learning, which had positive relationships to academic achievement.

**Keywords:** *Teacher-student relation, self-confidence in learning, academic achievement, Chinese high school.*

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## 1. Introduction

There has been a rapid growth in research on the importance of teacher-student relationship for students' school success during recent years (Fan, 2012). Teacher-student relationship is an important, although complicated, interpersonal relationship in education (Hughes, 2012). The interactions between teachers and students exert a profound impact on students' physical and mental development (Liao, 2001). Empirical studies suggested that teacher-student relationship was significantly related to students' academic achievement (Fan, 2012; Pianta, & Stuhlman, 2004), school adjustment (Hughes, 2012), problem behaviors (Graziano, Reavis, Keane, & Calkins, 2007), dropout rate (Barile, Donohue, Anthony, Baker, Weaver, & Henrich, 2012), and personality traits (Li, Zou, Wang, & Dou, 2008) in the process of learning.

Teacher-student relationship refers to "the basic interpersonal relationship between teachers and students in schools, which is also one of the important social relationships in the process of children's socialization through the whole educational development" (Zou, Qu, & Ye, 2007, p.77). During the process of teacher-student interaction, teachers' responses, either emotional, verbal, or behavioral, towards students' behaviors affect students' experience and play an important role in the development of students' psychological traits, such as self-concept, self-confidence, motivation and self-esteem (e.g., Maulana, Opdenakker, den Brok, & Bosker, 2011). Maulana et al. (2011) posited that the equality, respect, mutual understanding and trust in teacher-student relationship is conducive to stimulating students' motivation for independent learning (Maulana, Opdenakker, den Brok, & Bosker, 2011), improving students' confidence in learning (Wang, 2015), and reduce learning anxiety (He, & Qi, 2018). On the contrary, a poor teacher-student relationship may make students feel lonely, withdraw from courses (Baker, Grant, & Morlock, 2008), and prone to aggressive behaviors (Meehan, Hughes, & Cavell, 2003), which may negatively impact students' academic achievements, and lead to dropouts and

psychological disorders (Birch, 1997). Maslow (1943) defined self-confidence as a kind of positive emotional experience generated by certain satisfaction of “self-esteem needs”. Xiu (2009) proposed that self-confidence in learning referred to students’ positive reaction towards their completion of learning tasks and achievement of learning goals. Some scholars believe that self-confidence in learning is basic qualities closely related to educational development and have a significant impact on learning outcomes (e.g., Al-Hebaish, 2012; Chang, & Cheng, 2008; Tavani, & Losh, 2003).

Despite lots of studies on teacher-student relationship and students' learning outcomes, most of them focused on the impact of teacher-student relationship on students' academic achievement (e.g. Fowler, Banks, Anhalt, Der, & Kalis, 2008; He, & Qi, 2018; Zeng, Zhao, Luo, & Xin, 2012) or the association between students’ self-confidence in learning and their academic achievement (e.g. Kukulu, Korukcu, Ozdemir, Bezci, & Calik, 2013; Zhu, 2014). Very few had examined the mediating effect of self-confidence in learning for the associations between teacher-student relationship and students’ academic achievement. In addition, most previous studies treated teachers in various disciplines as a single group and used grade-point average (GPA) as an indicator for students’ academic performance with no refinement to a specific subject area (Corbin, Alamos, Lowenstein, Downer, & Brown, 2019; Li, Zou, Wang, & Dou, 2008). This study attempts to fill the gap by examining (a) the associations between students’ perceptions of teacher-student relationship, self-confidence in learning and academic achievement in three subject areas: Chinese language, mathematics, and English language; and (b) how does self-confidence in learning impact the association between teacher-student relationship and students’ academic achievement in each subject area.

## 2. Methods

### 2.1. Participants

A total of 14,021 11th graders participated in the current study from an eastern province in Mainland China. A stratified cluster random sampling was employed, through which, 100 schools from the 17 cities in the province were randomly selected to represent the student population in the province. Of the participants, 6794 (46.3%) were boys and 7527 (53.7%) were girls.

### 2.2. Instruments

The Teacher-Student Relationship Scale (TSRS) was developed by the Program for International Student Assessment (PISA) in 2012 (OECD, 2013). The internal consistency of responses to this scale measured by Cronbach’s alpha was .96, .98, and .97 for Chinese language, mathematics and English language, respectively. The Self-Confidence in Learning scale was also adopted from PISA (2012) (OECD, 2013), which aimed to measure students’ self-confidence in learning with three items. The Cronbach’s alpha of responses to this scale was .54. Students’ academic achievement was assessed by means of national standardized achievement tests which were deployed by the Collaborative Innovation Center of Assessment towards Basic Education Quality (CICA-BEQ) at Beijing Normal University. It was mandated and directed by the Chinese Ministry of Education. The norm for academic achievements in each subject was a mean of 84.28 and a standard deviation of 12.73 in Chinese language, a mean of 84.26 and a standard deviation of 12.73 in Mathematics, and a mean of 83.77 and a standard deviation of 10.23 in English language.

### 2.3. Data collection and data analytic procedures

Preliminary analyses included the testing of reliability and validity of responses to the instruments. Pearson correlation coefficients were used to represent the associations among the self-confidence in learning, teacher-student relationship, and academic achievement. Stepwise linear regression models and structural equation models were applied to examine the mediating effect of self-confidence in learning in the relationship between teacher-student relationship and academic achievement in each subject area.

Text

## 3. Results

Students’ perceptions of teacher-student relationship were consistent across all three subject areas, which were reflected by the statistically significant and positive correlations between the relationship reported in Chinese language and that in mathematics ( $r = .57, p < .001$ ); between the relationship reported in Chinese language and that in English language ( $r = .58, p < .001$ ), and between the relationship reported in mathematics and that in English language ( $r = .68, p < .001$ ). Teacher-student

relationship was statistically significantly related to the self-confidence in learning and academic performance in the tests in each subject area. Specifically,  $r = .40$  and  $r = .11$  in the Chinese language discipline;  $r = .49$  and  $r = .14$  in the mathematics discipline; and  $r = .50$  and  $r = .16$  in the English language discipline. Self-confidence in learning was also statistically significantly related to academic performance in the tests in each subject area and students' academic performance in each subject area was also statistically significantly related to each other.

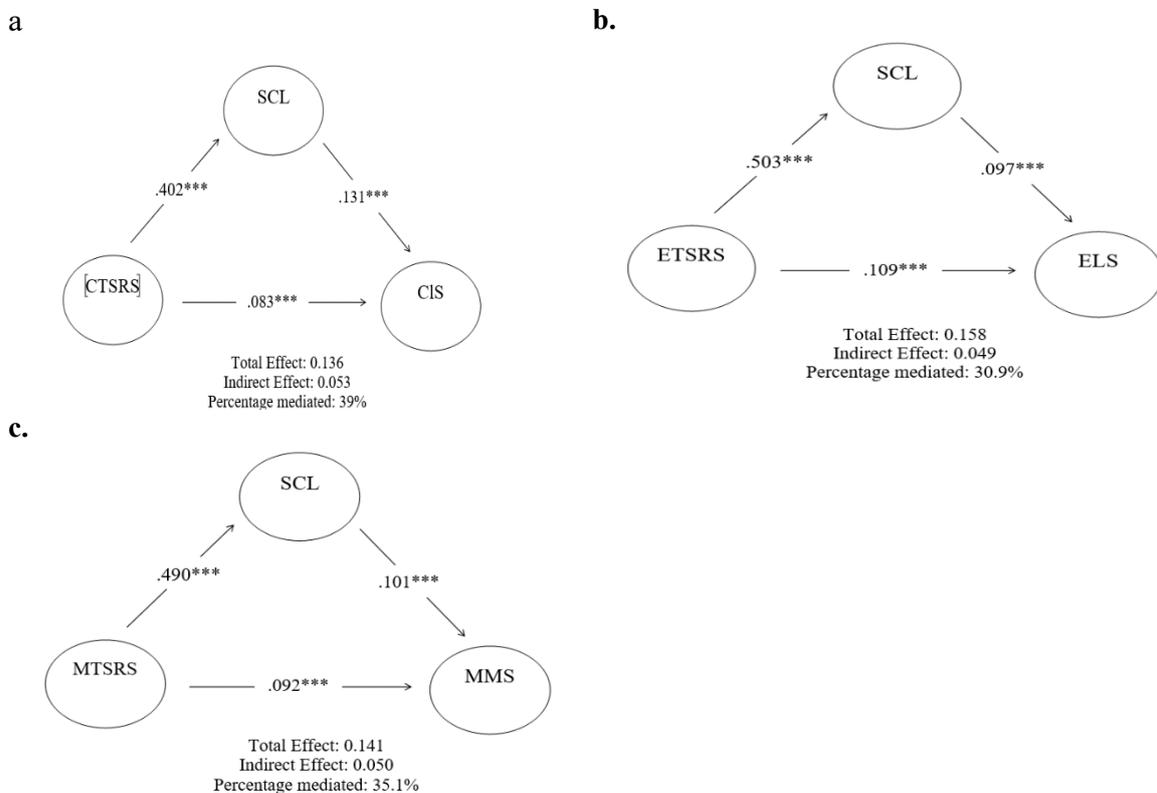
Results of stepwise linear regression models to test the mediating effect of self-confidence in learning for the associations between teacher-student relationship and academic achievement in each subject area were presented in Table 1 and the structural equation models were illustrated in Figure 1. Self-confidence in learning mediated 39% of the relationship between teacher-student relationship and academic achievement in the Chinese language test score (Figure 1a), which was 3.9% greater than in the mathematics test score (figure 1c). Furthermore, 30.9% of mediating effect existed in the relationship between teacher-student relationship and their academic achievement in the English language test score (figure 1b), which was the lowest among the three subject areas.

Table 1. Self-Confidence in Learning as Moderator of the Association between Teacher-Student Relationship and Academic Achievement.

	Chinese Language			Mathematics			English Language	
	Step 1 $\beta$ (SE)	Step 2 $\beta$ (SE)		Step 1 $\beta$ (SE)	Step 2 $\beta$ (SE)		Step 1 $\beta$ (SE)	Step 2 $\beta$ (SE)
CTSRS	.14(.02)*	.08(.02)*	MTSRS	.14(.03)*	.09(.03)*	ETSRS	.16(.02)*	.11(.03)*
SCL		.13(.05)*	SCL		.10(.04)*	SCL		.10(.03)*
$R^2$	.018	.033	$R^2$	.02	.028	$R^2$	.025	.032
$\Delta R^2$		.014*	$\Delta R^2$		.008*	$\Delta R^2$		.007*

Note. \*  $p < .001$ .

Figure 1. Mediating effect of self-confidence in learning.



#### 4. Conclusions and discussions

The purpose of this study was to explore the associations between teacher-student relationship, self-confidence in learning, and students' academic achievements in Chinese high schools. Results showed that the teacher-student relationship was significantly related to students' academic achievements. Good communication between teachers and students may help students pay more attention during the class, receive more teacher support as well as more positive feedback in learning, and achieve better academic performance. The results of the present study support findings of previous studies (e.g., He & Qi, 2018; Wang et al., 2015) and confirmed the positive role of teacher-student relationship in the school setting. Moreover, self-confidence in learning plays a mediating role in the association between teacher-student relationship and students' corresponding academic achievements in Chinese language, mathematics, and English language disciplines, respectively. The strong positive associations between teacher-student relationship and self-confidence in learning suggest that the relationship between teachers and students is associated with the students' self-confidence in learning. Furthermore, this study also showed positive relationship between self-confidence in learning and academic achievement. Students who are confident in their learning ability are more likely to adopt a positive attitude to overcome the difficulties in learning, and thus tend to achieve higher academic achievement (Al-Hebaish, 2012).

Teacher-student relationship is one of the most important factors that directly affects the quality of education, the healthy development of students' personal traits and their academic performance. In the process of education, teachers are recommended to create harmonious and positive teacher-student relationship and learning environment. Academic achievement is part of the quality of education, but increasing study time is not the only way to improve academic achievement (Wang, 2015). On the contrary, educators should explore efficient methods for students to improve their academic achievements. Examples of these methods include (a) integration of students' physical and mental health; (b) enhancement of learning quality, such as the motivation to learn (Maulana, Opdenakker, den Brok, & Bosker, 2011), interest in the subject areas (Chang, & Cheng, 2008), and self-confidence in learning. To stimulate one's potential to learn, to help students find topics of their interest, and to help students improve their academic performance in a healthy learning environment should be goal of education.

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# MAPPING DISABILITY REPRESENTATION IN PRIMARY SCHOOL YOUTH LITERATURE

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## Abstract

The growing number of inclusive classrooms resulting in significant changes in education. One important change is that there is an increasing number of opportunities for students with disabilities and their peers to be grouped for learning.

However, equity in access does not guarantee equity in outcomes in terms that nondisabled students will become accepting the ones who have disabilities. Therefore, there is a need for intervention that facilitates the acceptance of students with disabilities.

In an educational setting, youth literature can provide an easily accessible resource that helps students to become familiar with the diversity of society and its social and cultural contexts. These literary works, serving as a link between curriculum content and social perception, can affect the readers' self- image, interpersonal sensitivity and opinion toward different minority groups and social problems. It is therefore important that literary works do not contain biased content, or, if they do, textbooks or teachers should provide an opportunity for discussion of them.

The research examined the representation of disability found within youth literature that is employed to support the Hungarian National Curriculum. The study employed content analysis to identify different recurring patterns of the disability conception within the content of youth literature in primary education by using a code system which was based on Biklen and Bogdan's (1977) stereotypes categories.

The analysis of the data resulted in a number of findings, which have been grouped into individual themes including exclusion, the portrayal of characters with disabilities as an 'object of evil', or as an 'object of violence', as well as the elimination of people with disabilities as the solution of the 'happily ever after' story ending. In addition, in the literary works examined there is a severe lack of appropriate images of people with disabilities presented in everyday situations, as a part of a given socio-cultural environment.

These negative representations lead us to question the continued uncritical use of these literary works with students at primary schools as part of our National Core Curriculum. We suggest that such exclusionary and stereotypical storylines could create negative preconceptions toward people with disability by students and could also promote the segregation of disabled people in society. Therefore, these literary works could not be applied uncritically by teachers during the lessons.

**Keywords:** *Disability, youth literature, content analysis, elementary schools.*

## 1. Inclusion and textbooks

Social inclusion and the active participation of all members of the society are vital for practising human rights and promoting human dignity. Nowadays, the concept of accepting diversity plays an important role in social policy. The education system generally reflects the social structure by conveying the social norms to the students.

Textbooks have an important role among the tools in the education of children aged 7–14 in Hungary. Students use them every day to elaborate on the different information in them. During this process, the content of the textbooks has an effect on the ideology and the attitudes of the students. The attitudes acquired at school may also have an impact on student's social perception. Thus, inclusive school attitudes towards minority groups can be extended to the attitudes of the whole society.

Over the past few years, great emphasis has been placed on the importance of inclusive curricula to increase the visibility of minorities (Nind, 2005). The importance of disability representation in general education became more and more important due to the fact that inclusion of disability issues can positively influence the self-image and motivation of such students (Wieman, 2001) and will likely motivate non-disabled students to learn more about their disabled classmates (Hodkinson & Ghajarieh

2014). Moreover, inclusive textbooks can help non-disabled young learners to realize diversity in their teaching materials, which raise their appreciation for diverse and different characters, and also tolerance among these students of others' impairments (Rasche and Bronson 1999). Textbooks can be considered as "tools" that help students to become familiar with the diversity of society, and its social and cultural contexts (Mc Kinney, 2005). A realistic and non-prejudicial image of people with disabilities should be an important part of the textbooks of public education institutions. It can help students understanding the needs and reality of these people.

## **2. Disability and youth literature**

Youth literature provides a powerful tool through which students make sense of both their cultural heritage and the world they live in (Ullah, Ali, and Naz 2014). However, literary works can also function as mirrors, allowing students to self-reflect and recognize similarities and differences between themselves and the characters in literary works (Gilmore and Howard, 2016).

The disability representation of children's literature has a history dating back four to five thousand years (Flood, 2016). Since the 1980s, there have been numerous studies examining the portrayal of childhood literature (Greta, 1986; Harrill, Leung, McKeag, and Price, 1993; Carlisle, 1998; Ayala, 1999; Dyches, Prater and Cramer 2001; Prater, 2003; Hughes, 2006; Quayson, 2007; Beckett, Ellison, Barrett and Shah, 2010; Hodkinson and Park, 2017). These studies highlight that people with disabilities are portrayed primarily through negative stereotypes, they are often portrayed as fearful, evil, and often become ridiculous. Moreover, characters with disabilities often become victims of violent acts, often beaten and in several cases killed. Quayson (2007) emphasizes that if children's literature contains disability characters that are portrayed in a negative way and used scary scenarios and images for them it might make children dislike these characters. According to Wall and Crevecoeur (2016), such stereotypes in children's literature result in problematic attitudes towards disabled people. Almerico (2014) points out that literary characters have a very strong influence on children, almost as strong as the real people they encounter every day. The negative stereotyped portrayal of people with disabilities in children's literature can make a significant contribution to the general fear of children toward people with disabilities. Wall and Crevecoeur (2016) highlight that this problematic representation may also have a negative impact on readers' attitudes towards people with disabilities.

## **3. The theoretical background of the analysis**

The analysis of disability content in school textbooks and children literature is closely related to inclusive education. Research in inclusive education has highlighted the conditions required for the successful implementation of inclusive education. One of these is that inclusive classrooms need inclusive books, textbooks that depict people with disabilities in a realistic way. Therefore, it is necessary to analyse the disability content of current textbooks, to uncover and remove stereotyped representations (Prater és Dyches, 2008).

The present study aimed at identifying and critically analysing the presence of disability found within youth literature that is employed to support the Hungarian National Curriculum. The analysis was based on the categories of stereotypical representation revealed by the researches of Biklen and Bogdan (1977), Rubin and Strauss Watson (1987) and Marshall (2012), since these studies provide a detailed, complex description of the disability characters found in literary works. Analysing children's literature, Biklen and Bogdan (1977) found ten different commonly occurred stereotypical representations of people with disabilities, such as disabled people are 'pitiable and pathetic', 'an object of violence', 'sinister and evil', 'curio or exotica', 'an object of ridicule', 'super cripple', 'their own worst enemy', 'a burden', 'asexual' and 'incapable of fully participating in everyday life'. In 1987, Rubin and Strauss Watson added a stereotype category to the list of Biklen and Bogdan's stereotypes such as 'a person with a disability being isolated from disabled and non-disabled peer'. Marshall in 2012 also added another stereotype representation type to the previous list, he found descriptions about 'people with disabilities as childish and cannot behave like an adult'.

## **4. Research design**

### **4.1. Research questions**

The present research aimed at identifying and critically analysing the presence of disability in the literary works that can be found in school textbooks of Hungarian Literature in Hungary. In order to identify the discourse-level barriers and enablers of disability content in the sample literary works and to

reveal how stereotypical representations of disability are manifested in them we posed the following research questions:

- How does disability appear in the literary works?
- In what social context is it represented?
- What kind of disability concept can be found in literary works?
- How can these representation effect students 'perception about people with disabilities?

#### **4.2. Method**

To address the research questions, a content analysis of the sample materials was conducted using Atlas.ti software. Content analysis is a systematic, objective, quantitative examination of message characteristics (Neuendorf, 2017) intended for the analysis of message contents to unfold 'what they mean to people, what they enable or prevent, and what the information conveyed by them does' (Krippendorff, 1995, p. 2).

The study began with a selection of literature books for primary school students from the list of approved textbooks for the academic year 2019, which was revealed by the Hungarian Government. 39 books were selected from the list, whose literary works were analysed along the research questions.

In order to examine the disability-related messages in the literary works, the analysis first focused on the frequency and location of the Hungarian words for disability in the content. In the first phase of the research each textbook was read page by page, searching for texts which referred to disability or people with disabilities. The numbers of occurrences were analysed using descriptive statistics. During this phase we calculated the absolute and the relative occurrence of each search term to reveal how frequently disability or disabled people were mentioned in the texts. Within the second stage, the relevant hits were analysed to identify how disability was located in the texts and what conception of disability was represented in them. In the third stage of the analysis, the relevant hits were imported into Atlas ti. software and analysed to identify different recurring patterns of the disability conception within the content by using a code system which was based on Biklen and Bogdan (1977), Rubin and Strauss Watson (1987) and Marshall's (2012) stereotype categories. The interpretation of the terms related to people with disabilities formed on the basis of these recurring patterns.

### **5. Results**

The analysis of the data produced a range of findings which have been grouped into individual themes. In the texts, a considerable amount of examples has been found which referred to the stereotype categories presented above. In this paper, we turn to consider in detail those that have appeared in the largest number of literary works examined.

#### **5.1. Types of disability representations and their distribution in the examined literary works**

The frequency analysis of disability content in literary works revealed that the concept of disability and people with disabilities as actors are present in the reviewed literary works, although they are very underrepresented (absolute frequency is 132, relative frequency is 0.053). The presentation of the topic in question most often reflects a stereotypical view (95% of all depiction of people with disabilities). 83% of all depictions contain negative stereotypes, while in the 12% of the representation writers employ positive stereotypes to describe the characters with disabilities. Realistic, stereotype-free representation of people with disabilities was found only in 5% of cases.

#### **5.2. The disabled character as an object of an evil**

Within the literature reviewed for this research, the disabled character was often portrayed as an evil villain. One of the characters in Stevenson's novel *Treasure Island* is Pew the blind man, who is described as the most evil rogue of them all. In each part of Pew's involvement within the story, he is continuously seeking revenge on the nondisabled characters. This allows the reader to believe that a person with a disability 's condition of life makes them place blame and guilt on others. Another negative representation of disability may also be observed in a Hungarian legend, the *Son of the White Mare*. Within the story one of the main characters is a „deformed dwarf” who is represented to be sly and mean. As an object of evil, he was introduced within the story when he takes the food of people by force. Moreover, these characters often were depicted as terrifying, horrible people.

According to Quayson (2007), when students read stories such as those they are made to dislike the character which he believes leads to them developing a stigma towards disability.

### 5.3. The disabled characters as an object of violence

Another finding of this research was that the disabled character was often portrayed as an object of violence. Abused characters with disabilities are mostly helpless in this situation. In Stevenson's novel *Treasure Island*, Pew the blind man falls under the horses that crush him, and nobody goes to help him. One of the main characters in *The Story about the Echoes of Tihany* is a mute princess who becomes the victim of the wrath of the Wave King. János Lackfy writes in his poem about a one-eyed cat: “*And if you don't die in the fight, then my dad will kill you!*”

These depictions influence students to believe that, according to Goodley and Runswick-Cole (2011), the disabled body can be an easy target for real physical violence of non-disabled others. This perception of disability might enable students to place disabled people lower than themselves in terms of importance and hierarchy in society (McGrail and Rieger, 2014).

### 5.4. Disability as a problem or punishment

In the literary works analysed, the contrast between disability and perfection was striking. Disability usually appears as a problem or a mistake related to the appearance or the personality of the disabled character. For example, in *Story about the Echoes of Tihany*, we read the following about the protagonist, who is a blind princess: “*God made her not only beautiful but also gentle, kind-hearted, smart, and patient, however, she was mute*”. The writer contrasts the beauty, goodness (which are positive attributes) of the princess with the muteness (which in this context can be interpreted as a negative attribute). Another example can be found in the story of Sándor Kányádi, *The Silent Tulip*, in which the punishment of the evil gardener is to shrink into a dwarf. This distorted view of disability plants a seed into the minds of children which later might lead to insecurities in respect of people with disabilities.

## 6. Conclusion

The main finding of the research is that the presence of people with disability is underrepresented and problematic in the sample literary works for young people. This is because disability is formulated in the negative in these texts. They are often symbolised as an entity of evil or an object of violence. In addition to this, people with disabilities are frequently represented as unimportant in society and that it is essential that they should disappear. We can also conclude that there is a severe lack of appropriate images of people with disabilities presented in everyday situations, as a part of a given socio-cultural environment.

These representations lead us to question the continued uncritical use of these literary works with students at primary schools as part of our National Core Curriculum. We suggest that such exclusionary storylines might promote student's preconceptions toward people with disabilities and also their segregation in society. Therefore, a review of the employment of these literary works must be conducted to ensure that they are not applied uncritically by teachers during the lessons.

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## THE RELATIONSHIP BETWEEN STUDENTS' APPROACHES TOWARD LEARNING AND ACADEMIC ACHIEVEMENT IN THE CHINESE CONTEXT

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### Abstract

This study examined the relationship between student's approaches toward learning and academic achievements of high school students in China. Participants were 14,021 11th graders from an eastern province in China. They took the National Standardized Test in three subject areas: Chinese language, mathematics, and English language. The total score was used as an indicator of their academic achievement. Students' approaches toward learning were measured in three aspects: self-confidence in learning, learning interest, and study habits. Questionnaires of self-confidence in learning and learning interest were adapted from PISA2012. Study habits were measured with the questionnaire adapted from Academic Adjustment Inventory (AAT). Results of Pearson correlation and hierarchical linear regression models showed that the dimensions of student's approaches toward learning were statistically significantly related to academic achievement. Results of analysis of variance after the control of student gender and socioeconomic status suggested that the top 25% students in dimensions of approaches toward learning scored statistically significantly higher than the bottom 25% students with small effect sizes in their performance on the final examinations. This study suggests that helping students build good approaches toward learning may improve their academic achievements.

**Keywords:** *Students' approaches toward learning, academic achievement, Chinese high school students.*

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### 1. Introduction

The aim of education is to promote the comprehensive development of students (Anzai & Simon, 1979). Not only are learning outcomes important, but the quality of learning during the learning process is equally important. Shenzhen Education Bureau (2014) issued a guidance on further improving the comprehensive literacy of primary and secondary school students and clearly elaborated the importance of approaches toward learning. Approaches toward learning were defined as the relatively stable psychological characteristics of learners in the learning process, such as learning motivation, interest, habit and ability (Shenzhen Education Bureau, 2014). Other definitions of approaches toward learning include student essential characteristics for them to adapt to life-long learning and future development (Lu, 2017). Peng (2004, p. 75) referred approaches to learning as "the way for students to establish a connection with the learning content during learning period", which is one of the factors that affect how students achieve academic achievement and obtain study skills (Cutolo & Rochford, 2007; Kassab, Al-Shafei, Salem, & Otoom, 2015).

Education reform in sizeable countries over the world has shifted from focusing on academic performance to stimulating and cultivating students' approaches toward learning. For example, United Kingdom, Germany, Switzerland, Australia and other countries have begun new national curriculum standards development projects focusing on students' approaches toward learning. Many influential international organizations also have conducted empirical research on students' approaches toward learning and analyzed the influencing factors of students' approaches toward learning in different grades through large-scale assessment data. For example, PISA, TIMSS, PIRLS, NAEP have evaluated students' approaches toward learning on the strength of the content of a certain discipline or field, such as reading, mathematics and science.

Approaches toward learning can be appraised as a complex system with multiple levels and aspects (e.g. Ge & Yang, 1997; Lu, 2017). According to Early Learning and Development Benchmarks in Washington State in 2005, students' approaches toward learning can be divided into five dimensions: curiosity, interest, initiative, persistence and attention, reflection and interpretation (Kagan & Kauerz,

2012). Related to the High/Scope Educational Research Foundation in Michigan, students' approaches toward learning are sorted into the following six aspects: initiative, planning, participation, problem solving, use of resources, and reflection (Schweinhart, Berruetalement, Barnett, Epstein, & Weikart, 1985; Schweinhart et al., 1993; Schweinhart & Weikart, 1997).

Some scholars started to evaluate approaches toward learning according to the characteristics of Chinese students in recent years (e.g., Lu, 2017; Peng, 2004), which are reported to be in several dimensions such as learning motivation, learning habits, and learning methods (Zheng, 1996); learning motivation, learning tendency, learning monitoring, learning strategies, and learning ability (Peng, 2004); learning cognition and experience, learning motivation, learning ability and method, learning persistence, and learning outcomes (Lu, 2017). By integrating the definition and structure of approaches toward learning from domestic and foreign research, this study will measure students' approaches toward learning from three aspects: self-confidence in learning, learning interest, and study habits.

It has been unanimously affirmed in educational research that students' approaches toward learning significantly affect their academic performance (e.g. Hugener, Reusser, Lipowsky, Rakoczy, & Klieme, 2009; Jin & Si, 2004). For example, McDermott (1984) and his team demonstrated that approaches toward learning has a larger predictive effect on learning than intelligence. Most scholars believe that approaches toward learning such as self-efficacy, self-confidence in learning, learning motivation and study habit, are basic qualities closely related to learning and have a significant impact on learning (e.g., Bai, Chao, & Wang, 2019; Feng, 2002; Gorges, Maehler, Koch, & Offerhaus, 2016; Shen, Yang, & Fang, 2015).

Education in mainland China is academic achievement oriented, where students, schools, and parents only focus on academic performance, which leads to students' stress (Zhang, 2000). Moreover, their learning methods tend to be mechanical and passive. Students are taught to memorize and repeat teachers teaching content without in-depth understanding (Niu, 2010). Therefore, teachers and parents both pay attention to students' academic performance, but neglect the cultivation of students' quality of learning, which limits the comprehensive development of students. Based on the educational background in mainland China, it is crucial to explore the impact of students' approaches toward learning on students' academic achievements in schools.

## 2. Methods

### 2.1. Participants

A total of 14,021 11th graders participated in the current study from an eastern province in Mainland China. A stratified cluster random sampling was employed, through which, 100 schools from the 17 cities in the province were randomly selected to represent the student population in the province. Of the participants, 6794 (46.3%) were boys and 7527 (53.7%) were girls.

### 2.2. Instruments

The Self-Confidence in Learning scale was adopted from the Program for International Student Assessment (PISA) in 2012 (OECD, 2013), which aimed to measure students' self-confidence in learning with three items. The Cronbach's alpha of responses to this scale was .54. The Learning Interest Scale was developed by PISA (2012) (OECD, 2013), with the purpose to test students' interest in courses and reading contents. The internal consistency of the scale measured by Cronbach's alpha was .94, .96, .96 and .94 for learning interest of Chinese language, mathematics, English language, and overall learning interest, respectively. The Study Habit scale was adapted from Academic Adjustment Inventory (AAT). The scale has three dimensions: plan for learning, style of listening, and style of reading, with twelve items in total. Results showed high internal consistency with Cronbach's alpha for each dimension and the whole scale: .93, .90, .94 and .97, respectively.

### 2.3. Data collection and data analytic procedures

Preliminary analyses included the testing of reliability and validity of responses to the instruments. Descriptive statistics including mean and the standard deviation for the key variables. Pearson correlations and stepwise linear regressions were adopted to explore the relationship between approaches toward learning and academic achievements. Analysis of variance (ANOVA) were used to examine differences in academic achievements between the students on the top 25 percentile and those on the bottom 25 percentile based on self-reports on self-confidence in learning, learning interests, and study habits, when students' gender and SES were controlled. Effect sizes ( $\eta^2$ ) were reported using Cohen's (1988) standards for small (.01), medium (.06), and large (.14).

### 3. Results

Results of Pearson correlation among variables were shown in Table 1. Students' dimensions of approaches toward learning were statistically significantly related to each other. Dimensions of approaches toward learning was also statistically significantly correlated with academic achievement. Table 2 described the relationship between dimensions of approaches toward learning and academic achievement. Self-confidence in learning, learning interest, study habit all significantly predicted students' academic achievement.

Table 1. Pearson Correlation Coefficients among Self-Confidence in Learning, Learning Interest, Study Habit and Academic Achievement.

	SCL	LINT	STAB	TTS
SCL	1			
LINT	.63*	1		
STAB	.58*	.70*	1	
TTS	.17*	.18*	.15*	1
<i>M</i>	3.23	4.02	4.23	249.90
<i>SD</i>	0.66	0.85	0.75	27.92

Note: (a) SCL = self-confidence in learning; LINT = Learning interest; STAB = Study habit; TTS = Total score in three subjects = Academic achievement; (b) \* $p < .001$ .

Table 2. Relationship between Academic Achievements and Self-Confidence in Learning, Learning Interests, Study Habits, and Academic Achievements.

Variable	B	SEB	$\beta$	R2	$\Delta R2$
Step 1				.03*	
SCL	6.19	.32	.17*		
Step 2				.04*	.01*
SCL	3.11	.42	.09*		
LINT	4.29	.37	.14*		
Step 3				.06*	.02*
SCL	2.83	.43	.08*		
LINT	3.65	.44	.12*		
STAB	1.47	.54	.04*		

Notes. (a) SCL = Self-confidence in learning; LINT = Learning interest; STAB = Study habit; TTS = Total score in three subjects = Academic achievement; (b) \* $p < .00$

In order to further explore students' academic achievements by different dimensions of approaches toward learning, we classified students into two groups according to the scores of each dimension of approaches toward learning by the upper and lower 25%. The top group represented students who were high in self-confidence in learning, learning interests, or possessed good study habits, and students in the bottom group were those with low self-confidence in learning, learning interest, or poor study habits.

Table 4 showed the results from ANOVA of students' academic achievements by approaches toward learning (here refers to self-confidence in learning, learning interests and study habits) after controlling SES and gender. Significant differences were noted in three domains: students who were higher in self-confidence in learning ( $M = 255.25$ ,  $SD = 26.02$ ) had higher levels of academic achievements than who were lower in self-confidence in learning ( $M = 243.43$ ,  $SD = 29.78$ ),  $F(1, 6779) = 226.68$ ,  $p < .001$ , partial  $\eta^2 = .03$  (small effect size). Students who possessed higher learning interests ( $M = 255.43$ ,  $SD = 25.89$ ) performed statistically significantly better on standardized tests than those with lower learning interests ( $M = 243.22$ ,  $SD = 29.18$ ),  $F(1, 6980) = 211.83$ ,  $p < .001$ , partial  $\eta^2 = .03$  (small effect size). Meanwhile, students who had better study habits ( $M = 253.50$ ,  $SD = 27.15$ ) also had higher academic achievements than those with poorer study habits ( $M = 245.92$ ,  $SD = 28.38$ ),  $F(1, 7643) = 84.74$ ,  $p < .001$ , partial  $\eta^2 = .01$  (small effect size).

Table 3. Relationship between Academic Achievement (TTS) and Approaches to Learning.

Indicator	SCL			LINT			STAB		
	SS	F	partial $\eta^2$	SS	F	partial $\eta^2$	SS	F	partial $\eta^2$
SES	74885.05	100.51*	.02	74734.07	101.40*	.01	82211.30	110.55*	.01
Gender	85990.14	115.42*	.02	103826.2 4	140.88*	.02	138916.8 5	186.80*	.02
Approaches	168885.6 0	226.68*	.03	156121.7 3	211.83*	.03	63017.75	84.74*	.01

Notes. (a) SCL = Self-confidence in learning; LINT = Learning interest; STAB = Study habit; TTS = Total score in three subjects = Academic achievement; (b) \* $p < .001$ .

#### 4. Conclusions and discussions

The study was designed to explore the relationship between approaches toward learning and students' academic achievements for Chinese high school students. Results showed that the dimensions of approaches toward learning (self-confidence in learning, learning interest and study habit) significantly were all related to students' academic achievements. Moreover, statistically significant differences with medium effect size were also noted between various levels of self-confidence in learning, learning interest and study habit and students' academic achievement rent. These results echoed previous research (e.g. Chang, & Cheng, 2008; Kaur & Pathania, 2015; Xiu, 2009).

Approaches toward learning is of great importance to students' academic development (Hugener et al., 2009). It can reflect students' confidence, interest and other attitudes or behaviors in learning. Lu (2017) demonstrated that approaches toward learning is one of the most profound psychological characteristics that learners should have to contribute to their academic success. Poor learning outcomes are largely related to the absence of learning quality (Peng, 2004). Students with good approaches toward learning tend to show high interest and confidence in the learning process and have relatively viable study habits. They are interested in learning and believe that they are capable of learning, and regard learning as a pleasant behavior.

A stable automatic learning behavior pattern through better learning attitude and cognition enables students' learning proceeding smoothly (Feng, 2002). In order to improve students' academic performance, educators should put more efforts on helping students cultivate learning confidence. Educators should also help students develop interest in learning, love reading, and love their classroom teachers. Finally, classroom teachers could help students foster good study habits and establish appropriate plans for learning.

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# A GROUNDED THEORETICAL STUDY ON THE INFLUENCE MECHANISM OF VERBAL ABUSE BY TEACHERS

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## Abstract

Language violence by teachers has a serious negative impact on students' mental health. In this study, 16 primary and middle school students were interviewed in depth and qualitative research was conducted on the interview data using grounded theory. It is found that the language violence of teachers has the characteristics of harmfulness, persistence and coercion. Its manifestation mainly includes three kinds: Openness and directness, Openness and indirectness and private directness. The attribution of language violence in teachers mainly includes teacher attribution, self-attribution and task attribution. From the results, the language violence of teachers will have a serious negative impact on students' psychology, but sometimes it will also play a promoting role in some students. Based on the paradigm model of grounded theory, the paper also constructs a theoretical model of the influence mechanism of teacher verbal abuse. According to the model, the interaction between the internal personal evaluation system and the attribution system determines the degree of influence of teacher's verbal violence on students.

**Keywords:** *Verbal abuse by teacher, primary and secondary school students, influence mechanism, grounded theory.*

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## 1. Introduction

The teacher's verbal violence referred to in this study is a negative verbal behavior pattern in which teachers have a negative impact on students' physical and mental development through reprimand, insult and abuse in education and teaching activities. It is also a kind of emotional and spiritual abuse. (Zhibin Zhang & Yue Zhang,2013) Based on the investigation of primary and middle school students, this paper focuses on the influence mechanism of teacher language violence and tries to make a simple description and explanation of the influence mechanism of teacher language violence. The research tries to answer the following questions: (i) according to students, what is teacher's language violence, that is, what are the characteristics of teacher's language violence? (ii) Under specific circumstances, how does language violence occur? (iii) What are the effects of language violence on students and how to respond to it?

Primary and secondary school students are in the development period of values and ideology, and teachers as key figures will have an important impact on their inner shaping. In particular, teachers play a central role in students' self-evaluation, and students reflect on their own values according to teachers' attitudes, comments and evaluations. In other words, children who lack internal standards of self-evaluation tend to judge their academic ability, achievement and self-efficacy based on teacher evaluations. Therefore, teachers have the responsibility to strengthen their language cultivation, so that their language will not only become the carrier of knowledge, but also become the motivation for students to realize their own value. (Qiran Wang & Yang Li,2019) If teachers ignore this responsibility, once teachers use verbal violence against students, students will suffer negative effects that cannot be reversed and made up for. (Li Tan & Yunxiang Fan,2017)

Verbal violence refers to the use of verbal abuse, slander, contempt, ridicule and other insulting discriminatory language, resulting in the mental and psychological assault and damage of others, which belongs to the category of mental injury. The language violence of teachers is the language violence that teachers impose on students.

Studies on language violence by teachers can be divided into the following three stages according to the research emphasis.

The first stage is the general description stage, and the research mainly focuses on the end of the 20th century. At this stage, most of the studies used statistics to describe the prevalence of language violence among teachers. OLWEUS, for example, studied 2,400 Norwegian students in grades 6-9 using the peer nomination method in a 1996 study. The study showed that at most 5.2% of students were

subjected to verbal abuse by teachers. (Olweus D,1996) But CASARJIAN's study of 700 north American students from low-income backgrounds paints a different picture. Thirty-four percent of the students reported at least six incidents of teacher language violence, while 11 percent reported at least 31 incidents during the school year. (Casarjian BE,2000)

The second stage is the longitudinal connection study, mainly focusing on the study from 2001 to 2015. The main purpose of this phase of research is to explore the longitudinal relationship between teacher language violence and children's development at different stages. Among them Mara Brendgen was a key figure in this period. He tracked 399 children (177 girls) from kindergarten through fourth grade for seven years. The results showed that language violence by teachers was a highly stable phenomenon for 15 percent of children. Children with antisocial behavior and attention problems in kindergarten are more likely to be abused by teachers in primary school. Language violence by teachers is significantly associated with children's subsequent delinquency and academic difficulties. (Brendgen M, Wanner B & Vitaro F ,2006) The effect was not transitory. After further research, Brendgen concluded that there was also a significant link between verbal violence by teachers and behavioural problems at the age of 23. Especially for girls who experienced language violence from teachers as children, their chances of obtaining a high school diploma are low. (Brendgen M, Wanner B & Vitaro F ,2007)

After 2016, the third stage is the in-depth research stage. The research in this stage focuses on the specific situation of teachers' language violence and tries to make an in-depth investigation of teachers' language violence in a dynamic and micro process. In 2016, Brenda Geiger interviewed 60 sixth graders in Israel, asking them to make free statements, so as to understand the real inner world of children under teachers' language violence. In the face of teachers' language violence, students often choose to keep silent because of teachers' authority and fear of retaliation, so they are unwilling to report the situation to their parents and school leaders. Although they remain silent, they tend to vent by means of internal monologues. After being abused by teachers, students became indifferent to teachers' comments and began to lose interest in school. (Geiger B,2017) In 2018, Eriyanti observed the specific interaction process between teachers and students from the perspective of power imbalance. Through a critical discourse analysis of the verbal expressions between teachers and students, the author finally summarizes seven patterns of language violence used by teachers in the specific teaching process: rejection, accusation, undervaluation, ridicule, coercion, threat and anger. (Eriyanti RW,2018)

Generally speaking, compared with the survey of parents and teachers, it is obviously more instructive to let students make their voices heard from the perspective of students. Because students are the most important stakeholders and the direct victims of teachers' language, their views on language violence deserve our attention. In addition, only when students can freely express their experiences in school and talk about the incidents that violate their rights in school, can they be most effectively protected by the adult world, thus safeguarding respect, dignity and other legitimate rights and interests. Therefore, this study intends to conduct an in-depth exploration of the inner world of primary and middle school students in the form of in-depth interviews, hoping to guide them to use their own language to convey the most authentic views on teachers' language violence.

## **2. Methods**

To solve the above problems, this study decided to adopt the method of grounded theory. As an important research path of qualitative research, it is widely used in the field of social science. "The purpose of research is to generate theories, and theories must come from empirical sources; Research is a process of systematically collecting and analyzing data, discovering, developing and testing theories. The research results are theoretical representations of reality. A theory discovered through a systematic process of data collection and analysis is called grounded theory. (B. Glaser & A.L. Strauss,1968) The reason why grounded theory is adopted in this study to discuss "the influence mechanism of teacher language violence" is that this method can reflect the inner world of students to the greatest extent.

### **2.1. Sample recruitment**

Due to the low cognitive development level and language expression ability of students in the lower grades of primary schools, and considering the investigation fact that junior middle school is the worst-hit area for teachers' language violence, the interviewees of this study are mainly for primary and junior middle school students in grades 4 to 6. Since grounded theory does not specify the sample size, in principle sampling can be stopped as soon as theoretical saturation is reached. Therefore, 16 primary and secondary school students in the preliminary investigation stage were selected theoretically (namely primary and secondary school students who had experienced language violence by teachers). There are 3 people in grade 4, 2 people in grade 5, 2 people in grade 6, 5 people in grade 1 and 4 people in Grade 2.

## 2.2. Procedure

**2.2.1. Open coding.** The purpose of open coding is to identify the genera and their attributes and dimensions by "tagging" the interview data for further analysis. In this step, in-depth interview is mainly used to collect data. In the open coding, this study insists on logging in the concept of personal localization in the original materials, so as to create four initial categories of characteristics, manifestation, attribution and results of language violence of teachers after the tagging analysis of the interview materials of four interviewees.

**2.2.2. Axial coding.** In the spindle coding stage, 6 interviewees were asked the same 7 questions above. But different from open coding, spindle coding pays more attention to a more profound analysis of the six categories that have been abstracting in the process of open coding. The researchers conducted in-depth analysis on a particular genus at a time, hoping to enrich the correlation of such subspecies as much as possible.

**2.2.3. Selective coding.** The third step is to select the code, that is, to find a core genus from the generalized genera, so as to form a connection among the genera, construct the initial paradigm model of teacher language violence, and then establish a storyline consistent with the paradigm model.

## 3. Results

### 3.1. Characteristics of language violence by teachers

**3.1.1. Harmfulness.** On the surface, teachers' verbal violence seems to have a more insignificant impact on students than corporal punishment. But in the course of the study, it was found that sometimes it was more harmful to students than corporal punishment. Especially for those students who are introverted and sensitive in mind, a bad word from teachers will often cause long-term psychological troubles and serious harm to the development of students. For example, student D: "I don't like being told that I am not good by my classmates, let alone by my teacher. The teacher is the person we are closest to. What she says affects how my classmates think of me."

**3.1.2. Persistence.** The language violence of teachers also has the characteristics of persistence. Teachers ignore the principal status of students, disregard their personal dignity, even if the occasional vicious words, will also cause lasting damage to the students' spiritual world. For example, student F said in an interview, "Teachers' words have a negative impact on self-confidence. I don't want to meet teachers and classmates outside. Because I can't forget the teacher's abuse, even after a long time".

**3.1.3. Coercion.** In the eyes of students, the language violence of teachers is also characterized by coercion. No matter how to emphasize the subject status of students in education, in the real teaching environment, the relationship between teachers and students is still dominated by the manager and the managed. Especially for the physical and mental development of primary and middle school students, teachers are absolutely perfect leaders in their hearts. It is with the help of such a "superior leader" image that teachers make their language violence with strong coercion. "He stood on the platform, high above me, pointing at me all the time and telling me how stupid I was, and I could only sit in my seat and not argue, because he was the teacher." Student B's narration reflects the forceful characteristics of improper language of teachers due to the infiltration of teachers' authority.

### 3.2. Forms of language violence by teachers

**3.2.1. Openness and directness.** According to the students' narration of teachers' language violence, the most common manifestation of teachers' language violence towards students is open and direct. That is, teachers in the public (mainly in the classroom) directly insult, abuse students. For example, teachers will directly insult and reprimand unruly students in class, and some even make public verbal attacks on students' hair styles and names.

**3.2.2. Openness and indirection.** The second type of language violence is the overt and indirect type. Compared with the first type, this type causes more obvious psychological harm to students. The so-called openness and indirection refer to the demeaning behavior of a teacher towards a student in public (mainly in class). For example, student H: "The teacher praised my desk mate's progress in study and said he was 100 times smarter than me in front of everyone." Another example is that a teacher talks to a student whose father has died, "Your father is gone, but you still don't study hard." In this study, there are two main ways in which teachers use language violence against students by referring to other students or by referring to relatives of students to arouse students' family guilt.

**3.2.3. Private directness.** The third form of teacher language violence is the private direct type. That is, the teacher engages in language violence in the environment where he is alone with the students. Compared with the first two forms, this kind of teacher's language violence has a mild impact on students. Some students even explicitly mentioned that the teacher said a lot of "uncomfortable words" to them in private chat, but expressed gratitude for the teacher's words, because they thought the teacher was in their good intentions.

### **3.3. Attribution of teacher's verbal violence.**

The first is teacher attribution. In other words, students attribute the reason of language violence to teachers themselves. They believe that teachers often commit language violence due to bad mood, poor ethics or short temper. The second category is self-attribution. In other words, students attribute the language violence to themselves. Such students show extreme polarization in character. Optimists, with their broader mindset, often attribute the teacher's bad words to not trying hard enough. However, overly introverted students often attribute their teachers' language violence to their own abilities or talents due to their lack of sufficient confidence. The third category is task attribution. In other words, students attribute the language violence to the task itself. For example, student I: "The teacher asked me to do the problem on the blackboard, but I couldn't do it for a long time. The teacher finally told me to 'roll down'. But I thought the problem was too difficult. "

### **3.4. The result of language violence by teachers**

**3.4.1. Positive results.** Teachers' language violence sometimes has a positive impact on students, which is rarely mentioned in the interview, but it also exists objectively. Although the democratic equality between teachers and students in teaching is strongly advocated now, strict criticism is the responsibility and authority of teachers as the traditional teacher ethics requirement in China. But the line between good words and bad words is not always clear. When the teacher's strict criticism goes too far and turns into verbal violence, students who believe in the teacher's traditional ethics still sometimes regard it as a means to motivate themselves. Some students said: "Sometimes the teacher said dirty words, but that's because the teacher wants us to do better."

**3.4.2. Negative results.** On the whole, the target of teachers' language violence is usually the students who have poor grades and are playful and active. In fact, even if teachers are changed, these students are still the target of language violence by new teachers. For these students, teacher language violence, often accompanied by insulting words, stigmatizes them as "not liked by the teacher." In the face of verbal attacks from teachers, most students experience extremely negative emotions. In the face of verbal violence by teachers, students sometimes use "crying" to express their hurt emotions, but many also choose "silence" to relieve the pain. Although they don't talk to their parents, other teachers or school leaders, they secretly curse the teachers who have hurt them. Even in extreme cases, they will act violently, such as slamming the door and running out of the classroom, breaking their own water glass and so on.

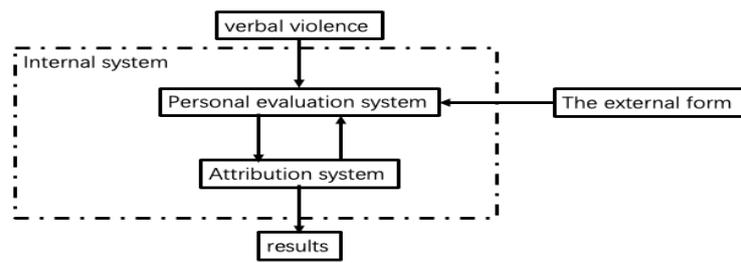
### **3.5. The process mechanism diagram of language violence by teachers**

According to the paradigm model of teacher language violence, this study proposes the influence mechanism of teacher language violence as shown in figure 1. The author believes that there are two systems in students' minds that are related to the results of teacher's verbal violence: the personal evaluation system and the attribution system.

In the face of language violence by teachers, students will first evaluate their own personal evaluations. The external manifestation of language violence will affect the result of individual evaluation. When a teacher publicly engages in verbal violence against students in class, students will feel a sharp drop in their personal evaluation because they "lose face in the whole class". The overt and indirect ways of language violence are more likely to frustrate students than the overt and direct ways of language violence.

In addition to taking into account their own personal evaluation, students will also conduct attribution analysis on the teacher's verbal violence. Students who attribute the causes of language violence to their own optimists and to tasks are more likely to self-resolve their negative results. Compared with the students who attributed to the teachers themselves, introverts were more likely to develop the dark mentality of inferiority, negativity and anger.

Figure 1. The influence mechanism of teacher language violence.



The interaction between individual evaluation system and attribution system contributes to the final step of the whole process of teacher's language violence -- the result of teacher's language violence. This result is sometimes shown by students' crying and violent resistance, but more often the result is invisible, hidden in their own hearts. We have no way of knowing whether it is good or bad, except to enter their inner world.

#### 4. Discussion and conclusions

The purpose of this study is to discuss the characteristics, manifestation, attribution and results of teacher language violence through in-depth interviews, to establish a preliminary example model and principle of the mechanism of teacher language violence process that can be further tested in subsequent studies, and to generate a grounded theory of teacher language violence.

From the research results, the paradigm model established in this study is effective. It reveals the characteristics, manifestation, attribution and results of language violence by teachers, which is more in-depth and comprehensive than the quantitative research on the same topic. The important innovation of this study lies in the understanding of the influence mechanism of teacher's language violence from the perspective of the "victim" through the narration of students, although it is difficult to avoid the unobjective criticism in the research process. However, the author maintains that it is the students who are affected by the language violence of teachers, and their understanding and understanding of the whole process are the closest to the truth.

Through the research, we find that, faced with the abuse of teachers' language violence, students will initiate the personal evaluation system and attribution system internally, and explain each other through the internal system, so as to produce the final result that can affect students' psychology and behavior. These findings undoubtedly provide more research perspectives for the follow-up related studies.

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## EVALUATION IN SCIENTIFIC ADVISORS' COMMENTARIES AS A MEANS TO DEVELOP STUDENTS' WRITING SKILLS

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### Abstract

The paper focuses on evaluative means in scientific advisors' commentaries that have an educating power and serve to develop students' writing skills. A scientific advisor assumes various roles in the process of correcting and editing students' linguistic research related papers. The roles of editors, psychologists, reviewers, representatives of academic discourse are revealed in the commentaries that accompany a feedback that teachers provide their students with. The commentaries are of evaluative nature.

**Keywords:** *Evaluation, writing skills, scientific advisor, commentaries, roles.*

### 1. Introduction

Academic writing (further on – AW) has a long history as a genre and as a form of human intellectual activity.

Google Ngram Books graph (see below) shows that AW has been gradually gaining momentum among the scholars since 1960s.

*Figure 1. The Occurrence of the Term “Academic Writing” in literature since 1800 (Google Ngram Books, electronic resource).*



Since 1960s, scholarly research focusing on AW has increased dramatically (see, e.g., ScienceDirect resource, featuring 158,375 publications on AW (as of the beginning of January 2020)).

AW enjoys a versatile and comprehensive research history and is being studied from various perspectives: scholars focus on existential aspects – e.g., the authors' as well as the readers' identities in AW (Hyland, 2001a; 2001b; 2002; 2010); they study AW through the prism of contemporary publication processes (Hyland, 2018); they examine specific linguistic features that are characteristic of AW (Vo, 2019). Teaching AW has also been in the focus of researchers' attention. Therefore, the nature of AW as regards to developing students' writing skills is studied (McGregor, 2018); the teaching AW across global contexts (Burgess & Pallant, 2013) and across disciplines (Purser, Dreyfus & Jones, 2020) is taken into account. Researchers undertake comparative analysis of students' and professional AW

(Aull, Bandarage & Miller, 2017); they focus on the nature of information in student notes (Siegel, Crawford, Ducker, Madarbakus-Ring & Lawson, 2020) and on exemplars in students' writing (Carter, Salamonsen, Ramjan & Halcomb, 2018).

In this paper, I focus on developing students AW skills through the teacher's written feedback in the form of evaluative sentences.

## 2. Methodology: Towards understanding the development of AW

The process of creating research papers in the academe is a multidimensional phenomenon: students are empowered by their scientific advisors to write texts which correspond to the traditions of academic discourse, at the same time, writing research papers is a creative, individualized, process.

To help the learners develop their writing skills, scientific advisors comment on those parts of the research paper, which should be corrected, assuming various roles in the process of teaching.

The aim of the research was to reveal the implicit processes that underlie seemingly explicit process of providing feedback to students on their writing progress. Moreover, I focused on the persuasive techniques that teachers use to encourage and empower students to develop their writing skills. Linguistically, these techniques are based on evaluative lexis, while institutionally (from the point of view of academic discourse) they depend on the role that scientific adviser assumes when interacting with the students (the role of the representative of academic discourse society, the role of a psychologist and some such).

To study the mechanism of developing writing skills in students, 80 Russian theses and 107 course papers on linguistics with the commentaries from scientific advisors have been analyzed. For research purposes, my colleagues from the Department of Linguistics and Translation Studies (Institute of Foreign Languages, Moscow City University) let me analyse their commentaries on research papers of their students. Therefore, I had a verbalized feedback from 10 teachers. The number of commentaries amounts to 2100 utterances. The research focused on commentaries accompanied by a verbalized evaluation, when teachers expressed their attitude towards the way a particular section of the paper, a sentence, or a single word was written. In this paper, evaluation is regarded as "the broad cover term for the expression of the speaker's or writer's attitude or stance towards, view point on, or feelings about the entities or propositions that he is talking about" (Thompson & Hunston, 2003). This definition is especially relevant for the research into AW, where the evaluation does not circulate around *the good* or *the bad* only: it covers relevancy, dynamism, depth, style and other aspects of a research that are evaluated. Therefore, the commentaries have been analysed based on semantics and the values of academic discourse, for "evaluation plays a key role in the construal of a particular ideology" (Hunston, 2002, 177).

When analyzing students' research papers the teachers rely on written academic discourse rules (see e.g. Suleimanova, 2017).

## 3. Results

The research has revealed that scientific advisors assume **the role of the representatives of the academic discourse**, when they encourage students to follow the ethics rules of the discourse community, demonstrating a respectful attitude to the scientists they quote. Therefore, the "dialogue with the *Other* in academic discourse" (Suleimanova, 2017; 2016) is developing. Markers of deontic modality are used in teachers' commentaries (*one should be more explicit about the contribution of linguists in this field*). Students' appraisal of their own papers (*my paper is destined to be a role model for the papers in this field*) are met by corrective commentaries shaping students' discourse identity. It is vital to feel a "humble servant of the discipline" (Hyland, 2010). There is a category of teachers' commentaries that are a reaction to students' misuse of evaluation, e.g. a first-year student wrote that *this scientist has suggested too simple classification*. The teacher advises the student to try to find something relevant in every classification and to avoid labeling linguists whose contribution to the field has long been acclaimed. In this case, the negative evaluation that is contained in the adjective *simple* (because the research of another linguist is evaluated) is corrected by the teacher in terms of academic discourse values and in terms of research ethics. Sometimes, when a positive evaluation of a linguist's contribution is used, teachers may correct students' use of evaluation. Thus, for example, when a student wrote that *the researcher NN has developed a good typology*, the teacher corrected the student by saying that *we assess typology not in terms of good and bad, but in terms of its relevancy to the purposes of the research, moreover, by saying that the typology is good you place yourself in a position to judge the linguist's work, which is unacceptable from the point of view of academic discourse*. In this case, the teacher encourages the student to explore the categories of acceptability and unacceptability in research processes.

Assuming **the roles of editors**, teachers give extensive commentaries on the language use and style. Thus, e.g. when students analyse translations in the framework of translation studies research, they may use such evaluative sentences like *this translation sounds drier than the other one*. The teacher's correction – *this translation sounds less expressive than the other one*.

Various psychological issues blocking motivation are cured by positive evaluation (*Perfect work!*) which lessens the pressure and encourages students to continue researching, turning the teacher into a **psychologist**.

At the last stages of the research the teacher becomes mostly a **reviewer**, which is mirrored in the character of the evaluations used.

85% of commentaries contain explicit verbalized evaluation, while in 15% evaluation is expressed in the form of advice to improve the passage. 99% of teachers' evaluations on first year course papers are negative, while 95% of teachers' commentaries in theses (written by the same students) contain positive evaluative means, for their writing skills have been drastically improved years 1 through 4.). In this case, we rely on the scientific adviser's review on a student's work and on the reviewer's feedback (for every student receives a feedback from an independent reviewer who evaluates the students thesis and comments on relevancy, style, compliance with academic discourse rules and some such).

#### **4. Conclusions: Towards the understanding of multidimensional character of developing AW skills**

Academic research starts for students when they make their first steps in the academe. They shape their discourse identity throughout the university life and AW contributes into this process significantly. It is the multidimensional character of AW that enables teachers to empower their students with professionally meaningful skills. The multidimensional character of AW reveals itself in the institutionally contextualized interactions between the student and his/her scientific advisor. First of all, importantly, scientific advisors develop students' ethic awareness, trying to reveal the values of the academe to the researcher-beginners, the students' understanding of the importance of these values reveals itself in their written texts – when they cite scholars, when they respectfully evaluate scientists' theories, contributions and typologies. Secondly, teachers promote life-long-learning to their students (Vodyanitskaya, 2018), for the latter see that there is always a room for improvement in writing. Thirdly, students become the members of discourse society, for they learn to analyze and take into account their teachers' evaluations and judgements, polishing their research skills. Developed AW skills outreach academic environment, for students develop linguistically (learning to verbalize their research analysis) and professionally. Their self-esteem is boosted in the process of mastering writing as well as speaking skills (Suleimanova, Yaremenko & Vodyanitskaya, 2018). Scientific advisors' commentaries have, therefore, pedagogical, cultural, ethical, discursive, psychological and linguistic impact. They change over time with the changes in students' writing. The roles they assume also change over time – with the development of the student's writing skills, teacher's roles also develop.

What is relevant, such commentaries are aimed at developing understanding in academic discourse (for more on understanding in academic discourse see Suleimanova 2013) and the final presentations of students' research results show that this understanding has been mutual.

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## **CZECH CURRICULAR REFORM IN THE REAR-VIEW MIRROR: THE CASE OF FOREIGN LANGUAGE LEARNING**

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### **Abstract**

The aim of the paper is to present some insights into the long-term effects of the Czech curricular reform, which was carried out at primary and lower-secondary level of educational system in the second half of the previous decade. The author combines two relevant perspectives. The first viewpoint is represented by referring to the outcomes of the author's own longitudinal empirical research, which was carried out within the years 2004-2007. The aforementioned study was focused on analysing the particular dimension of English language teachers' professional competence in relation to the proclaimed goals of the upcoming curricular reform. The second perspective intends to provide a valuable complementary picture as it is based on the analysis of "language learning stories", expressed by the current university students, i.e. the addressees of the previous curricular reform. This small-scale empirical investigation was carried out via a content analysis of the students' reflections on their prior learning experience. The arising categories of qualitative data are interpreted with regard to the main principles of the curricular reform, and discussed in terms of some potential ways of dealing with the issues of the university students' previous language learning experience.

**Keywords:** *English language learning, university students, teacher professional competence, curricular reform.*

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### **1. Introduction**

Over the past fifteen years, the Czech educational system has undergone numerous changes in terms of the proclaimed goals of education, as well as of its content. One of the key topics of the Czech pedagogical discourse in the previous years was the so-called curricular reform. The idea of the two-level curriculum, consisting of the national curriculum (i.e. Framework Educational Programmes for the particular levels of educational system) as the basis for creating the context-specific school curricula (i.e. the respective School educational programmes), was expected to bring the desirable changes directed towards long-term positive educational effects.

The obvious demands of carrying out the curricular reform successfully have always included both the aspects of its temporal characteristics and the issues of an active involvement of teachers as key agents of the reform. Besides, the need for perceiving this reform as a long-term process is clearly formulated e.g. by Vrabcová and Pázlarová (2016, pp. 294-295), who distinguish between the so-called period of systemic reconstruction (1999-2004), general implementation (2005-2011) and reform modification (2012 and later). Furthermore, their empirical analysis deliberately focuses on the area of teachers' attitudes, similarly to the studies of other authors in the Czech educational context during the "reform modification period", which have been carried out with the intention to analyse its effectiveness (e.g. Janík et al. 2018 at secondary grammar schools, or Pešková et al. 2018 at primary schools).

The main aim of this text is to reflect back on the "general implementation" period of the curricular reform through "the voices" of current university students of non-pedagogical study fields. However, a useful starting point of further analyses might be found in drawing some parallels between the outcomes of our own long-term empirical research conducted during the "general implementation" period (namely 2004-2007) and some current findings related to the subsequent "reform modification stage".

### **2. Perspectives on the curricular reform "at that time" and "at the moment"**

It has been previously mentioned that the curricular reform primarily focused on new roles of teachers in real-life school environments. General interest in the empirical evidence in the area of new

teacher competences was reflected in numerous research studies, such as the one conducted by Straková et al. (2014), intended to find out whether the teachers “identify with the aspects of curricular reform that are new and have no tradition in the Czech school” (Straková et al. 2014, p. 65). A similar aim was previously formulated also for our longitudinal empirical research from the period 2004-2007 (Brebera 2008, 2010), which represented the so-called “preparatory period” of the curricular reform at primary and lower-secondary schools, i.e. before the official launch of the two-level curriculum system for these schools. We investigated into the competences of novice teachers in the area of curricular design, and we identified a very important determinant of the teacher professional development within the particular school culture. Our results showed that the outside pressure on schools, which were suddenly expected to perform as potential professional learning communities (the term according to Persson 2006, p. 35; similarly Shulman & Shulman 2004, in their influential model of multi-level teacher learning), sometimes even produced the type of results quite contrary to the proclaimed goals of the reform. Our empirical evidence showed that the general perceptions of professional learning opportunities in schools could be characterised in terms of “learning ignored” (in 2004-5), “learning rejected” (in 2005-6) and “learning imposed” (in 2006-7) (Brebera 2008, pp. 12-13). Similarly, some current reflections on the curricular reform in various contexts show e.g. that it “has been accepted by the Czech grammar school teachers to a limited extent” (Janík et al. 2018, p. 66), which concerns both the so-called “subject/content-oriented teachers” and the “student-oriented” ones (ibid). Moreover, there certainly exist noticeable individual differences in the teachers’ attitudes to the reform, characterised e.g. by Pešková et al. (2018) as “positive – supporting, neutral – balancing and negative – disenchanted” (Pešková et al. 2018, p. 69).

An excellent complementary viewpoint to the previously presented general perspective on the curricular reform could be found in the empirical research carried out by Černá et al. (2016) in the field of foreign language learning. This study appears to be really valuable, mainly owing to the fact that the authors investigated into individual foreign language learning stories of the research subjects who were directly affected by the implementation of the curricular reform. This study involved a relatively large group of the students of English language teaching programmes, it is based on a very complex and precisely elaborated research methodology and presents very useful and deep insights into the role of formal learning contexts but also the non-formal and informal ones in the process of building the attitudes towards English language learning.

Here below, we try to offer the results of our own small-scale empirical investigation, carried out with a similar intention, i.e. researching the perceived impact of various types of language learning experience, acquired during the era of curricular reform, on the attitudes towards foreign language learning. Nevertheless, in our research context we deal with a different researched population, which consists of purely non-philological students. Besides, our viewpoint primarily intends to offer a synthesis of the key categories that appeared in the perceptions of the novice teachers during the era of “triggering the curricular reform” (i.e. 2004-2007, in Brebera 2010), with the reflections on the corresponding concepts, as expressed by current non-philological students. To sum it up, the novice teachers’ perspective from the period 2004-2007 is represented by the following broad categories: “teachers as agents of change, aims and competencies, educational content, textbooks, and cross-curricular links” (ibid, pp.135-139). Accordingly, the key concepts that have been deliberately chosen as the basic structure for categorising the current respondents’ reflections are: my language teachers, my language achievements, my favourite and disliked areas of language learning, my textbooks, and my use of English for real-life purposes.

### 3. Empirical evidence

#### 3.1. Research methodology, context and participants

It has already been mentioned that the aim of our empirical research was to identify the specifics of previous learning experience in the group of non-philological university students. Therefore, the researched population consisted of the students of Bachelor degree study programmes in the field of transport engineering, who enrolled into the particular one-semester intermediate courses of English for Transport (i.e. B1 and B1+ according to the Common European Framework of Reference for Languages) in the period 2014-17. Altogether, 71 students were involved in this empirical investigation.

The research included the qualitative part based on the content analysis of the student-generated material within the specific blended learning task, and the quantitative part based on the feedback data related to the previously mentioned task, collected by means of a semi-structured questionnaire. The format of the student-generated material was defined in terms of the spoken presentation, entitled “My language learning story”. In their narratives, the students were expected to reflect on their language learning achievements during their university studies via commenting on their collection of the so-called digital badges (for more about this particular blended task, see Brebera, Bezdíčková 2019, pp. 95-96), and

they were also invited to present their prior learning experience in other contexts. The research results, which are presented below, are based on the aforementioned qualitative part (for the results of the quantitative part, see Brebera, Bezdičková 2019, pp. 96-99).

## 3.2. Research results

**3.2.1. Teachers as agents of change / My language teachers.** The empirical research from the period 2004-2007 revealed a huge variety of perceived attitudes towards change in schools. In some schools, the curricular reform was obviously perceived as a great opportunity for innovations: “... *I would say that the teachers at our school are very progressive and open to any changes that would generally improve teaching ...*” (Brebera 2010, p. 146). On the other hand, numerous sceptical observations related to the acceptance of the curricular reform appeared as well: “*I had a feeling from the teachers here that they were staring at me and grumbling: What the hell is she trying to do? Does it mean that also we will have to do something extra?*” (ibid. 149).

The obvious variability in terms of the continuum ranging from “progressive teachers” towards the “resistant” ones was reflected also in the current students’ memories of their primary and secondary schools studies. A negative aspect that was mentioned quite frequently was the teachers’ turnover, e.g.: “*I don’t remember much because we had three teachers and it was not good*”. Besides, some comments manifested the pupils’ disappointment related to their teachers’ professional competencies, e.g.: “*Our teacher knew less than we did. Lessons were boring with her and such a shame, it resulted that I lost an interest in English;*” or “*It was in the 7<sup>th</sup> class. We learned new words and there was the word model train. I like the trains and the model trains but the teacher said it isn’t an important word for us because it won’t be in the exam*”. However, also the excitement connected with the experience of having highly competent teachers still stays in the memories of the current university students, e.g.: “*At the elementary school, I liked my English teacher. He was very nice. I liked English;*” or “*We had a teacher who was always in England. So, her English is really good and the experience from the lessons with her is unforgettable.*” Based on that, a conclusion might be drawn that the new generation of school pupils seems to be aware of a huge impact of their former teachers on their attitudes towards language learning. This fact might be one of the incentives for the forthcoming reform efforts.

**3.2.2. Aims and competencies / My language achievements.** One of the main ideas of the curricular reform was to focus on the development of the learners’ competencies. The positive efforts of some of the teachers in this area were rewarded by some clearly observable pupils’ achievements and at the same time, they produced a higher level of the teachers’ job satisfaction: “*I know that it may take a long time, maybe even several years. But I want to do it this way. I am really happy that something will change. I really like it because I will be happy that I could do the project work at the elementary school. Before I started studying the teacher training programme I didn’t even know what project work is. And then I tried it out with the children, first only short-time and a short project. And they were so happy and liked it so much when they were actively searching for new information. And what they also liked about it was that their projects were displayed and everybody could look at them*” (Brebera 2010, p. 146). On the other hand, the newly formulated focus on the category of competencies was sometimes openly questioned: “*The key competencies are certainly important for the child and his/her life. On the other hand, they do not guarantee that the child will be able to pass the entrance exam for the secondary school or get a good job if he/she doesn’t have theoretical knowledge. I talked about it with my colleagues at school and they think the same*” (ibid. p. 163).

As regards the current university students’ perceived language achievements, they were very often expressed in terms of school grades, e.g.: “*I always wanted English just because of school, because I needed good marks;*” especially in connection to the so called “maturita exam”, i.e. final secondary school exam: “*The teacher was strict, it was really hard, I got bad marks and I hated English at the grammar school. But after this hell with the teacher, the “maturita” exam was easy.*” Besides, the perceived language achievements demonstrable outside the formal school context also appeared in the reflections, and they concerned mainly the experience of being successful in real-life communicative situations, e.g.: “*I liked meeting new people and new language, I am very interested in languages. First of all, learning is about culture which is connected with the language. Then I tried to speak about everything with the native speaker when I was on holiday or some visitor came to our class;*” or “*When I was younger I travelled a lot with my family and I was the only one who knew a few English sentences because my family know just Russian and German language*”. These comments point out that the students still attach equal importance both to “learning for life” and “learning for school”.

### 3.2.3. Educational content / My favourite and disliked areas of language learning.

According to many comments from the period 2004-2007, the task of writing the school curriculum was often perceived as a formal one: *“Everybody says that in fact, nothing will really change, and that the teachers will just re-write the things they have already been using for years, and they will just use a different label for them”* (Brebera 2010, p. 148). Nevertheless, other teachers undoubtedly demonstrated a very responsible approach in the area of designing the educational content within the study subject English language: *“I think it should be something like a broader framework so I decided to design it in this way: Reading skills – shopping, free time, holiday postcard; writing skills – holiday postcard; listening skills – free time, etc. And I also added the recommended aids – cassette player, postcards, textbook, worksheets, picture cards, etc.”* (ibid, p. 163).

The current students’ voices clearly reveal how the choice of the specific content might influence the attitudes towards language learning either negatively (*“This English was very hard because we learned by heart long topics, it was terrible and I hated it”*) or positively (*“Especially at the grammar school, I liked small groups of people, and we communicated together and needed to maybe run some meetings or do some interviews together”*). From a more general perspective, the newly arising requirement of studying two foreign languages at the primary level was occasionally questioned (*“In the eighth class I started learning German and it makes me problems sometimes because I am mixing these two languages. And sometimes it works like I mean something in Czech, then translate in German and finally I can say it in English.”*). Based on the previous comments, the choices of the educational content, made at the level of formulating general language policies as well as in real schools, seem to be absolutely vital from the perspective of creating a meaningful and well-functioning educational system.

**3.2.4. Textbooks / My textbooks.** Perhaps the most frequently discussed topic in the unstructured teachers’ debates in our research from 2004-2007 was the issue of textbooks. The curricular reform was intended to encourage the creative way of using various teaching materials and this idea was also reflected in many comments on the new school curriculum development: *“My colleagues also like working with this textbook. This textbook contains many funny stories about the family. The pupils like the dramatization of these stories. And it is also full of songs”* (Brebera 2010, p. 152). On the other hand, the need for avoiding an overdependence of the new school curricula on the particular textbooks was expressed as well: *“In our teams, we discussed the importance of textbooks and concluded that the aims and textbooks are important but the curriculum should not be based on them. We stated the outcomes for each grade but not according to textbooks. The reason was that if we decided to change the textbook in the future we would have to re-write the whole curriculum.”* (ibid. 163).

Unlike the aforementioned teachers’ huge interest in the issues of textbooks, the current students’ reflections on the period of their primary and secondary school studies included only occasional remarks on the textbooks and classroom materials. They appeared only in the case of describing the specific learning context (*“in the kindergarten... we couldn’t read, we were learning from picture books”*) or in case of strongly positive emotions (*“...this is my first textbook. The magnificent Chit Chat which was full of pictures and illustrations. It’s really the first thing that came to my mind if someone asks me how I started learning English.”*). Implicitly, the comments on the classroom materials appear in the descriptions of preferred activity types, such as e.g. *“We did a lot of reading with the magazine R and R. and in this magazine there are lots of crosswords. I like crosswords.”* This fact implies that the categories of educational content and the teaching materials are to a certain extent overlapping both in the teachers’ as well as the students’ perceptions.

**3.2.5. Cross-curricular links / My use of English for real-life purposes.** The new system of curricular documents also supported the idea of creating meaningful links across the whole school curriculum. This aspect of designing the new school curricula represented a very complex task for the teachers but sometimes it was questioned even from the part of the students, e.g.: *“I was really surprised when we were talking about English speaking countries and the 7<sup>th</sup> graders told me that the biggest English speaking country is China and that they really did mean it. After a long discussion they told me that English classes are not Geography ones and that on English lessons they didn’t need to know these things. I was really shocked”* (Brebera 2010, p. 155). Nevertheless, the potential of interconnecting the educational content of English language with other subjects appeared in many practical recommendations, such as e.g.: *“I might hate anything that is connected to physics but I don’t agree that it is useless to connect English to physics. When you come to England and you want to buy something, the knowledge of our measures would be useless for you there... So why don’t we use it for connecting both subjects – miles, pounds, etc.... After all, when the kids come to England one day this might be more useful for them than to know where Shakespeare used to live”* (ibid, p.161).

In their reflections, the current university students, who are predominantly technically-oriented, very often commented on practical language learning opportunities beyond the scope of formal school curricula, i.e. mainly films, series and sports on TV, PC games and holiday trips. The school-related opportunities for establishing the links between the acquired language skills and other study areas were expressed mainly in terms of the appreciation of school exchange programmes (“*This photo is from the secondary school when we were with friends and a teacher on Erasmus plus.... We studied about ecology and renewable energies. The teacher was from India so the communication was pretty hard but we made it*”), or following the particular professional interests (“*At the secondary school I explored that English could be important for 3D modelling and graphics. There was and still is the professional vocabulary which I can get to know.*”) Apparently, in the area of reflecting on the power of foreign language learning across the curriculum, our specific group of technically-oriented respondents demonstrated the highest level of personal fulfilment in accordance with the proclaimed principles of the curricular reform.

#### 4. Conclusion and discussion

There are two main reasons for using the metaphor of a rear-view mirror in connection to the curricular reform in the title of this text. Firstly, we intended to emphasise the general importance of stimulating the reflective thinking and developing the metacognitive skills related to language learning. Secondly, the metaphor was supposed to characterise our researched group, i.e. the future professionals in the area of transport engineering, since the concept of rear-view mirror represents a relatively relevant technical expression used within this particular professional group. In short, we may assume that the aspects of both “looking back” and “thinking forward” with regard to one’s professional needs represent one of the essential components of English language education at the tertiary level.

Besides, it was proved that the concepts which produced such strong feelings among the novice teachers during the initial stage of the curricular reform (i.e. 2004-2007) resonate to a certain extent also in unstructured reflective narratives of the people who experienced this era from the student’s perspective. Therefore, there appears to exist a clear conceptual inter-relation between those who provide the education and those in the role of its recipients, in this case the “addressees” of the curricular reform. In conclusion, our findings imply that the long-term effects of the curricular reform are always worth investigating since they may serve as a very useful basis for shaping the particular educational policies at the present time as well as in the future.

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## **BASIS OF ARCHITECTURAL SURVEY BETWEEN GEOMETRY AND REPRESENTATION. A FIRST EDUCATIVE APPROACH**

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### **Abstract**

This paper illustrates the educative path – aimed at learning the basis of architectural survey – we propose to the students in the first year, as part of the Drawing and Survey Laboratory (bachelor's degree in Architecture). The primary focus of the Laboratory is to guide them in studying and using the graphic languages and related fundamental tools. In this case, architectural survey comes as a cognitive tool of fundamental importance for the analysis and understanding of architectural artefacts. The main objective of the exercises carried out during the Laboratory is to prepare student by a gradual theoretical and technical path for the direct and indirect operations of survey. During the first semester the course includes a first operation of surveying an architectural drawing (during the exercise of critical redraw of a published project), giving birth to an ideal scalar approach to the themes of survey, both manual (direct survey) and digital (PR, SfM), which combines and develops horizontal and vertical skills. Here, we discuss the main passages of the path of survey through an emblematic case study from Torino.

**Keywords:** *Architectural drawing and survey, architectural education, integrated architectural survey, architectural heritage, process of knowledge.*

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### **1. Introduction: The Architect and the study of the built environment (MP, UZ)**

Since the dawn of his profession, the Architect has been the professional who shapes the built world by designing its volumes, spaces and places. However, it is important to remember that in the contemporary world, in the European context and specifically in Italy, the Architect has to deal with a highly stratified context, characterized by the presence of a significant amount of existing building and architectural/landscape heritage, that arise the necessity of a productive dialogue (Piano & Cassigoli 2009). Therefore, the Architect is increasingly working on existing buildings. This makes it necessary that he should be able, even if often supported by other professionals, to obtain metric, material, technological knowledge of the architectural artefacts before working on it. Then, it is necessary to provide students of Architecture with the skills and related tools that might be useful to build this knowledge.

Over the years, however, the transition from a five-year to a 3+2 degree course (Bologna process) has certainly required a remodeling of the educational programs, with the primary purpose of preparing three-year graduates in the world of work with specific expendable skills. Among these skills, the geometric knowledge (and not only) of the built environment stands out. In the architectural field, this process takes place through that set of operations, not only technical, but theoretical, that are grouped under the name of Survey (Ippolito 2016). Thanks to new technologies, it has been recognized for years as a result of integration of multiple analysis processes (historical, material, structural, etc.) and different measurement techniques (eg. meters, disto, theodolite, LIDAR, photogrammetry and SfM, etc.).

### **2. Designing the educative path (UZ)**

Observe, notice, grasp and annotate, graphically. This, in short, is a first approach to the architectural object. But how to observe, what to note, what aspects to grasp or to write down and... which is the right communicative modality? Usually, these are the questions we ask our students of the Drawing and Survey Laboratory of the first year of the bachelor's in Architecture. They are extremely heterogeneous students by school training; therefore, we cannot make use of prerequisites, we must offer them a complete educative path that, within a few months, allows them to face the subsequent courses.

This path must aim at structuring the scientific, theoretical and applicative bases of the graphic language: the Architect's own expression, useful to conceive, know and communicate the built environment. Moreover, we need to provide the bases for the Survey, following the Ministerial rules (DM 30 October 2015, n. 855) that, for our discipline, Drawing, indicates drawing as «a means of knowledge of the laws that govern the formal structure, an instrument for the analysis of existing values, an expressive act and visual communication of the design idea at the different dimensions» and survey «as a tool for knowledge of the architectural, urban and environmental reality, through direct and instrumental methodologies up to the most advanced ones».

We face the issues of direct analysis of existing buildings by means of theoretical lectures and practical applications, starting from the foundations and applications of descriptive geometry, to consciously work on drawing and redrawing published project and survey practices. Experiencing with redrawing of published projects allows students to investigate the graphic language and formulate their first interpretations (Spallone 2016; Zich, Comparetto and Pavignano 2019). Subsequently, the educational path makes use of the newly acquired skills to approach the real object, starting from the critical reading of graphical sources and developing direct and indirect survey of the built artefact.

### **3. Case study: Casa Maffei in Torino (UZ)**

Choosing the example becomes part of the educational path: we need an easily accessible building (to let students apply survey techniques), whose original project is still available. It also must be extremely significant for a reading through the rudiments of the perceptual survey, between form and proportion. For this exercise we chose Casa Maffei in Torino, sited in corso Montevecchio 50.

We start from the *Census of environmental cultural heritage in the municipality of Torino* which systematized in a logical grid heterogeneous information from archival and bibliographic sources: it describes Casa Maffei as a «civilian building [...] of historical, artistic and environmental value, designed by A. Vandone di Cortemiglia in an Art Nouveau style with Lombard school influences in 1904» (Nelva 1984). It is precisely from the critical reading of the archive documents that the activity begins (Figure 1).

#### **3.1. Maffei's house in Turin: Redrawing the project (EC-UZ)**

The redrawing activity is an opportunity to discuss the validity of the graphical sources, the relationship between the scale of representation and the qualitative/quantitative aspects of the information and graphic standards (both for its original representation and its remediation). The practice of redrawing an architecture can have multiple declinations, from working on an archive drawing or on published sources, to interpreting a photographic image or the result of its geometric transformation. As such, redrawing a building offers the possibility of exploring the different values of representation, ranging from the study of the design idea to the analysis of the as built by means of its survey. Redrawing is a heuristic practice that involves critical evaluations of the graphic sources; in fact: «redrawing consists of a real transcription, with a high content of abstraction: the process starts from the recognition of each sign, as part of the building [...] and arrives to another type of sign, which responds to the codified language of the architectural drawing. Each line of the graphic sources must therefore be read, recognized, interpreted and then retraced» (Spallone 2016, p. 735). In this sense, redrawing a project starting from a graphic source, allows students to study the architectural forms not from the real object, but from its representations, operating a survey of an architecture 'on paper'. This process gets the student used in reading drawings in various scales. Consequently, the student is obliged to think on the concept of representation scale. The information offered by the sources never seems exhaustive and often the work becomes a search for those data to be considered more reliable than others to base one's hypothesis of critical reading. Therefore, by tackling the redrawing in scale, the student is led to think on the qualitative/quantitative aspects of the graphic information to be managed: if representing at the same scale of the graphic source, he will adopt the same level of detail of the source itself, adding elements derived from the graphic conventions of architectural drawing. By making the change of scale to a less detailed one (i.e. from 1:100 to 1:50), he will decide which information is visible on this scale and which information will be lost and will remain only on the original drawings. For example, in this case, the 1:100 metric scale indicated in the drawings and the presence of some dimensions allow the student to correctly scale them on the CAAD. This step is the first one in order to redraw the original project. It follows the vectorization of the graphic source. This task allows the student to practice with the software and the notions of physical drawing scale and scaling of the same in the virtual (therefore infinite) space of the CAAD. During the process, however, it is necessary to make a reduction of the measure detected on the drawing, bringing them back to finite numbers that can be easily interpreted. This last step unites the practice of redrawing the survey practice, thus making the redrawing activity more like the restitution of a survey. The procedure is in fact to read a measure (which in this case is a

measure on a drawing) and bring it back on the drawing itself. As a process of knowledge, all the iconographic apparatus represents a tool to study its author's graphic codes and to correctly interpret their use. First, we focus on the façade, extrapolating the measurements from the project plans, suitably scaled. In order to prepare the student for the survey of the façades through the use of the RDF software.

Figure 1. The case study: Palazzo Maffei in Turin. a) the building and its urban context; b) main façade; c), d), e), f) original project of Palazzo Maffei from the Building Archive of the City of Turin, all right reserved.



### 3.2. Maffei's house in Turin: Geometrical perspective rectification (OB-DM-MP)

As second step, we introduce simplified methodologies for indirect survey: the photo rectification (of a geometric type) is one of the most appropriate in the first year of Architecture. From the point of view of descriptive geometry, straightening is an automated application of projective homology that transforms a central perspective into an orthogonal projection (Bassi Gerbi 1995) usable for the survey and analysis of façades or flat architectural elements, characterized by evident horizontal and vertical axiality. Flat objects are those artifacts where we can recognize one or more vertical reference planes (on each elevations) on which lie a sufficient number of elements characterizing the façades to be surveyed (openings, decorations, technological elements, etc.).

The described process involves two distinct steps: the acquisition of data, in this case shooting the photos, and the graphic restitution. The latter is the set of operations designed to reconstruct the true form of the photographed object. This process requires at least a photo of the object and the knowledge of at least two significant dimensions, to be measured on the object (one vertical and one horizontal). The operative practice starts from the correct method of photo acquisition: the visual field of the optical cone must display the sectors on which the two linear measures – which will allow the scaling of the frame (both on the straightening software and on the CAAD) – lie. This technique is adaptable to the most common forms of radiometric acquisition available today, such as smartphones, tablets, compact cameras. The photo of the element to be rectified must be appropriately acquired, possibly using lenses that contain medium-radial distortions, setting a resolution (dpi) that allows enlargement, up to the reading of the detail of interest, and without excessive contrast. It is therefore clear that the distance between the object to be photographed and the point of view is a not negligible parameter.

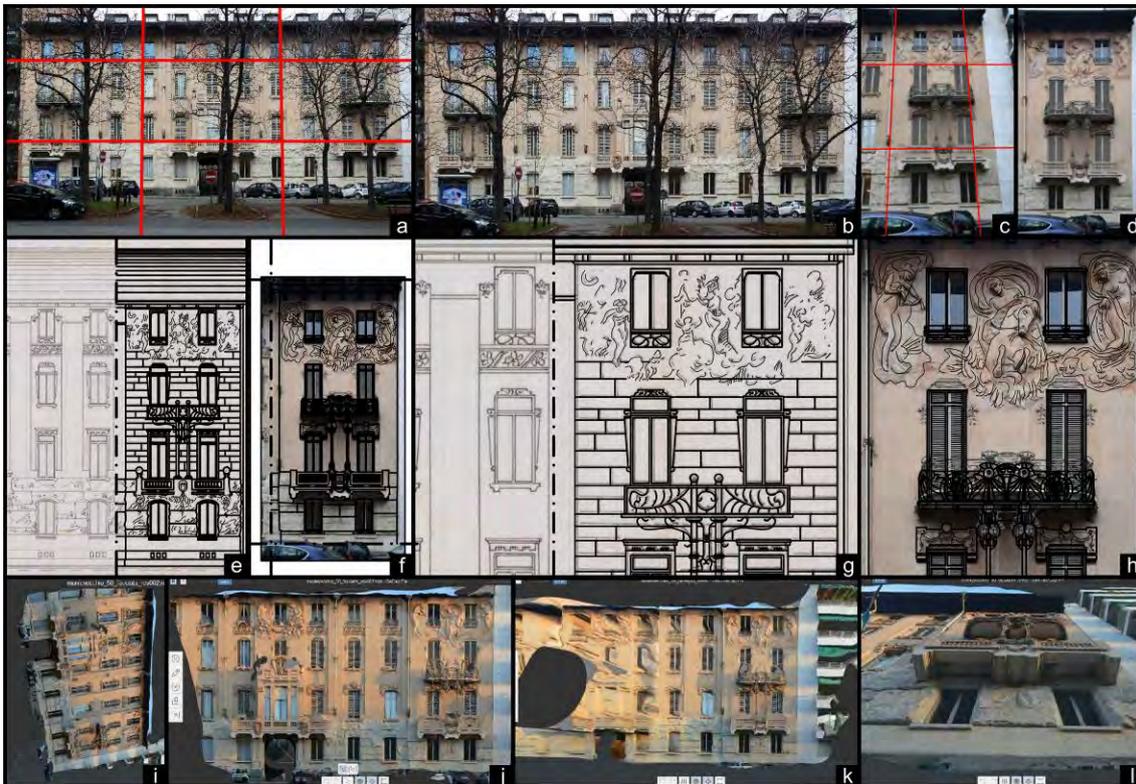
We use RDF, a software developed at the IUAV Photogrammetry Laboratory at the end of the 90s ([www.iuav.it/sistema-de/laboratori2/cosa-offri/software/index.htm](http://www.iuav.it/sistema-de/laboratori2/cosa-offri/software/index.htm)), still usable on the most modern pc. The operations to be carried out to obtain a rectification must be carried out carefully and without further simplifications. We refer to the operating manual available on the IUAV site.

We summarized the procedure performed to obtain the geometric straightening of a portion of the *bas-reliefs* to decorate the façade of Casa Maffei. Given its location (fourth floor), this portion of the decorative apparatus cannot be directly reached, therefore it would be very complicated to acquire the two linear measures for its straightening. Consequently, as a first procedure, an overall geometric straightening of the façade was performed using two dimensions, directly acquired on the building, relating to the total width of the façade and its height, measured from the upper edge of the windowsill on the mezzanine floor to the lower edge of the band of decoration placed under the windows of the fourth floor. While operating in geometric mode, it is necessary to consider the almost total impossibility of verifying the errors committed, both in the digitization of the geometric parameters and in recognizing them directly on the façade. So students must be aware of the risk of falling into a series of errors, for example: setting erroneous parallelisms of bundles of straight lines, obtained from architectural elements on which there is no possibility of control or verification; or processing the drawing of a façade without considering the error of scale and perspective due to the assembly of elements that deviate strongly from the height of the reference plane.

### 3.3. Maffei's house in Turin: Redrawing the rectified photos (EC-UZ)

Once obtained the rectified photos of the elevation of the house (and its details), we proceed again to the redrawing of the same on CAAD (Figure 2f). Also, in this case the student must organize the layers of the file and, therefore, practice the critical extrapolation, for quality and quantity, of the elements of the elevation. In this phase, the CAAD tool proves to be the most suitable for relating the different digitalized sources. The process of redrawing on rectified photos differs from that of the graphic source by mean of data interpretation: synthetizing the signs that characterize the form is now an operation done directly on the object photo (Figure 2h), thus not mediated by the language of the author of the archival drawing (Figure 2g).

Figure 3. Issues of redrawing and surveying Casa Maffei: a) original picture, horizontal and vertical alignments are highlighted with red lines; b) rectified photo; c) original picture used for the detail of the decoration, horizontal and vertical alignments are highlighted with red lines; d) rectified photo; e) redrawing a slice of the elevation on the archival graphic source; f) redrawing the same slice on the rectified photo; g) redrawing the detail of the decoration on the archival graphic source; h) redrawing the same detail on the rectified photo; i) SfM elaborated model (half of the façade) as oriented by the software; j) orthographic view of the same model; k), l) Detail SfM elaborated model.



### 3.4. Casa Maffei in Turin: The SfM survey (MP)

The latest didactic experience deal with automated frame processing, with the range imaging Structure from Motion approach (Häming and Peters 2010): in this way we move from the processing of a single photo, which allows the reconstruction of a rectified photo (and consequently to extrapolate only two-dimensional measurements on the reference plane), to an elaboration of several frames, which lead to the construction of a three-dimensional model of the object (therefore opening the possibility of extrapolating three-dimensional measurements) (De Luca 2011).

For the activity we use the Autodesk® Recap Photo™ (EDU release). This software is limited in the quantity of usable photos (100) the user cannot set the operating parameters (camera calibration, relative and absolute orientations of the frames, etc.). However, since it is a cloud-based software, this allows all students to proceed with the creation of an exportable mesh models without having a powerful pc. Since it is not possible to set control points on individual frames, it is clear how the use of this solution must be calibrated according to the obtainable results (of which is not possible an accurate control) and must be proposed as the first non-definitive approach to the problem of SfM range imaging survey. A consequence of the lack of control is the not always perfect orientation of the elaborated model in the space (Figure 2i), which could therefore be difficult to manage. The workflow involves taking photos with an overlap of about 70%, and at different angles, so that the software can automatically

recognize a suitable number of homologous points and elaborate the digital model. The use of Recap Photo™ puts students in front of the possibility of learning a method of taking photos and of a *posteriori* empirical critical evaluation of the results obtained in a completely automatic way. If the mesh model appears to be consistent with the detected object then we can extrapolate high resolution flat views, obtaining photo planes similar to those processed by RDF. We propose the use of this technique to elaborate detailed drawings (in 1:50 or 1:20 scale) of details of the buildings to be detected and, potentially, to obtain metric information of portions that cannot be directly surveyed (difficult to access or shape) (Figure 2k, l).

#### 4. Conclusions (MP-UZ)

The described educational path must be commented taking into account the context of application of the various tools proposed and the beneficiaries. All the activity, founded on the basis of a learning by doing approach, is aimed at developing the ability to critically select tools and procedures useful for the assigned task. In this sense, the generic redrawing of existing buildings, «carried out by students starting from graphic sources or from real life», or on the basis of metric processed photos, contributes to the construction of the graphic language (and not only) that students should be able to master as future professionals (Spallone 2017, p. 57). Furthermore, the photo rectification, aimed at the realization of a survey, must be taken into consideration when the analysis of the built environment or the study of an architectural artefact does not require its orientation in space based on points of known coordinates, still not fitting for rigorous error control. On the other hand, the automation of the survey process, by means of a simple SfM technique, offers an advanced instrumental approach, with multiple advantages in terms of visual impact of the graphic production, but colliding with the actual impossibility of controlling the process and, therefore, with the real possibility of obtaining materials of difficult interpretation. In this sense, it is fundamental for students to understand its limits above all. In this regard, Paolo Belardi (1996) notes that the mastery of software promotes a sort of new manual skill, no longer limited by the materiality of the ‘graphic sign’, however it is clear how much there remains a substantial difficulty which sees students as protagonists: their unaware use of software specifically designed to automatically perform important tasks is in no case immediate, but must be determined by a conscious use of the IT medium. In conclusion, the proposed path wants to be the activator of the students’ awareness and related development of a critical, implementable approach to the study of the built architectural fact, whose operational phases, part of the path, are applicable tools only on specific cases.

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## CREATING AUTHENTIC LEARNING AND ASSESSMENT ENVIRONMENTS

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### Abstract

The aim of this study is to investigate how the concept of “authentic learning” and “authentic assessment” is formed in the discourse of education executives. Authentic learning is based on the theory of social constructivism, according to which the social nature of knowledge is emphasized and the learner builds knowledge by creating meaningful authentic activities. Authentic assessment is described as a dynamic form of assessment which focuses on the skills developed by students during the learning process. The design of learning environments is based on the nine features of authentic learning, constructivism and the theory of embedded learning. In this study examples of authentic activities that support authentic learning environments are presented. In these activities a variety of authentic techniques are used and they are related to different subjects, such as Physics, Ancient Greek, Mathematics, Environmental studies, etc. The sample of the study consisted of 114 adults participating in a training program as a qualification for their professional development during the year 2018-2019. Quantitative analysis of the data was conducted. The analysis of the data revealed that an authentic learning environment consists of experientiality, interdisciplinarity, team work, problem solving, self-assessment, peer-assessment, real-world relevance, which are characteristics of authentic learning and assessment. Moreover, the implementation of authentic learning activities in different learning contexts can lead to the development of cognitive, metacognitive, social and communicative skills of the 21st century.

**Keywords:** *Authentic learning, authentic assessment, authentic activities, 21st century skills.*

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### 1. Introduction

Authentic learning may be more important than ever in a rapidly changing world, where individuals are expected to progress through multiple roles. Although foundational skills (reading, writing, mathematics, history, language) remain essential, a more complex set of competencies are required today. The skills that are required to adapt to new conditions are classified into four categories (Binkley, Erstad, Herman, Raizen, Ripley, Miller-Ricci, Rumble, 2012): ways of thinking ways of working, working tools and living in the world (citizenship, life and career etc). Therefore, schools must be connected with the real needs of society and promote changes that are necessary for the development of the 21st century skills. The changes must aim at different learning and assessment environments that can be created by "authentic learning".

Authentic learning is based on the theory of social constructivism and supports authentic learning environments where learners build knowledge by creating meaningful authentic activities. According to Lombardi and Oblinger (2007), authentic learning is “a type of learning that focuses on real-world, problems, using role-playing exercises, problem-solving activities, case studies, simulations, virtual learning communities, self-assessment and peer assessment” (p.2). Har (2016) defines it as “learning which happens by participating and working on real-world problems” (p. 2).

Authentic learning environments simulate real life problems and create the opportunity for using alternative approaches to solve a problem combining different ways of working and thinking. Therefore, problem-solving activities, simulations, on line learning communities, projects etc. can be used to implement authentic learning in school environments. Reeves, Herrington and Oliver (2002) describe what authenticity means in the design of learning activities. They present ten characteristics that define authentic Learning activities: 1. Authentic Learning activities have real world relevance, 2. Authentic Learning activities are ill-defined, 3. Authentic Learning activities require sustained student effort, 4. Authentic Learning activities involve multiple perspectives and resources, 5. Authentic Learning activities involve collaboration, 6. Authentic Learning activities provide opportunities for reflection, 7. Authentic Learning activities encourage interdisciplinary perspectives, 8. Authentic Learning activities

integrate assessments, 9. Authentic Learning activities create polished products, 10. Authentic Learning activities produce diverse outcomes.

Students taking part in authentic learning activities are able to develop cognitive, social and metacognitive skills, as they use knowledge to decide the steps and the strategies they must take on to solve a real life problem (Wornyo, Klu & Motlhaka, 2018; Reeves, Herrington, & Oliver, 2002).

## 2. Method

### 2.1. Objective and research questions

The objective of this study is to investigate the concept of “authentic learning” and “authentic assessment” as it was revealed by education executives. In specific, the present study explores:

- How education executives create an authentic learning environment using specific examples of authentic learning activities.
- What results they expect to receive from the implementation of the authentic learning activities
- What education executives consider as “authentic learning” and “authentic assessment”

Research Questions:

- What learning and assessment techniques do education executives use to ensure the authenticity of learning and assessment?
- What are the characteristics of authentic learning activities according to education executives?
- What kind of skills do they consider to be developed by students through the specific options?

### 2.2. Research strategy and instrument

A qualitative data analysis was carried out. The qualitative study was regarded appropriate because the researchers were interested to investigate how the concept of “authentic learning” and “authentic assessment” is formed in the discourse of the education executives (Delikari, 2005). All recorded data were analyzed by thematic analysis (Creswell, 2000). Data were collected in one phase for all the participants. The questionnaire that was administered to the education executives was divided into three categories. The questions were open, so the education executives had the opportunity to express their conceptions about the meaning of authentic learning and authentic assessment. Moreover, quantitative analysis of the data was conducted. 114 questionnaires were collected in total.

### 2.3. Participants

The sample of the research consisted of 114 adults participating in a training program in order to obtain a certification in leadership and management in education during the year 2018-2019. The trainees were education executives with previous experience in education. At the end of the training program the trainees had to complete questionnaires online. They had to define “authentic learning” and authentic assessment”, describe the connection between authentic learning and authentic assessment and give examples of authentic learning activities and techniques of authentic assessment that they had used in their teaching practices”.

## 3. Results

48 men (42%) and 66 women (58%) participated in the study. 43 of the men and 56 of the women answered the questions. 15 of them did not answer the question about giving examples of authentic learning and assessment techniques.

*Table 1. The participants according to gender.*

	<i>They answered</i>		<i>They did not answer</i>		<i>Participants</i>	
	<i>n</i>	<i>%</i>	<i>v</i>	<i>%</i>	<i>v</i>	<i>%</i>
<i>Male</i>	43	89,6	5	10,4	48	100
<i>Female</i>	56	84,8	10	15,2	66	100
<i>Total</i>	99	86,8	15	13,2	114	100

Table 2 shows the type of authentic activity chosen by education executives according to their gender.

Table 2. Types of authentic learning activities according to gender.

	Men		Women		Total	
	v	%	v	%	v	%
project	21	23,3	28	22,8	49	23,0
portfolio	11	12,2	23	18,7	34	16,0
role-playing	6	6,7	5	4,1	11	5,2
case study	6	6,7	5	4,1	11	5,2
problem solving	6	6,7	5	4,1	11	5,2
rubric	7	7,8	5	4,1	12	5,6
concept map	5	5,6	9	7,3	14	6,6
simulation	3	3,3	9	7,3	12	5,6
self-assessment	5	5,6	7	5,7	12	5,6
peer-assessment	4	4,4	8	6,5	12	5,6
diary	2	2,2	3	2,4	5	2,3
ICT	7	7,8	5	4,1	12	5,6
experiment	2	2,2	3	2,4	5	2,3
brainstorming	0	0,0	1	0,8	1	0,5
observation	3	3,3	3	2,4	6	2,8
debate	1	1,1	1	0,8	2	0,9
visit	1	1,1	3	2,4	4	1,9
Answers in total	90	100	123	100	213	100

The findings resulting from qualitative data collected through questionnaires were grouped in three categories according to the purposes of the study. The researchers divided the findings of the research into the following three categories: the types of authentic learning and assessment techniques, the characteristics of authentic learning environments and the skills the students can develop through the participation in authentic activities, according to the perceptions of the education executives.

The education executives, who were of different specialties, gave examples of authentic learning and assessment activities supporting authentic learning environments used in their daily school practice in a variety of subjects such as Maths, History, Geography, Biology, Physics, Literature, Religion Education, Chemistry etc.

Most education executives in the sample (n=83) answered that project and portfolio are the authentic techniques they mostly use in their school practices. According to their answers, project and portfolio have the characteristics of authentic learning and assessment and support authentic environments. Using this kind of techniques, students learn to work in groups, reflect on their experiences, develop critical thinking, cognitive, social and metacognitive skills, use strategies to solve a problem, design plans and follow steps to achieve a goal. One dominant skill that came up from the study is the skill that students can develop to solve a problem using a variety of sources distinguishing relevant from irrelevant information. The students associate the gained knowledge with everyday life discovering links, they become an active part of the process of gaining knowledge and they are activated through a process of creation.

From their answers emerged the fact that all the above authentic activities are a form of experiential learning where students are initially exposed to an experience and then encouraged to reflect on it and develop new knowledge, skills, attitudes and behaviors (Phillips, 2004). “*Students’ develop imagination and creativity. They apply knowledge in practice and in situations of everyday life and they develop critical thinking through experiential activities*” (P.89). Indicative examples of project that focus on experiential learning are the following: “*In Geography students were asked to make a research of a country they were interested in and to make a tourist guide of that country. Then they had to take on the role of a tour guide (role playing)*. (P.3). *A primary school in a tourist coastal area had to make a tourist guide for their area in which they had to highlight the advantages of their place among other schools in Greece in order to make other students visit it. Students had the chance to select between a printed tourist and a digital one by creating a website or posting it on local blogs*” (P.10)

In Experiential learning skills, which is a basic characteristic of authentic learning, knowledge, and experience are acquired outside the traditional academic classroom setting. “*Students of an elementary school who want to study plants make their own vegetable garden and through this they learn all the stages of vegetable development, the ways of cultivation, the parts of the plants, their species, the amount of water they need as well as the frequency of watering. They learn how to take responsibility for their protection, get to know their enemies and the ways of protection*” (P.33).

In role-playing activities “*Learning takes place through a role-playing game for students, sometimes representing traders and sometimes customers. In an experiential way, students learn how to use the knowledge they acquire in dealing with real-life situations*” (46). “*In authentic learning contexts the students take on the role of Municipal Counselor and try to face the big problem of pollution in the city they live. They try to propose solutions in order to solve the problem*” (P.100)

According to the participants' answers in all kinds of authentic activities (project, simulation, role playing, case study, c-map etc) students become an active part of the learning process through their participation in authentic activities. "*Students act on their own by researching data, recording opinions, exchanging opinions, announcing results and developing cognitive and social skills.*"

Another basic characteristic of authentic learning and assessment which became apparent from the analysis of the answers is team work. In all kinds of authentic learning activities students work in groups, interact with others, cooperate and respect the other members of the team. "*Students share and exchange views, attitudes, experiences and information about a problem*" (P.58).

Moreover, the analysis of the data revealed self-assessment and peer assessment as dominant authentic characteristics in all kinds of the authentic examples (project, simulation, role playing, case study, c-map, diary etc.). The students are able to learn on their own how to find answers to some of the inconsistencies they came across and to resolve the ambiguities embedded in some of the tasks. For example "*Students evaluating the work of their classmates, realize their mistakes and reflect on their own learning process*". "*They can get information from the others team members and compare it with theirs, express their point of view and correct their mistakes*". "*Using concept maps, teachers can identify students' weaknesses and adapt their lesson to the students' needs*". "*The student chooses the tasks he will include in his/her portfolio based on goals and criteria that are defined by him/her with the help of the teacher*" (P.74).

In authentic activities students are able to get engaged in inquiry and problem solving, decision making and scientific research. Problem solving was emerged as a basic characteristic and as a metacognitive skill. "*In Physics a rainy day can be the cause for exploring the circle of water. The students ask questions, such as "why is it raining?", "where does the rain come from", etc. After activating the pre-existing knowledge, the teacher follows the steps of constructive learning, i.e. students formulate questions, make predictions and are led to formulate functional definitions and draw conclusions. Through experimentation they will approach the concepts of melting, coagulation, solubility, ventilation*" (P.22).

#### 4. Discussion

In this study we have focused on the definition of authentic learning and authentic assessment according to the perceptions of education executives. The participants through specific examples given on how to create an authentic learning environment were led to the definition of authentic learning and authentic assessment, which is consistent with the literature (Oblinger, 2007; Har, 2016; Herrington & Oliver, 2000 Wornyo et.al, 2018). From the results of the research the authentic techniques that have been used most were project, portfolio, problem solving, self-assessment and peer assessment, role playing and the use of ICT.

In authentic learning and assessment students construct their own knowledge through research and problem solving and develop critical thinking and metacognitive skills. Through authentic learning, students work in groups, they take initiatives and think creatively. Through inquiry and the expression of different ways of thinking, the students are encouraged to collaborate, to respect and consult one another (Wornyo et.al, 2018). According to the participants' answers, for example in the project method students are able to explore and solve problems by choosing information through collaboration and dialogue. The results are consistent with other research, where through Project Based Learning (PBL), students have the opportunity to be involved in problem-solving, decision-making and scientific research (Hmelo-Silver, 2004; Panasan & Nuangchalerm, 2010; Thomas, 2000). Regarding rubrics, according to Jonsson, and Svingby (2007), when they are used by students to assess their own performance, the students are encouraged to take responsibility for their own learning and they are able to appreciate the strengths and weaknesses of their learning work. On the contrary, Orsmond and Merry (1996), argue that students might not find the qualities in their work even if they know what to look for, since they have a less developed sense of how to interpret criteria.

The findings of this study indicate that the above techniques give students the opportunity to use previous experiences and knowledge and share them in groups in order to gain new knowledge. According to Jarvis (1999:122), this happens, because these techniques are focused on students who use pre-existing knowledge to solve problems and collaborate. Authentic learning is an active learning process where students are not passive. It has been observed that this learning is necessary for developing critical thinking skills and scientific contents (Apedoe, Walker, & Reeves, 2006).

As far as experientiality and interdisciplinarity are concerned, the analysis of the data indicated that they are key characteristics of authentic learning, as we find them as key characteristics in many examples of our study, such as project, portfolio, role playing and problem solving. This is in line with literature according to which students' experiences are enriched by providing them multiple perspectives of a single topic or issue and authentic learning activities encourage interdisciplinary perspectives (Oliver,

Herrington & Reeves, 2011). Finally, the important role of ICT in authentic learning environments was referred by most of the participants.

From the answers of the participants, we are led to the conclusion that assessment of authentic learning can take the form of a number of evaluation measures which do not include formal tests, such as portfolios, journals, and self-assessment but they create opportunities which enable students to craft polished performances (McLellan, 1996).

## 5. Conclusions

While authentic learning environments are appealing, much research needs to be conducted on how to use them in an effective way in classrooms. In addition, much research needs to be conducted on the importance of the role of teachers who need to have a clear rationale for completing the task, understanding of the real-life application of the task and appropriate support to complete the task. Future research needs to focus on authentic environments that support student learning and enrich learning experiences. However, for this to happen it is necessary for teachers to carefully design and facilitate classroom tasks that promote the principles of authentic learning. Finally, the findings could be a trigger for further research in which the perceptions and views of the students about authentic learning and assessment could be investigated.

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## DESIGN BASED ON ICF THE TRAINING COURSES FOR IN-SERVICE TEACHERS

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### Abstract

The bio-psycho-social model is increasingly becoming the reference for the planning/organization of inclusive interventions, in Europe and in the Italian schools. The ICF has been one of the main topics (l. 107/2015) in the last three-year Italian teacher training plan but it requires to change the traditional way of consider and train on the design skill of teachers.

The work presents the procedures, the technique and the early results of three professional training courses evaluation (years 2017-2019). The courses involved 73 in-service teachers in a southern Italian area and aimed to enhance the design skills of Individualized Education Plan (IEP) based on ICF model. According to the Kirkpatrick Model, the evaluation has been conducted on the teachers' 'learnings' and 'transfer' detected through pre-post test and a document analysis of the PEI-ICF produced.

The study highlighted few linguistic and semantic difficulties (alphanumeric codes, meanings of capacity and performance in the reading of the Functional Profiles) and a better teachers' sensitivity to the environmental component of the functioning. It also outlines some procedures in order to evaluate the training 'results', in terms of learning stability.

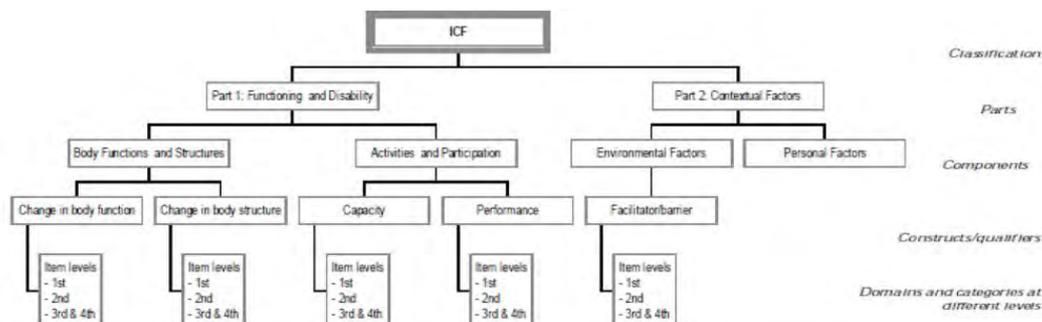
This offers some useful arguments for the construction of a possible trans-national platform - sharing of practices, data-base – about the training of school teachers on ICF bio-psycho-social model.

**Keywords:** *International classification of functioning disability and health, special education, school inclusion, in-service teachers' training.*

### 1. Introduction – ICF: A gap between theory and teachers' training

The 'International Classification of Functioning, Disability and Health' (ICF), as a framework for describing the adult health and disability at both individual and population levels, is inspired by a bio-psycho-social model and is officially endorsed by WHO Member States 2001 (WHO, 2001), then adapted to the children and youth (WHO, 2007). The term 'functioning' refers to the *neutral* interaction between the individual (with a given health condition) and the contextual factors (environmental and personal); it exceeds the traditional concept of 'disability' as 'deficit' in a dynamic relation between four components - Body Functions and Structures, Activities, Participation, Environmental and Personal factors<sup>1</sup> (v. Figure 1), linked to meaningful relationship and quality of life – Hollenweger, 2014; UNESCO, 1994); it offers a 'new paradigm and taxonomy of human functioning and disability, which can be used to guide holistic and interdisciplinary approaches to assessment and intervention' (Simeonsson, 2009, p. 70).

*Figure 1. Structure of ICF (WHO, 2013, p. 18).*



<sup>1</sup>*Participation* as involvement in a life situation and *environmental factors* as 'attitudes or physical-social environment in which people live and lead their existence'.

The ICF framework introduces more specific meanings: 4 levels for qualifying each component (no problem, mild, moderate, complete); alphanumeric codes for summarizing dimensions, chapters, qualifiers<sup>2</sup>; two important distinctions - between *performance* (in the current environment) and *capacity* (in a standard environment) into 'Activity and Participation' and between *barriers* and *facilitators* into 'Environmental factors' component (Chiappetta Cajola et al., 2016).

WHO has elaborated numerous explanatory tools useful for creating a common knowledge base for professionals in the medical, psycho-social and educational area involved as trainers and users (Tokunaga, 2008) - checklist, short list, e-learning platform with tools and quizzes for verify. Despite, the ICF bio-psycho-social model is increasingly becoming the reference for the planning/organization of inclusive interventions, mostly in Europe (Sanches-Ferreira et al., 2018; Moretti et al., 2012), however 'there has been relatively little use of the ICF-CY in educational settings and for eligibility decisions about scarce education provision' (Norwich, 2016, p. 10).

Researches show the ICF usefulness for in-depth description of individual and student's (Klang et al. 2016) needs, the development of individualized programs (Sanches-Ferreira et al., 2015), the wide decision-making, a better comparison of specific cases but also the need to train teachers: a. to read the objectives from a more global perspective and on multiple domains (Sanches-Ferreira et al., 2013); b. to assume environment as an indispensable aspect of intervention (Castro et al., 2014). One of the early experiences of professional development in Italy, aimed at design the IEP through the services, parents and school collaboration (Francescutti et al., 2009), found a satisfactory adherence to the new ICF-based protocols but also difficulties in distinguish roles and responsibilities as well as in assume 'environment' as a category for procedures and materials. Some recent researches on the elaboration of IEP (Meucci et al., 2014) reported teachers' difficulties in using constructs as 'bodily impairments', *capacity* and *participation* and in full understanding distinction between *barriers* and *facilitators*.

As noted by Norwich (2016, p. 10) 'these results suggest (...) that there is a gap between the ICF theory and IEP development practice that raises questions about how the ICF policy innovation has been implemented and adopted' (p. 8) and how teacher training should be enhanced.

## 2. Design and objectives – Training on ICF design skill of teachers

In Italy ICF was introduced as descriptive model and inclusive procedure in 2012 (Minister Decree December 27th 2012; European Commission, 2013) and officially adopted for the development of IEPs in 2016 (D.Lgs. n. 66). After that, Ministry of Education started a sweeping three-year in-service training (l. 107/2015 – 2016-2019) for teachers and support teachers, which integrates contextual and systemic skills - as well as that of the design - within the whole competence framework.

Design competence could be considered a 'hybrid' (Davey, 2013) - ability to effectively connect learning objectives and outcomes and to adapt these to specific needs and context resources - and a 'peculiar' feature (Laurillard, 2012)<sup>3</sup>.

Three training courses were held for in-service teachers - in the south of Italy, years 2017-19 - named 'ICF 1', 'ICF2', 'ICF3' – aimed at enhance the design skill of IEP-IC and profiles on specific contents and skills (Table 1) and profiled on four phases of development (Table 2).

In conjunction with the training courses, a more extensive exploratory survey was carried out, based on a sequential mixed-method design (Creswell, Plano Clark, 2007; Cameron, 2009). This paper presents the outcome of the qualitative analysis regarding the knowledge on ICF.

Table 1. Main contents and learning objectives of IEP-ICF training courses.

Contents:	Learning objectives:
Legislation on inclusion, up to the news of Legislative Decree n. 66/2017	use technical language and procedures of ICF model
Language and articulation of the ICF bio-psycho-social model (WHO, 2007)	read a Functional Profile and a PEI-ICF as documents for school inclusion
Procedures to elaborate Functional Profile and IEP-ICF	develop a PEI-ICF in a group based on Functional Profiles and <i>case studies</i> provided

<sup>2</sup>The letters b, s, d, and e represent the different components and are followed by a numeric code that starts with the chapter number (one digit), followed by the second level (two digits), as well as third and fourth levels (one extra digit each). For example, the following codes indicate a 'mild' problem in each case' - b2.1 Sensory functions and pain; b210.1 Seeing functions; b2102.1 Quality of vision; b21022.1 Contrast sensitivity – WHO, 2013, p. 17.

<sup>3</sup>The 'designer' socially builds a design model, negotiating his/her own individual knowledge (past experiences, even implicit mental habits - Polanyi, 1967) with shared culture (experiences of colleagues and families, school organization procedures etc.) and sharing a controlled vocabulary/glossary, a specific taxonomy/thesaurus (Rossi, Toppano, 2009).

Table 2. Phases of IEP-ICF training courses.

Learning objectives	Training tool	Focus
Phase I - <i>Information</i>		
Knowledge of the ICF model and language (alphanumeric codes, technical terms)	Official documents (WHO, 2007; 2018) Case-studies	4-domain model: body functions / structures; activity and participation; environmental factors; personal factors
Phase II - <i>Deconstruction</i>		
Analysis of traditional IEP models/document 'by axes' (ICD-10)	Traditional IEP document Functional diagnosis and dynamic profile	Difference between IEP by 'axes' and by 'function'
Phase III - <i>Reconstruction</i>		
In a group elaboration of IEP-ICF, based on <i>case studies</i> and document example	Document example of IEP-ICF, Functional Profile, Class programs	Integration between Functional profile, Individual project, IEP-ICF, Class programs
Phase IV - <i>Construction</i>		
Individual elaboration of IEP-ICF, based on personal experience and teaching practice		Document's adaptation to specific cases

### 3. Methods – *Learnings* of training though pre-post test

According to the Kirkpatrick Model (1996), the results of training intervention has been focused on the teachers': *learnings* - increase in knowledge, skills, attitudes in participants - detected through an *ad-hoc* pre-post test on content and knowledge; *transfer* - if participants utilize learnings at work, every-day live etc.<sup>4</sup> – document-comparative analysis (Bowen, 2009) of the PEI-ICF produced during training and adopted at school.

For learnings it has resorted to an 'ad hoc' test, articulated in n. 10 questions - four closed ended item; it is the adaptation of a validated tool (Francescutti et al., 2009) which detects knowledge on the general function of the ICF (Q.1, Q.2), on qualifiers in alphanumeric codes (Q.3, Q.9, Q.10), on performance and capacity in 'Activities and participation' (Q.5, Q.6, Q.8), on 'Environmental factors' (Q.4, Q.7). It was administered at the end of Information (*pre*) and Reconstruction (*post*) phases (see Table 2) and completed anonymously. The teachers - not statistically representative n. 73 - have varied characteristics, regarding seniority average (4,7) and teaching experience in supporting (n. 60 – 82,2%) - see Table 3.

Table 3. Characteristics of participants.

Course	ICF1	ICF2	ICF3	Tot.
<i>n. participant</i>	17	14	42	73
<i>School grade*</i>	I/P	I/P	I/P/M	
<i>Seniority average</i>	3	3,5	7,5	4,7
<i>n. support teachers</i>	13	10	37	60
(%)	(76,50%)	(71,4%)	(88,1%)	(82,2%)

\*I = Preschool; P = Primary School; M = Middle School

#### 3.1. Analysis

Fellows an example of the analysis of the question (Q.5) on relation between *performance* / environmental factors (as *facilitator*) / *capacity* - a detailed presentation of the analysis elsewhere. Analyzing the types of answers, it is possible to attribute discover specific difficulties:

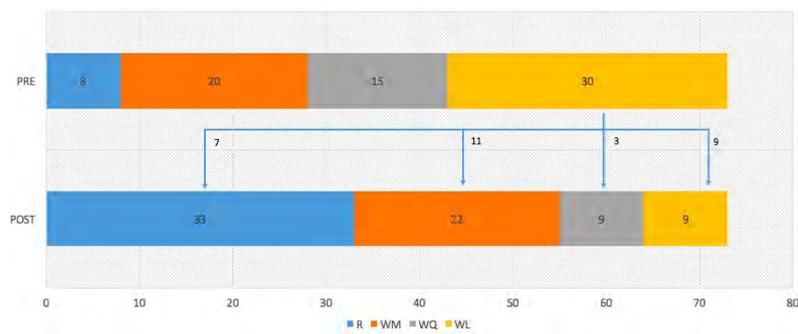
Q.5. Text – '*If a pupil has slight difficulties in reading and is supported by the teacher who merely provides simple help in keeping the attention alive, the qualifiers to be used should be*': .

Table 4. Analysis of the Q5 answers.

Answer	Text	Type of difficulty
1 – right	'1 in <i>performance</i> and 2 in <i>capacity</i> ; support is to be scored as a mild facilitator (+1)'	<i>R = right answer</i>
2 – wrong	'1 in <i>capacity</i> and 2 in <i>performance</i> ; support is to be scored as a mild facilitator (+1)'	<i>Meanings</i> – inversion of meaning between 'performance' and 'capacity' <i>WM = wrong answer for meanings</i>
3 - wrong	'0 in <i>capacity</i> and 1 in <i>performance</i> ; support is to be scored as a mild facilitator (+1)'	<i>Levels</i> – failure in recognizing qualifier levels <i>WQ = wrong answer for qualifiers</i>
4 - wrong	'no support can be scored'	<i>Logic</i> – failure in recognizing link between 'performance' / facilitators / 'capacity' <i>WL = wrong answer for general logic</i>

<sup>4</sup>Other levels are: 1. *Reaction* - how participants react to the training (e.g., satisfaction, feelings); 4. *Results* if there is a positive impact on the participants' organization (Kirkpatrick, 1996).

Figure 2. Distribution pre-post and movement of WL answers.



Based on the Q.5's analysis (Figure 2) - chosen only as an example - it is found that training had a general positive impact on *learning* (Kirkpatrick, 1996) - the pre-post comparison stated that:

- increase in the right answers ( $R_{post} - R_{pre} = +25$ )
- incorrect answers persist on the meaning of the terms ( $WM_{post} - WM_{pre} = +2$ )
- wrong answers on qualifiers decrease ( $WQ_{post} - WQ_{pre} = -7$ )
- the wrong answers about logic decreases ( $WL_{post} - WL_{pre} = -21$ ) - note also the movement of wrong answers on logic ( $WL_{pre} = 30$ ): redistributed ( $R_{post} = 7$ ;  $WM_{post} = 11$ ;  $WQ_{post} = 3$ ) while remaining ( $WL_{post} = 9$ ).

#### 4. Discussion

From a descriptive point of view, the participants understand the difference *barrier - facilitator* starting from the case provided - R, WM,  $WR_{pre}$  -, however at the operational level they manifest two types of difficulties: a. *logical-semantic*: the difference between *capacity* ('standard' environment) and *performance* ('current' environment) and the function performed by environmental factors within this relationship are difficult to grasp - n.  $WL_{pre}$ ; b. *graphic-linguistic*: in coding the environmental factors, participants easily distinguish facilitators (with graphic notation '+') not barriers (graphic notation '-'), confused with the *performance* and *capacity* qualifiers.

It is appropriate to highlight, also, an aspect of the course' structure. In phase I Information (Table 2), environmental factors were presented as 'attitudes or physical-social environment in which people live and lead their existence' (WHO, 2007) that influence the functioning and disabilities from the outside and in the form of facilitating (+) or impeding (-) impact on *performance* and *capacity*. Given that clarity, compared to Q.5, a high number of correct answers in the pre-test would have been expected, at the end of phase I; instead the increase ( $R = +25$ ) occurred in the post-test, at the end of phase III. This suggests that not the knowledge learned in phase I was affected by the increase but the skills exercised in II and III phases (analysis of case studies, IEP-ICF documents example); it leads to reconsider 'learnings' as object of evaluation according to the Kirkpatrick model: in order to encourage understanding of IEP-ICF by teachers, it does not seem useful to separate declarative (phase I) and procedural (phase III) knowledge.

#### 5. Conclusions

The complete analysis - answers to the pre-post test as well as Document analysis in the triangulation phase (Fig. 2) - will be provided elsewhere. However, it is already possible to deduce useful information for the training' organization on IEP-ICF design - some procedures in order to evaluate the training 'results', in terms of *learnings* stability (Kirkpatrick, 1996).

As already noted in previous research, teachers should be supported, in general regarding the ICF model, in integrating environmental factors within students' learning objectives (Castro et al., 2014) and, regarding the elaboration of IEP, in better distinguishing *capacity/participation* and *barriers/facilitators* (Raggi et al., 2013). Our analysis is highlighting a teachers' better sensitivity to the environmental component of the functioning, from the semantic point of view (alphanumeric codes, meanings of *capacity* and *performance* in the reading of the Functional Profiles) but also a logic difficulty regards the relationship *performance / environmental factors* (such as 'barriers' / 'facilitators') / *capacity*. The well known graphic model used in phase I (Tab. 2) - presenting 'Activity and Participation' and 'Environmental factors' (Fig. 1) not so related -, is functional for understanding meanings (declarative knowledge) but not relationships (procedural knowledge). The exemplary PEI-ICF used in phase III Reconstruction (Tab. 2) - which directly describe this relationship seem more useful for the *learnings* of teachers, in terms of knowledge and skills.

From the comparison with other research and teachers' training experiences, similar difficulties emerge although at different levels: this consideration would be enough to wish a possible trans-national platform, about teachers' training on ICF bio-psychosocial model, that shares practices, difficulties and hypotheses of solution and that contributes to the development of common knowledge

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# THE USE OF COMPUTER SIMULATIONS AS AN INTERVENTION TO ADDRESS MISCONCEPTIONS OF GRADE 11 PHYSICAL SCIENCES LEARNERS IN SOUTH AFRICAN TOWNSHIP SCHOOLS

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## Abstract

This study examined the affordances of the use of computer simulations as an intervention to address acid-base misconceptions of grade 11 Physical Sciences learners in South African township schools. Technological pedagogical content knowledge (TPACK) framework was invoked to provide valuable insights into the efficacy of computer simulations as an innovative intervention to address misconceptions associated with acids and bases. The study adopted a mixed-method approach located within a case study design and involved purposively selected grade 11 Physical Sciences learners from two South African township schools. Quantitative data was collected by administering *Acids-Bases Chemistry Achievement Test* developed by Damanhuri, Treagust, Won and Chandrasegaran (2016) as part of a control group-experimental group design. Qualitative data was collected through semi-structured interviews with the participants. Findings revealed significant differences between pre-test and post-test scores as a result of the implementation of virtual laboratory simulations as a remedial intervention. The results showed that the post-test mean score was significantly higher ( $M = 38, SD = 14$ ) than the pre-test mean score ( $M = 26, SD = 10$ ) for the experimental group. There was no significant difference between the post-test mean score ( $M = 32, SD = 13$ ) and the pre-test mean score ( $M = 30, SD = 11$ ) for the control group. Elicited responses indicated that learners perceived the use of virtual laboratory simulations as a useful alternative means to demystify abstract scientific concepts associated with acids and bases as a Physical Sciences key knowledge area. In addition, the learners demonstrated fundamental appreciation of the affordances of virtual laboratory simulations as an innovative intervention to address misconceptions. The use of virtual laboratory simulations was largely perceived to provide meaningful opportunities for self-directed learning. However, the learners indicated that virtual laboratory simulations cannot supersede the experiences provided by traditional science laboratories in view of their critical role in the development of science process skills. Theoretical implications for meaningful development of technology-enhanced learning are discussed.

**Keywords:** *Misconceptions, virtual laboratory simulations, technology-enhanced learning.*

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## 1. Introduction

Inadequate performance of learners in Physical Sciences can partly be attributed to prevailing misconceptions associated with various content knowledge areas (Reddy, 2006). In particular, research has demonstrated that high school learners hold several misconceptions about acids and bases (Artdej, Ratanaroutai, Coll & Thongpanchang, 2010). Lack of essential resources at township schools in South Africa renders meaningful enactment of contemporary pedagogic approaches such as inquiry-based learning a daunting task for teachers. The use of computer simulations can be a viable alternative mechanism for adequately addressing misconceptions associated with various Physical Sciences content knowledge areas. This study explored the efficacy of computer simulations as an intervention to address misconceptions associated with acids and bases with a view to enhance meaningful conceptual understanding.

## 2. Research design and methodology

This study adopted a mixed-method approach as part of a case study involving purposively selected grade 11 Physical Sciences learners from two South African township schools. The mixed-method approach is appropriate as it aims to draw on the strengths and reduce the weaknesses of the quantitative and qualitative methods (Johnson & Onwuegbuzie, 2004). Quantitative data was collected by means of a validated instrument which was administered as part of control group-experimental group design. The validated instrument used for collection of quantitative data is

*Acids-Bases Chemistry Achievement Test* developed by Damanhuri, Treagust, Won and Chandrasegaran (2016). Statistical Package for Social Sciences (SPSS) version 25 was used to analyse quantitative data. Qualitative data was collected through semi-structured interviews with the participants.

### 3. Findings

Quantitative data was collected by means of *Acids-Bases Chemistry Achievement Test (ABCAT)* developed by Damanhuri, Treagust, Won and Chandrasegaran (2016).

#### 3.1. Comparison of pre-test and post-test performances in the ABCAT

Data was analysed to compare learners' understandings of acid-base concepts in the pre-test and post-test using the ABCAT. The control group was not exposed to the use of virtual laboratory simulations while the experimental group was exposed to the use of virtual laboratory simulations. The virtual laboratory simulations adopted for utilisation in this study were sourced from the Physics Education Technology (PhET) Research Project of the University of Colorado in the United States of America. Table 1 below depicts the performance of the control group in relation to the two sections constituting the questionnaire. There was no significant difference between the pre-test and post-test scores for both sections in relation to the control group.

Table 1. Pre-test and post-test scores for the control group ( $N = 27$ ).

Section	Pre-test		Post-test		Effect size (Cohen's $d$ )
	Mean	SD	Mean	SD	
Section A	2.9	1.1	3.1	1.3	0.32
Section B	2.5	0.9	2.8	1.1	0.29
Total	5.4	2.0	5.9	2.4	0.61

\*\* $p < 0.01$  (Note: Section A consists of 10 multiple-choice items; Section B consists of nine two-tier multiple-choice items).

Table 2 below depicts the performance of the experimental group in relation to the two sections constituting the questionnaire. The post-test scores were significantly higher than the pre-test scores for both sections in relation to the experimental group.

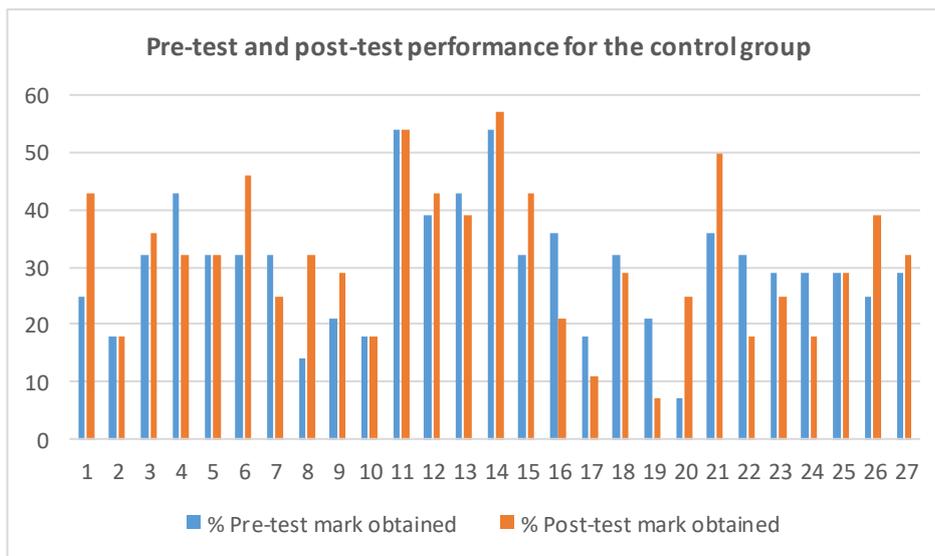
Table 2. Pre-test and post-test scores for the experimental group ( $N = 26$ ).

Section	Pre-test		Post-test		Effect size (Cohen's $d$ )
	Mean	SD	Mean	SD	
Section A	3.1	1.2	4.0	1.5	0.46
Section B	2.1	0.8	3.7	1.4	0.43
Total	5.2	2.0	7.7	2.9	0.89

\*\* $p < 0.01$  (Note: Section A consists of 10 multiple-choice items; Section B consists of nine two-tier multiple-choice items).

It is imperative to point out that the strength of the difference between the pre-test and post-test mean scores was determined by computing the effect size, Cohen's  $d$ . Cohen (1988) defines the effect size as being small when  $d = 0.2$ , medium when  $d = 0.5$  and large when  $d = 0.8$ . The Cohen's  $d$  values suggest that the difference between the means was small for the control group while the difference between the means was large for the experimental group. As illustrated in Figure 1 below, the performance of the control group remained largely steady which suggests that traditional instruction was not effective as an intervention to enhance conceptual understanding by dispelling misconceptions. This observation underscores the need for the adoption of appropriate innovative instructional strategies geared towards the inculcation of cognitive and reflective skills. The redundancy of teacher-centred pedagogical approaches has to be viewed in a serious light with a view to sensitise teachers to adopt and implement learner-centred pedagogical approaches which can essentially be used to foster technology-enhanced learning.

Figure 1. Overall performance of the individual participants in the control group.



As illustrated in Figure 2 below, the performance of the experimental group improved as a result of the implementation of virtual laboratory simulations as an innovative intervention to address learners’ misconceptions. This performance improvement suggests that virtual laboratory simulations can be used as an innovative intervention to enhance understanding of abstract scientific concepts by dispelling misconceptions.

Figure 2. Overall performance of the individual participants in the experimental group.

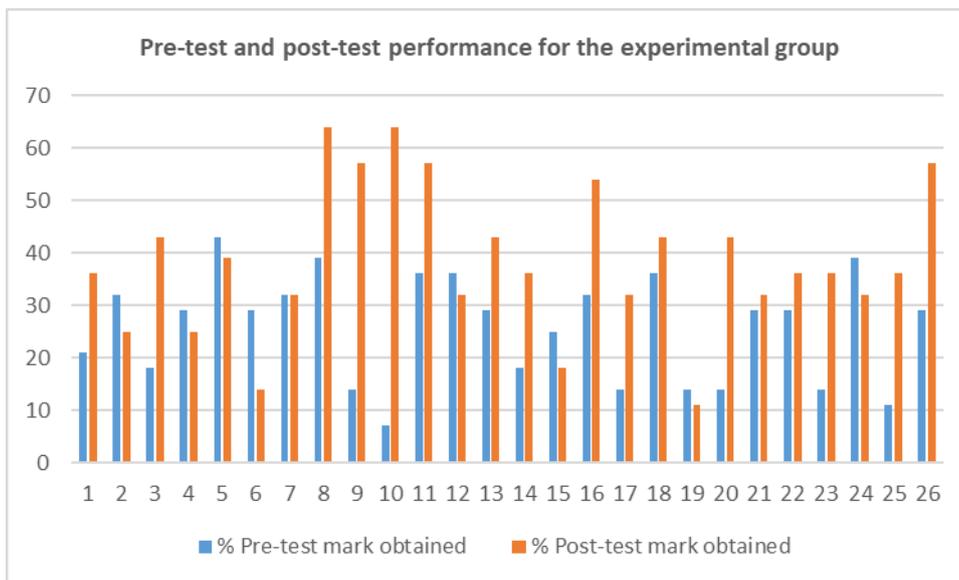


Table 3 below provides the overall post-test and pre-test mean scores for the control group and the experimental group. The results show that the post-test mean score was significantly higher ( $M = 38$ ,  $SD = 14$ ) than the pre-test mean score ( $M = 26$ ,  $SD = 10$ ) for the experimental group. There was no significant difference between the post-test mean score ( $M = 32$ ,  $SD = 13$ ) and the pre-test mean score ( $M = 30$ ,  $SD = 11$ ) for the control group.

Table 3. Overall post-test and pre-test mean scores for the control group and the experimental group.

	Pre-test		Post-test	
	Mean	SD	Mean	SD
Control Group	30	11	32	13
Experimental Group	26	10	38	14



## 5. Conclusion

The use of virtual laboratory simulations as an innovative intervention to address misconceptions appears to be a promising pedagogic approach as evidenced by the findings in this research study. There is a crucial need for teachers to adopt innovative instructional strategies that are responsive to the critical needs of learners. Sustained commitment to such key endeavours can potentially serve to demystify opportunities associated with the advent of the fourth industrial revolution as a game-changer.

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## **BEYOND GAMIFICATION: *CLASSCRAFT* AS AN ENGAGEMENT TOOL IN THE TEACHING OF ENGLISH AS A SECOND LANGUAGE**

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### **Abstract**

The educational use of gamification in class has been widely explored by research. Deterding (2012), Cronk (2012), or Stott and Neustaedter (2013), are only some of the experts on the field that have established in their theorizations a direct relationship between gamification and higher levels of motivation and engagement of students regardless their educational levels. When teaching English as a second language, gamification becomes a key factor to provide dynamism to lessons and to foster the consolidation of the contents taught in class. Moreover, gamification not only promotes the assimilation of vocabulary and grammar (Abrams & Walsh, 2014), but also the improvement of oral and written comprehension and production (Mazur, Rzepka & Araki, 2011; Grouling, Hedge & Schweigert, 2014). The extensive use of new technologies in class nowadays has proved to be very useful for the implementation of the methodology on gamification. One of the tools that have got the attention of educators in recent years is Classcraft, an online virtual game based on digital storytelling in which students and educators can interact with a two-fold purpose: to promote participation in class, and to propose activities for the learning and consolidation of contents. This paper aims at explaining and assessing the use of Classcraft as a successful technology-based collaborative learning tool in a course on English as a Second Language at university level. The following pages are to provide an explanation for the design and implementation of Classcraft in a group of 35 students with a B2 level according to the CEFRL, for a course on English for Specific Purposes (Academic English) at a Spanish University for one semester. Classcraft has been used here to increase motivation and attention in the classroom, to promote students' participation as well as their ability to work in groups, solve challenges, while encouraging the development of students' personal qualities such as persistence, creativity and resilience through extended play.

**Keywords:** *Gamification, classcraft, motivation, ESL, methodology.*

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### **1. Introduction**

Teaching a second language nowadays requires creativity, a great amount of attractive resources, and distinctive approaches that attempt to intermingle old methodologies and new techniques. This created situation in which teaching finds itself under continuous pressure and necessity for innovation is much marked and propelled by the vertiginous technology transformation affecting classrooms everywhere around the world.

As an attempt to solve existent problems of the schooling system, theorisations on the learner and motivation in the classroom attempt to go beyond the traditional classifications of the latter in intrinsic and extrinsic, and its valuation in terms of social and emotional conditionings. By investigating students' engagement in classroom, and by highlighting the obsolescence and ineffectiveness of traditional schooling approaches (Lee & Hammer, 2011), a connection can be observed between the latter mentioned elements and problems of levels cheating, disengagement from school, and with this, higher attrition rates.

The implementation of games and gamification in the educational institutions might offer an answer for the solving of some of these quandaries regarding class planification, management, teaching and learning, considering that games are desirable experiences that set into motion motivational mechanisms which engage learners of English as a second language since they provide dynamism to the lessons and foster through play the consolidation of contents. This formerly alluded widespread use of new technologies has proved to be strongly useful for the implementation and diversification of the methodology of gamification in the classroom.

One of the tools that follow these principles of motivation and engagement in the classroom that has got the attention of educators lately is *Classcraft*, an online virtual game based on digital storytelling where both, learner and educator can interact.

The following pages aim at explaining and assessing the use of *Classcraft* as a successful technology-based collaborative learning tool in a course of English as a Second Language at university level. The first step of this study would be to review literature related to the use of gamification in general, and later in education and ESL teaching. Further sections of this paper are to explain the design and implementation of *Classcraft* in a group of 35 students, taking a course on English for Specific Purposes (promoting the acquisition of Academic English) at a Spanish University for one semester. Considering the framework of six-point scale or levels of proficiency of the Council of Europe, the students of the case study must attain a B2 level.

Subsequently, are to be explored several questions regarding the designing and the distribution of tasks in order to work on the four language skills to acquire the level required to pass the course successfully, but also a concluding analysis on the students' impressions on ESL teaching previously to the implementation of the game and after the process in order to assesses *Classcraft's* usefulness and its degree of success as a methodology for the teaching of a second language.

## **2. Beyond definitions. Uses and applications of gamification in education**

According to (Deterding, Dixon, Khaled & Nacke 2011:1) the term gamification was used for the first time in 2008, although it was popularised only in the second part of the year 2010 due to games' booming expansion in the world of digital media and industry. Their success and merging with real life from that moment was such, that Jesse Schell, a game designer, professor and visionary spoke in 2010 in an interview to CNN about an imminent "gameapocalypse [,] where every second of your life you're playing a game in some way (Sutter and Schell 2010).

This affirmation is definitely not hyperbolic if considering that nowadays gamification is part of the contemporary lifestyle and a rapidly growing dimension of daily reality with applications working in diverse fields such as "business, marketing, corporate management, and wellness and ecology initiatives [...as an attempt to] shape user's behaviour in a desirable direction" (Dicheva, Dichev, Agre and Angelova 2015:2) by praising players with badges, discounts and other rewards for visiting real world shops and "checking-in" to the mobile application" (Lee and Hammer 2011:1). Considering this mechanism therefore, gamification proposes the experimentation with rules, emotions and roles within an ambit characterised by "the use of game design elements in non-game contexts" (Deterding et al., 2011).

Despite its success in other spheres like those previously mentioned, there has been hardly any academic attempt to provide an immediate definition of gamification or an assessment of its possible applications and roles within the schooling system until relatively very recently. The educational use of gamification in class has been explored by scholars of the field such as Deterding (2012), Cronk (2012) or Stott and Neustaedter (2013) among others. Their studies have contributed to construction on the theorisation of a relationship between gamification and a higher level of motivation and engagement of students from different educational levels since it has been demonstrated that "video games and virtual worlds excel at engagement (McGonigal 2011). Furthermore, it has been illustrated how gamification promotes the assimilation of vocabulary and grammar (Abrams & Walsh, 2014), and improves oral and written comprehension and production (Mazur, Rzepka & Araki, 2011; Grouling, Hedge & Schweigert, 2014). Also, it will be interesting to mention that bibliography on the subject affirms that positive side effects of this transmission and learning of contents through playing are numerous. Frequently, games work at different levels since they combine mental and physical exercises, provide immediate feedback, they offer the chance to satisfy curiosity by reasoning and solving problems, and offer a sense of progress and satisfaction associated with the possibility of success when these challenges are overcome. Moreover, games incite to collaboration and communication, while promoting the development of personal qualities such as persistence, creativity and resilience through extended play (McGonigal 2011).

As regarding the disadvantages of this innovative methodology or the pitfalls of gamification, it is worth mentioning not only the adaptation of the game itself to the class's necessities, objectives and contents is tedious, but also its implementation during the different sessions which is time consuming for the teacher. Moreover, to these aspects must be added the fact that using games as resources for teaching might be expensive (Kapp, 2012).

The role of gamification within the educational system and also its success comes from the understanding of the role of game elements designed in relation to the learning behavior of students, the contents and objectives of the subject being taught and class dynamics. In order to explain the theoretical rationale behind gamification when referring to education, "badges" must be perceived as being grades regularised by a system of rewards for desired behaviours, and by the contrary as punishments for

undesirable ones. Just in the same way as games, educational systems use grading systems conditioned by specific criteria that value the achievement of the objectives of the curriculum by accumulating points that result into a final mark. These elements of grading and accumulation of marks can be transformed in formal education into a gamified experience where students might feel motivated while enjoying the learning process. Under this refocus “levelling up” in the game would be the equivalent of passing the subject at the end of every academic year. Starting therefore from the premise that “within the context of games, players voluntarily invest countless hours in developing their problem-solving skills for levelling up and reaching their final goals” (Gee 2008), games can be transformed into valuable learning tools with other multiple and positive side effects as the following pages are going to reveal.

### 3. Classcraft as educational tool

Classcraft is an educational online tool available to educators to use in the classroom. It is designed to act as a complement to regular lessons and its main purpose is to foster active participation, teamwork and engagement. Besides, Classcraft allows educators to gamify a complete course, add only specific gamified activities or entire teaching modules; thus, it was chosen because of its adaptability to educators’ teaching needs and its usefulness to explore the effectiveness of the combination of gamification and video games in an ESL context.

This study pretends to analyse, qualitatively and quantitatively, the degree of motivation before and after the implementation of the game when compared to traditional teaching practices. The sample group for this intervention was composed of 35 undergraduate students (18 to 26 years old) who took a course on Academic English as part of their regular academic load in a Spanish university. This group was chosen because of its accessibility for the researchers and because of a considerable number of its newly arrived students who were not motivated. The intervention took place once a week (60 minutes) for a period of 15 weeks. Spoken and written production and comprehension were part of the daily schedule and proposed activities. The first session was devoted to eliciting Classcraft’s regulations and functionality.

Prior to the experiment, students filled out a survey composed by eleven close-ended questions where were studied student’s general conceptualisation and enthusiasm towards English lessons and different traditional and current teaching methodologies. Besides, they were also asked to pinpoint their observations regarding cooperation and competition in learning, teamwork and working on online assignments. Finally, students had to expose their degree of interest in games and rewards, and videogames as tools to learn English. Similarly, a post-intervention survey composed by thirteen close-ended questions was designed to value the impact of the tool on the students’ acquisition and learning process, insisting upon the degree of stimulation and significance of the content of the activities, the usability of the tool after the experiment and whether or not students would recommend the use of this tool in other English courses.

Results from the survey before the intervention reveal that all students (34,7% strongly agreed and 65,3% agreed) like taking English courses at a university level. A 23% of the students marked that the learning process was better with the use coursebooks and worksheets, while there was a majority of 55% who disagreed. In relation to activities implemented in class, 100% of students strongly agreed on the fact that these should be appealing and motivating for students. Post-intervention results show that almost all students enjoyed the use of Classcraft in class (92 % strongly agreed and 8% agreed), and that they liked the creation of the story that guided them towards the final reward. The design and content of activities was significant and stimulating for 78% of students, and most of them would like to implement Classcraft as part of their regular English lessons (88%). Regarding students’ motivation, an 86% of the respondents claimed to be highly interested in learning English through the use of this tool, and a 14% expressed an average enthusiasm when asked.

This tool has proven to be a very useful and motivating resource to teach English as a second language, however, Classcraft might not be very interactive for students since characters remain static as they go through each quest. Besides, reward mechanics is only useful for instant feedback in class, and it can become very complex for students at the beginning. Even if students are able to design and customize their own character, available options are limited and some powers cannot be customized.

#### 4. Conclusion

This paper presents a case study which attempts to discuss gamification in the English class as a strategy to foster motivation among students. In particular, the educational videogame Classcraft has been selected to encourage students to be active participants and work in teams. The competitive environment of the class has also been useful to improve students' behavior in class. Regarding its usability to teach English, the videogame has been used to work on both written and oral production and comprehension.

Data analysis before and after the intervention shed light on very remarkable effects of the tool in class. It could be claimed that as the literature review points out, gamification has the prospective to intensify students' second language acquisition and to improve their abilities. Besides, as Buckley and Doyle (2014) assert, virtual games influence positively students' outcomes. The paramount benefit of applying gamification in class relies on its capability of improving students' enthusiasm, teamwork, and language acquisition and, as Kapp (2012) rewards and competition also have important effects on students' engagement with classroom resources. All these mentioned aspects could be observed in the conducted surveys.

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# SOUTH AFRICAN GRADE 11 PHYSICAL SCIENCES LEARNERS' PERCEPTIONS OF SCIENTIFIC INQUIRY

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## Abstract

This study explored South African Grade 11 Physical Sciences learners' perceptions of their experiences of scientific inquiry within the context of science classrooms. The study adopted a case study design and involved purposively selected Grade 11 physical sciences learners from two South African township schools. Data was collected by administering a validated *Learner Perceptions of Classroom Inquiry* (LPCI) instrument developed by Dudu and Vhurumuku (2012) with the participants. The study revealed that the learners held mixed conceptions about the nature of scientific inquiry. A substantial number of learners held naïve and incoherent views about the nature of scientific inquiry. The findings have profound implications for meaningful enactment of contemporary pedagogic approaches such as inquiry-based learning in various instructional settings. Theoretical implications for coherent development of scientific literacy within the broader South African educational context are discussed.

**Keywords:** *Scientific inquiry, scientific literacy, inquiry-based learning.*

## 1. Introduction

The teaching and learning of science through inquiry has been a key research focus area which provoked interest in scientific inquiry (Kruit, Oostdam, Van den Berg & Schuitema, 2018). This is evidenced by a vast array of research studies which have been conducted focusing on teaching and learning through inquiry (e.g. Abell & Lederman, 2007; Campbell, Abd-Hamid, & Chapman, 2010; Flick & Lederman, 2004). While the development of learners' knowledge about scientific inquiry remains a key science education curriculum goal, a considerable number of secondary school learners continue to demonstrate naïve understandings about scientific inquiry itself (Abd-El-Khalick & Lederman, 2000a, 2000b). According to Flick and Lederman (2004), scientific inquiry primarily involves doing science and developing learners' understandings of the processes undertaken by scientists in developing scientific knowledge. Scientific inquiry requires learners to formulate their own questions, design and implement their own strategy, draw conclusions based on results from evidence and mathematical and analytical tools to derive a scientific claim (Olson & Loucks-Horsley 2000; National Research Council, 2000). This research study is underpinned by inquiry in school science as the underlying theoretical framework. School science inquiry is largely viewed as similar to the inquiry done by professional scientists as learners also investigate the world, propose ideas and justify explanations based on collected evidence. However, school based inquiry is cognitively and epistemologically different from authentic scientific inquiry (research done by scientists) (Chinn & Malhotra, 2002). School science learning activities are described by Vhurumuku, Holtman, Mikalsen and Kolstoe, (2004) as belonging to a continuum ranging from closed inquiry to open ended inquiry. Hofstein and Lunetta (2004) define scientific inquiry as various ways of studying the natural world, asking questions, proposing ideas, collecting evidence to justify assertions and explanations and communicating results. The significance of this research study stems from the fact that the Curriculum and Assessment Policy Statement for Physical Sciences puts greater emphasis on the development of learners' investigative skills required for inquiry-based learning (Department of Basic Education, 2011). This key strategic imperative hinges to a large degree on meaningful development of scientific inquiry skills.

## 2. Research design and methodology

The study adopted a case study design and involved purposively selected Grade 11 Physical Sciences learners from two South African township schools. Data was collected by administering a validated *Learner Perceptions of Classroom Inquiry* (LPCI) instrument developed by Dudu and Vhurumuku (2012) with the participants. The validated instrument measures learners' perceptions of their experiences of scientific inquiry within the context of science classrooms.

## 3. Findings

Table 1 below provides distribution of learners' responses to the questionnaire items.

*Table 1. Distribution of learners' responses.*

Item	Almost never	Seldom	Some-times	Often	Almost always
<b>A: Learners ask questions/framing research questions in the science classroom</b>					
A1: I formulate questions which can be answered by investigations	25	15	4	3	3
A2: My research questions are used to determine the direction and focus of the lab	20	26	2	1	1
A3: Framing my own research questions is important	2	3	15	17	13
A4: Time is devoted to refining my questions so that they can be answered by investigations	9	10	11	12	8
<b>B: Designing investigations in the science classroom</b>					
B1: I am given step-by-step instructions before they conduct investigations	6	8	13	11	12
B2: I design my own procedures for investigations	15	20	8	4	3
B3: We engage in the critical assessment of the procedures that we employ when we conduct investigations	13	23	9	3	2
B4: We justify the appropriateness of the procedures that are employed when we conduct investigations	10	19	11	6	4
<b>C: Conducting investigations in the science classroom</b>					
C1: I conduct my own procedures of an investigation	12	22	9	3	4
C2: The investigation is conducted by the teacher in front of the class	2	2	6	25	15
C3: I actively participate in investigations as they are conducted	3	18	19	7	3
C4: I have a role as investigations are conducted	2	15	18	8	7
<b>D: Collecting data in the science classroom</b>					
D1: I determine which data to collect	9	18	6	8	9
D2: I take detailed notes during each investigation along with other data I collect	8	12	10	11	9
D3: I understand why the data I am collecting is important	4	10	17	14	5
D4: I decide when data should be collected in an investigation	3	20	16	7	4
<b>E: Drawing conclusions in the science classroom</b>					
E1: I develop my own conclusions for investigations	4	8	18	12	8
E2: I consider a variety of ways of interpreting evidence when making conclusions	7	10	20	8	5
E3: I connect conclusions to scientific knowledge	8	10	11	12	9
E4: I justify my conclusions	6	7	15	14	8

As reflected in Table 1 above, the learners held mixed conceptions about the nature of scientific inquiry. In addition, the learners' conceptions were largely inconsistent with acceptable conceptions of scientific inquiry. The naïve and incoherent views expressed by the learners about the nature of scientific inquiry can partly be attributed to teachers' lack of professional competence and expertise in enacting inquiry-based teaching and learning.

#### 4. Discussion

Meaningful enactment of inquiry-based learning as a contemporary pedagogic approach remains a fundamental challenge to teachers as key agents of educational change within the broader South African context. The views expressed by learners about the nature of scientific inquiry point to extensive exposure to instructional settings providing limited opportunities for learner autonomy when performing scientific investigations. Such instructional settings essentially serve to stifle meaningful development of inquiry skills required to perform plausible scientific investigations. The development of learners' knowledge about scientific inquiry remains a key science education curriculum goal. Yet, a considerable number of secondary school learners continue to demonstrate naïve understandings about scientific inquiry (Abd-El-Khalick & Lederman, 2000a, 2000b). There is a need for sustainable teacher professional development interventions which are specifically geared towards the enhancement of scientific investigation skills. The importance of nature of science and scientific inquiry as essential components of scientific literacy has been emphasized by several researchers (e.g. Lederman; Lederman & Antink, 2013; Roberts, 2007). This key consideration underscores the need for the development of scientific investigation skills with a view to foster meaningful enhancement of human capital development in its broadest sense.

#### 5. Conclusion

Meaningful enactment of inquiry-based teaching and learning remains a pervasive fundamental challenge for teachers within the broader South African context. The promotion of scientific inquiry as an essential tenet in science education hinges to a large degree on the inculcation of scientific investigation skills. Progressive realization of the inculcation of scientific investigation skills on a broader scale would serve to pave the way for meaningful development of scientific literacy as a science education key curriculum goal.

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## PROSPECTIVE TEACHERS' COPING WITH MATHEMATICAL ALGORITHMS IN A FLIPPED CLASS SETTING

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### Abstract

The implementation of the flipped-class learning method has been increasing during the last several years in the education system. The underlying idea of the flipped-class method is that learning materials that students can study and manage by themselves are handed to their responsibility. This allows teachers to focus the classroom meetings on educational activities such as discussions on difficulties the students tackled during their independent learning, and to adjust the teaching to students' personal needs. As a result, students develop self-regulated learning skills and deepen their knowledge of the subject matter.

The aim of the current research was to explore the effects of flipped-class learning on changes in prospective teachers' perceived sense of mathematical self-efficacy as a result of their independent coping with mathematical patterns and algorithms as part of a one-semester course. Successes and failures in performing mathematical tasks affect learners' perceived mathematical self-efficacy, which refers to the individuals' perception of their ability to cope successfully with mathematical tasks.

Once in two weeks, a lesson about mathematical patterns of various types (e.g., arithmetic series) or mathematical algorithms (for example, Euclid's algorithm) was uploaded to the course site. The prospective teachers were asked to read the learning materials, pose relevant mathematical problems and answer them. The face-to-face class meetings were dedicated to discussing students' difficulties, implementation of the learned materials through engaging the problems that were posed by the students and providing personalized assistance to students that encountered difficulties during their self-learning. The prospective teachers who attended the course were in their third year (out of four) of studies towards B.Ed. degree and were specializing in teaching elementary school mathematics. As it was their first experience in learning in this format, we were interested in exploring emotional aspects of their engagement with the course contents, and their sense of self-efficacy.

The research tools included transcriptions of class discussions and prospective teachers' reflective journals in which they documented their experience and reflected upon their feelings and the insights they gained as a result of experiencing learning mathematical contents in a flipped class setting. Using content analysis methods, we looked for evidence of the impact of flipped class learning on the prospective teachers' perceived mathematical self-efficacy.

**Keywords:** *Flipped class, self-efficacy, prospective teachers, patterns, algorithms.*

### 1. Introduction

The implementation of the flipped-class learning model has been increasing during the last several years in the education system in general and in mathematics education in particular. The underlying idea of the flipped-class method is that the topics students can learn and handle by themselves are transferred to their responsibility. This frees the classroom meetings to other educational activities, and they are utilized to discussions on difficulties the students tackled during their self-learning, and to individual assistance to the students in need (Love, Hodge, Grandgenett, & Swift, 2014).

As part of the prospective mathematics teachers (PMTs) training to become mathematics teachers, it is important to expose them to a variety of teaching/learning methods. We believe that self-experience raises the odds that the PMTs will consider adopting such methods in their future classes. These odds are also influenced by PMT's self-efficacy (Bandura, 1982). Self-efficacy refers to the manner in which a person perceives his ability to complete a particular task.

The flipped-class method was implemented in a third-year course in which the PMTs were engaged with mathematical patterns and algorithms. These PMTs were specializing in teaching

elementary school mathematics. As it was their first experience in learning in this format, we decided to explore affective aspects of this engagement focusing on aspects relating to self-efficacy. In this study, we examined a variety of aspects of students' experience in learning mathematics in the flipped class, and in this paper, we will address the issue of mathematical self-efficacy.

## **2. Brief theoretical background**

### **2.1. Flipped-class learning method**

The idea behind the flipped-class method is that the learning materials are given to the students for self-learning at home, while the lessons in the class are devoted to discussions, to implementation of the learning materials and to the provision of assistance for the students in need. Thus, the responsibility of learning is now passed to the learners. They can set their own learning pace and monitor their learning process. Teachers are encouraged to promote collaborations among learners, develop their independent learner skills, help them understand the issues they have dealt with independently, and challenge them with exploration tasks. It was found that this learning method has the potential to motivate learners to take an active part in their learning process (Love, Hodge, Grandgenett & Swift, 2014). As regards to the learning of mathematics, a review of the research literature conducted by Lai and Hwang (2016) shows that learning using the flipped-class method enables active learning, develops the learner's ability to set educational goals, fosters high-order mathematical thinking and contributes to the strengthening of the students' mathematical self-efficacy. However, students with low levels of independent learning skills do not benefit from flipped class learning and find it difficult to integrate into classes.

### **2.2. A sense of mathematical self-efficacy**

Bandura (1977a, 1997) defined perceived self-efficacy as personal judgments of one's capabilities to plan, arrange and carry out actions to achieve designated goals. The level of self-efficacy refers to its dependence on the difficulty of the performed task, such as trying to solve a mathematically complex problem; to the transferability of self-efficacy beliefs across activities, such as from algebra to geometry; strength of perceived efficacy is measured by the amount of one's certainty about performing a given task.

Perceived mathematical self-efficacy refers to the way a person perceives his ability to complete a particular task (Bandura, 1982). Experiencing successes have been found to reinforce perceived self-efficacy while experiencing failures weaken it and make it impossible to cope with similar tasks (Bandura, 1994). Bandura (ibid) referred to the main sources of influence of one's perceived self-efficacy saying that they include (1) mastery experiences; (2) seeing people similar to oneself manage task demands successfully; (3) social persuasion that one has the capabilities to succeed in given activities; and (4) inferences from somatic and emotional states indicative of personal strengths and vulnerabilities. Perceived mathematical self-efficacy refers to an individual's perception of his ability to cope successfully with a mathematical task. Perceived mathematical self-efficacy has a bigger impact on mathematical achievements than to variables such as mathematical anxiety, socio-economical background, and gender (OECD, 2013).

## **3. The study**

### **3.1. The study participants**

26 students in their third year of B.Ed. studies at a College of Education located in the northern part of our country, specializing in teaching mathematics at elementary school participated in the study. Students studied in a flipped class format as part of a semester course dealing with various mathematical patterns (for example, arithmetic sequence) and mathematical algorithms (for example, Euclid's algorithm). For all students, this was their first experience in learning mathematical content using the flipped class method.

### **3.2. The context of the study**

The students attended a one-semester course dealing with mathematical patterns and algorithms, in which they experienced flipped-class learning. Once every two weeks, a new chapter was uploaded to the course website. To help students monitor their self-learning, they were instructed to pose questions relating to the learned materials and answer them. Every third week a plenary session was held for responding and discussing students' difficulties and the challenges they encountered during their individual work. As part of the classroom discussions, the students were given the opportunity to receive feedback from the lecturer on the questions they posed and their solutions, and to be exposed to questions posed by their classmates, in order to deepen insights regarding the contribution of posing questions as a means of managing independent learning. In the final examination, students were asked to analyze and

apply unfamiliar patterns and algorithms.

### 3.3. The aim of the study and derived question

The aim of the study was to examine cognitive as well as emotional aspects, relating to the students' experience in learning patterns and mathematical algorithms in the format of the flipped class, as perceived by them.

Due to space limitations, we will address one of the research questions:

How do prospective teachers perceive the effect of studying mathematics in a format of flipped class learning on their sense of mathematical self-efficacy?

### 3.4. Tools for data collection and analysis

The data gathered included a reflective journal in which the students documented their learning process. The journal also included the questions they posed and the answers to these questions. The use of a reflective journal as part of teacher training has advantages both in terms of strengthening the connection between the lecturer and the students and in terms of empowering the learning process. In addition, the research data included recordings of class meetings and the students' answers to the final test questions.

The information obtained from the reflective journals and the transcripts of the class sessions was analyzed using content analysis (Neuendorf, 2002). The results of the content analysis were also examined in relation to the grades that were obtained in the final test of the course.

## 4. Results and discussion

### 4.1. Prospective teachers' perceptions as regards to the effect of learning in a format of flipped class with relation to their sense of mathematical self-efficacy

In the first two weeks of the course, most students (22 out of 26) expressed reservations about the flipped class method and wrote in their reflective journals: "I don't have the tools to do a lecturer job. In the classroom, teachers teach math and explain in real time the things I don't understand. That's how I am able to understand". "Not every new method should be tried on us. This expectation that we will only be able to understand the various stages of these algorithms and formulas is ambitious and a little exaggerated in my opinion".

"The [flipped class] method does not contribute to understanding these issues, nor is it clear how posing questions will help me understand. We are dealing here with mathematical patterns and not with stories".

By the mid-semester, the students' reactions were changed. In their reflective journals, they wrote: "At first, I felt frustrated in lessons because I felt the questions I posed were common and trivial, and I didn't know if I really **understood the algorithm**. I posed questions because those were the guidelines. I didn't even see the connection between the questions and my learning".

"When I heard the questions posed by my classmates, I realized that if they were able to come with such results, so could I. I also **learned a lot** from your [the lecturer] analysis of the relationship between the questions and the stages of the algorithm".

*"Despite the difficulties I encountered, I didn't give up, which gave me a good feeling that I could learn on my own.* The truth is, that is was our first experience with this way of learning and it took us time to adjust to it. I know I was really upset at first and even angry, but *with the first success came the joy, which gave me the motivation to continue*".

In the final reflection, students wrote:

"I saw that my questions were really good, so I started attending the class discussions. *It greatly enhanced my confidence*, because I realized that **I was able to succeed** in this learning method".

"I think that only after you get positive feedback on what you do, only then do you get that urge to keep going, and that is how your *self-confidence develops*".

"It's kind of weird because I've never thought that *self-confidence strengthens* when you compare your achievements to others, even though you are actually **learning** from them".

Not all students experienced the feelings described above. Low achievers wrote reflections like: "I need the lecturer to explain to me. Can't study alone"; "flipped classroom learning doesn't suit me. point." "I gave up and did not come ready for class discussions". "I couldn't think of any questions to help me understand the algorithms, and it just made me helpless". "Not every teaching method is suitable for everyone ... I saw that others were successful, and I couldn't understand, and it was really frustrating not to understand this course. The fact that others succeeded, and I did not, made me feel even worse".

Analysis of the students' reflections revealed references to three main aspects: feelings (marked by an underline), knowledge (marked by bold letters), and sense of mathematical self-efficacy (SMSE)

(marked by italic style).

At the beginning of the process, there was a sense of general frustration, expressed by most students, stemming from their difficulty to pose significant questions that their answers will help them understand the algorithm at hand., which would help them understand the algorithm at hand. The classroom discussions in which successful experiences were presented and discussed led to a change in the average and high achievers that if their peers are capable, then they also can. Moreover, in the classroom discussions, a standard was set for the posed questions, which increased as a result of covert competition created among the students to show that they can do better than their peers. These results are in line with Zimmerman (2000) who found a strong connection between self-efficacy and motivation to learn.

The number of active participants in the discussions increased from week to week and the discussions dealt with topics that they work out on became more and more interesting and meaningful. Viewing peers' outcomes motivated the students to invest efforts and pose questions that would help them understand the algorithms. These findings are in line with Bandura (1994), who found that successes were found to reinforce students' sense of mathematical self-ability while failures result in a sense of frustration and helplessness, and a decline in mathematical self-ability to avoid coping with course content.

The flipped class method consists of independent learning and classroom sessions. Observing the obtained results reveal that both components affected the students' mathematical self-efficacy. However, for the low achievers, there should be additional actions to be taken under consideration in order to help them develop independent learning skills so that they will be able to experience successes while learning in a flipped class method. Bandura (1994) referred to the main sources of influence of one's perceived self-efficacy saying that they include (1) mastery experiences; (2) seeing people similar to oneself manage task demands successfully; (3) social persuasion that one has the capabilities to succeed in given activities; and (4) inferences from somatic and emotional states indicative of personal strengths and vulnerabilities. If we look at the process the students had gone through during the course, we can find references to the four sources influencing one's perceived self-efficacy. At the beginning of the course, the students were asked to cope with the understanding of mathematical algorithms in a setting that was new to them. The difficulties they experienced aroused in them negative feelings of frustration and experiences of unsuccessfulness which in turn decreased their mathematical self-efficacy. The class discussions exposed them to the successes of some of their peers, which inspired them to invest more effort, and try to be equally and even more successful. The classroom discussions and the encouragement of the classroom teacher provided them also with social recognition that they can succeed. However, this process was found to be effective for the average and high achiever students but did not work well for the low achiever students. As Bandura (1994) said that it is not the emotional reactions that are important rather how it is perceived and interpreted. People who have a high sense of efficacy are likely to view their state of affective arousal as an energizing facilitator of performance, whereas those who are affected by self-doubts regard their arousal as a debilitator. Since low achievers have already low mathematical self-efficacy as a result of prior low achievements, adding to the challenge of new learning methods in addition to the difficulty of coping with a mathematical task did not contribute to improving their perceived mathematical self-efficacy.

In light of the positive correlation between mathematics achievements and self-efficacy (OECD, 2013), the experience described above seems to have reinforced this feeling among those who had a high sense of mathematical self-efficacy in the first place, while the experience was weakened by others. Therefore, the research findings raise questions about how to support the learning of low-achievement students in mathematics required to study in the flipped classroom.

## **5. Concluding remarks**

The incorporation of new teaching methods into the educational system is important and valuable. However, careful consideration should be given to the question of whether a method is suitable for all learners or should it be modified to fit different populations of learners as emerging from the present study. This is especially relevant when planning the new student generations for the next decade. The OECD (2019) released a document in which several principles to shape future learning are recommended. One of these principles refers to personalization which means customizing content, products, and services to the specific needs and desires of a student to increase the added value she/he receives during the learning process. This trend is being intensified due to the ability of technology to identify and meet the specific needs of each individual through a growing range of products and services. The strengths of each method should be examined as well as its weaknesses, investing plenty of effort in looking for ways to minimize its weaknesses.

This research should be followed by studies that will address the following issues:

- What is the unique contribution of each of the flipped class method components to the cultivation of high-order mathematical thinking?
- What is the connection between the initial level of mathematical self-efficacy and the rise/fall of that feeling in a flipped classroom learning setting?
- How can we support the learning of low-achieving math students required to study in the flipped classroom?

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# EXPLORING SOUTH AFRICAN IN-SERVICE TEACHERS' BASELINE KNOWLEDGE OF MATHEMATICS: A CASE OF FURTHER EDUCATION AND TRAINING PHASE

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## Abstract

The advent of the fourth industrial revolution provides opportunities for teachers as key agents of educational change to fully embrace digital transformation in its broadest sense with a view to foster pedagogic innovation. In view of this key strategic imperative, this study explored South African in-service teachers' baseline knowledge of mathematics in the Further Education and Training (FET) Phase. In terms of the structure of the Curriculum and Assessment Policy Statement (CAPS), the FET Phase is comprised of Grades 10, 11 and 12. A mathematics professional development intervention involving 30 teachers was implemented during which a diagnostic assessment test was administered as a pre-test and post-test to evaluate teachers' baseline knowledge of FET mathematics. The results of the diagnostic assessment test revealed pervasive knowledge gaps associated with various topics in FET mathematics. In addition, there was no meaningful correlation between teacher professional experience and knowledge of FET mathematics. While the pre-test results painted a gloomy picture about teachers' baseline knowledge of FET mathematics, the post-test results revealed a marginal improvement with the overall performance of the teachers remaining below 65%. The inadequate learner performance in mathematics in South Africa can partly be attributed to pervasive knowledge gaps exhibited by teachers in various topics. There is a critical need for sustainable teacher professional development interventions to strengthen teachers' content knowledge and pedagogical content knowledge in mathematics as a key knowledge domain. Implications for sustainable teacher professional development and meaningful curriculum reform are discussed.

**Keywords:** *Teacher professional development, curriculum reform, pedagogic innovation.*

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## 1. Introduction

The enhancement of teachers' content knowledge and pedagogical content knowledge remains a key strategic imperative within the broader South African educational context. South Africa faces the imperative to provide a globally competitive curriculum that is responsive to the acceleration of socio-economic development. Meaningful curriculum reforms ought to be underpinned by a coherent implementation of appropriate strategic interventions which cater for the critical needs of both teachers and learners. The cultivation of mathematical skills is central to meaningful enhancement of human capital development. The generation of optimal levels of economic growth requires higher-order mathematical skills. As agents of educational change, teachers are expected to play a pivotal role towards the progressive realization of this noble goal. However, research has demonstrated that while teachers are competent solvers of school mathematics problems, they are often unable to analyse and interpret learners' errors for diagnostic purposes (Ndlovu, Amin & Samuel, 2017). This reality calls for provision of sustainable professional development opportunities aimed at the enhancement of teachers' subject matter knowledge. The Grade 12 Moderators' Report compiled by the South African Department of Basic Education in 2014 calls for a nuanced examination of the enablers or inhibitors of teaching and learning of mathematics at secondary school level in particular.

## 2. Research design and methodology

A mathematics professional development intervention involving 30 teachers was implemented during which a diagnostic assessment test was administered as a pre-test and post-test to evaluate teachers' baseline knowledge of FET mathematics. This intervention formed an integral part of continuous professional development efforts aimed at holistic enhancement of in-service teachers' content knowledge and pedagogical content knowledge coordinated by the provincial Department of Basic Education in the Limpopo Province of South Africa.

## 3. Findings

Table 1 below provides the demographic profile of the participants. A considerable number of the participants possessed a College Diploma as a teaching qualification while others possessed Advanced Certificate in Education and University Degree as teaching qualifications.

*Table 1. Demographic profile of the participants.*

Age		Teaching Experience		Qualifications	
< 30 years	43%	< 5 years	15	College Diploma	17
30-39 years	14%	5-10 years	5	Advanced Certificate in Education	6
40-49 years	43%	> 10 years	10	University Degree	7

The frequencies indicating participants' confidence rating of various FET mathematics topics are depicted in Table 2 below. The distribution of frequencies demonstrated that the professional confidence of the teachers in various FET mathematics topics was not firmly established.

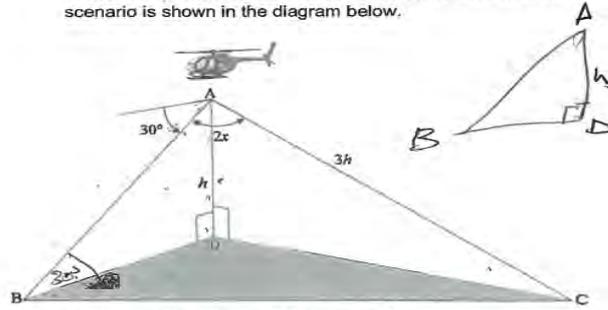
*Table 2. Frequencies indicating participants' confidence rating of various FET mathematics topics.*

Topic	Confidence rating				
	Very confident	Just confident	Slightly confident	Not confident	Neutral
Arithmetic sequence and series	9	4	4		13
Geometric sequence and series	9	4			17
Real numbers	9		4		17
Algebraic expressions and equations	9	8			13
Roots, exponents and surds	13				17
Logarithms, remainder and factor theorem	13				17
Triangle geometry	17				13
Volume and area	9	4		4	13
Circle geometry	4	9			17
Similarity of triangles	5	4	4		17
Trigonometric ratios	4	9	4		13
Trigonometric identities	5	4	4		17
Compound angles	4	9			17
2D & 3D problems	9	12	9		
Univariate numerical data	4	9	13	4	
Bivariate data and regression	9	4			17

An extract below captures fundamental difficulties encountered by the participants with regard to the application of trigonometric ratios.

Figure 1.

1. A pilot is flying in a helicopter. At point A, which is  $h$  metres directly above point D on the ground, he notices a strange object at point B. The pilot determines that the angle of depression from A to B is  $30^\circ$ . He also determines that the control room at point C is  $3h$  metres from A and  $\angle BAC = 2x$ . Points B, C and D are in the same horizontal plane. This scenario is shown in the diagram below.



- 1.1 Determine the distance BD in terms of  $h$ . (2)

$\tan 2x = \frac{\sin 2x}{\cos 2x}$
$= \frac{x}{h}$
$= \frac{h}{3h}$

An extract below depicts difficulties encountered in finding the general solution of trigonometric equations.

Figure 2.

3. Find the general solution:  $2\sec^2 x - 11 \tan x + 13 = 0$  (5)

$2\left(\frac{1}{\cos^2 x}\right)^2$
$2\left(\frac{1}{\cos^2 x}\right)^2 - 11 \frac{\sin x}{\cos x} + 13 = 0$
$2\left(\frac{2}{\cos^2 x}\right) - 11 \frac{\sin x}{\cos x} + 13 = 0$

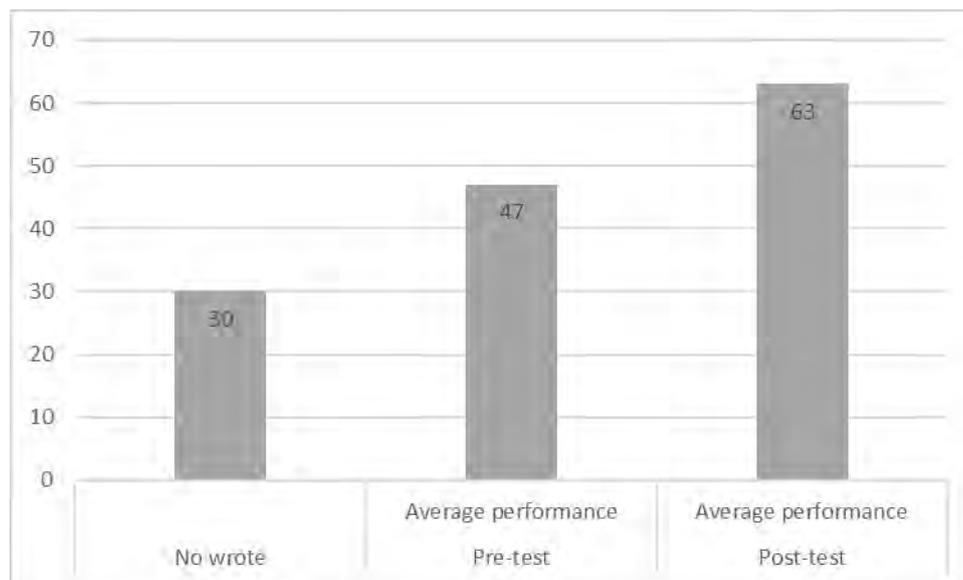
Table 3 below provides participants' perceptions about the professional development intervention. While the participants demonstrated fundamental appreciation of the efficacy of the professional development intervention, they further provided contextually appropriate recommendations on the improvement of the intervention itself.

Table 3. Participants' perceptions about the professional development intervention.

<i>I have achieved my goal as all my expectations were met</i>
<i>The overall delivery of the workshop was excellent</i>
<i>We need a workshop like this in future to address issues like optimization in Mathematics</i>
<i>The workshop developed me in terms of subject content</i>
<i>We need many workshops of this nature</i>
<i>We should be divided into respective groups according to grades during the workshop</i>
<i>The duration of the workshop must be reconsidered</i>
<i>More time is needed to focus on key areas of concern during the workshop</i>

The pre-test and post-test average performances are illustrated in Figure 3 below. While the average performance improved as a result of the professional development intervention implemented, the participants still demonstrated pervasive knowledge gaps which required additional time to address. This observation is consistent with the sentiments expressed by the participants with regard to the recommended prolonged duration of the professional development intervention. This implies that the affordances provided by strategic professional development interventions of this nature ought to be harnessed with a view to enhance the quality of education.

Figure 3. Pre-test and post-test average performances.



#### 4. Discussion

Assessment of in-service teachers' baseline knowledge of mathematics revealed the prevalence of pervasive knowledge gaps associated with various topics in FET mathematics. In addition, there was no meaningful correlation between teacher professional experience and knowledge of FET mathematics. While the pre-test results painted a gloomy picture about teachers' baseline knowledge of FET mathematics, the post-test results revealed a marginal improvement with the overall performance of the teachers remaining below 65%. The inadequate learner performance in mathematics in South Africa can partly be attributed to pervasive knowledge gaps exhibited by teachers in various topics. There is a critical need for sustainable teacher professional development interventions to strengthen teachers' content knowledge and pedagogical content knowledge in mathematics as a key knowledge domain. Several researchers argue that mathematical knowledge for teaching is crucial for successful teaching, realization of learning outcomes and learner attainment (e.g. McAuliffe, 2013; Bansilal, Brijlall & Mkhwanazi, 2014; Pournara, Hodgen, Adler & Pillay, 2015; Livy, Vale & Herbert, 2016; Aksu & Umit, 2016; Pournara, 2016). The key conundrum associated with this state of affairs is that there is a paucity of

substantial research on what this knowledge for teaching entails and how it is acquired during the learning to teach phase particularly in South Africa.

The establishment of sustainable communities of practice may serve to encourage teachers to work collaboratively for purposes of sharing expertise. In support of this notion, Pournara (2016) posits that engaging with peers' mathematical contributions serves to deepen content knowledge. The need to implore teachers to be reflective practitioners is paramount. This implies that problematic aspects associated with mathematics content have to be identified and adequately addressed as part of continuous professional development interventions. Adler (2010) argues that some of the aspects requiring attention include mathematics for teaching, task design and attention to mathematical content, object and processes. These critical considerations ought to underpin far-reaching curriculum reforms which are essentially responsive to the critical needs of teachers and learners alike.

## 5. Conclusion

The prevalence of pervasive knowledge gaps associated with various FET mathematics exhibited by in-service teachers remains a key area of concern within the broader South African context. There is a critical need to put in place sustainable appropriate professional development interventions to enhance teachers' subject matter knowledge.

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## DOES SELF-ASSESSMENT OF CREATIVITY AND ITS DEVELOPMENT SUPPORT THE DEVELOPMENT OF CREATIVITY?

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### Abstract

Creativity is considered one of the most vital capabilities of the 21st century. Therefore, it is assumed that one of the fundamental roles of the education system is to nurture all learners' creativity. However, in general, the education system does not give it proper attention. This reality is the result of a range of circumstances, among others, the multifaceted nature of creativity, its variety of perspectives and definitions, and insufficient familiarity of teachers with the breadth of aspects associated with the nurture of creativity and its assessment. Therefore, in order to design a learning environment aimed at nurturing high school students' creativity, we have incorporated several principles inherent in the various perspectives related to the essence of creativity, and to make it easier for teachers to assess the development of their students' creativity, we utilized a designated psychometric model. The learning environment was in the field of mathematics, where students dealt with problem-posing activities as part of inquiry tasks they were engaged with. The problems that students produced constituted the "product" to be assessed in terms of creativity. Relating to the psychometric model, scores of two types can be produced: a personal score, which over time reflects each student's individual progress, and a relative score, reflecting the student's progress relative to his or her peers. Based on accumulated graphical displays of both individual and relative scores, teachers can get an idea about the strengths and weaknesses of both each student and the entire class, thus make pedagogical decisions regarding the emphases they should put, in order to nurture students' creativity. Through a process of self-assessment students can follow their own gradual change, both in relation to themselves and their colleagues.

In this paper, we present the results of a study that followed the experience of students who took part in the described learning environment. In particular, we focused on two students' perceptions of the benefits and limitations of self-assessment of their creativity and its development, using the designated model. The results indicate that self-assessment of creativity using relative scores can be beneficial for students who possess an optimal mixture of certain personal resources (e.g. motivation to study) from the outset. Such students are able to exploit this process for further developing their creativity. However, students who lack a certain degree of a threshold for some personal resources might be harmed by the process and their creativity might be suppressed.

**Keywords:** *Creativity, self-assessment, problem-posing.*

### 1. Introduction

In the 21<sup>st</sup> century, creativity is recognized as a key driver of social and economic changes as well as one of the most valuable personal skills. One might, therefore, expect that the education system would invest efforts in attempts to nurture students' creativity. However, although teachers believe that creativity can and should be nurtured at school (e.g. Shriki and Lavy, 2012), the education system scarcely encourages it. Consequently, most students do not have the opportunity to experience creative thinking and learning. This reality is a consequence of a combination of several circumstances, among them (Shriki, 2013): (i) The heavy load of teaching, and the external pressure on teachers to cover the mandatory curriculum and succeed in standardized tests leave no time for teachers to focus on nurturing skills that students are not tested on (such as creativity); (ii) Teachers were not trained to nurture their own creativity, let alone the creativity of their students, thus they do not possess the adequate pedagogy and available materials; (iii) Many teachers erroneously believe that expressions of creativity are limited to the various fields of art, and attribute creativity to giftedness, and therefore avoid implementing approaches that foster the creativity of *all* students in every discipline; (iv) There is a shortage of tools

aimed at assessing students' creativity and its continuing progress. Thus, teachers find it difficult to implement a systematic approach to develop students' creativity and observe improvement. Such monitoring could provide teachers with feedback that would help them to decide on suitable courses of action.

The learning environment we have developed, as described below, was designed to address these five factors, with the purpose of helping teachers develop learning environments aimed at nurturing the creativity of their students as part of the routine teaching of the discipline, as well as assessing its development. The learning environment that is illustrated in Section 3 was adapted to teachers who teach mathematics in secondary school. In this paper, we will briefly describe the characteristics of the learning environment and focus on issues related to assessing mathematical creativity.

## 2. Literature background

In today's era, creativity and the capability to link objects that are seemingly unrelated are considered among the most important skills for success. For over a century, scholars have been engaged in the diverse face of creativity, its characteristics, origins, and development. These studies yielded a variety of understandings regarding the nature of creativity, its origins, manifestation, and assessment (Shriki, 2010; 2013). Review of the empirical literature in the field of creativity, in general, and mathematical creativity, in particular, reveals more than one hundred contemporary definitions of creativity as well as numerous interpretations of its essence and meaning (Mann, 2006). Due to the complexity of this field, a considerable part of these definitions and interpretations are rather vague and to date, none of the definitions has been commonly accepted. Moreover, throughout the years, creativity has been investigated from at least four perspectives: the creative process, the creative person, the creative environment and the creative product; as well as through a variety of approaches to the assessment of creativity, among them a psychometric approach (e.g. Torrance, 1974), a cognitive approach (e.g. Sternberg & Davidson, 2005), and a personal-social approach (e.g. Sternberg & Lubart, 1996). The multitude of perspectives and approaches has led, among other things, to the question of whether creativity is innate or whether it can be nurtured through appropriate education. Today, many researchers concur that creativity can be nurtured by means of suitable purposeful instruction, nevertheless, there is still no consensus as to the way it can be done (Henry, 2009).

As mentioned in the Introduction section, in most schools students do not have the opportunity to experience creative thinking and learning due to systemic aspects and teachers' perceptions and beliefs about creativity and its nurture. To address some of these constraints, we designed a learning environment that would fit into the existing set of school lessons, while developing the didactic approach and the tool for assessing creativity. In the next section, we describe the learning environment and its underlying rationale and demonstrate its implementation in the context of mathematics lessons.

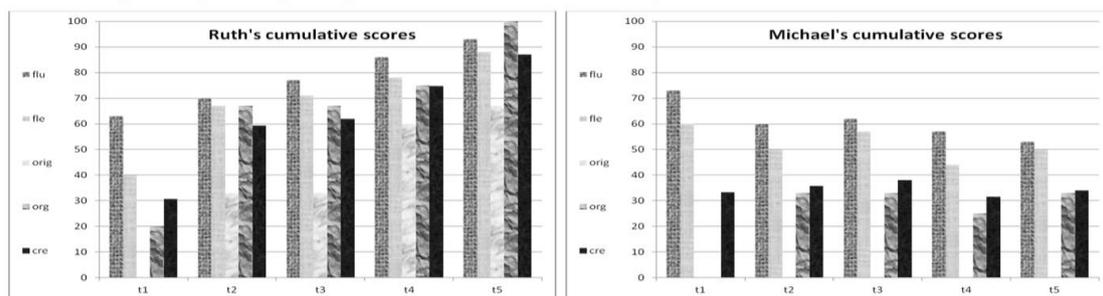
## 3. The learning environment

The following is the **rationale** underlying the design of the learning environment, and its adaptation to the case of mathematics teaching: (i) Among the four common perspectives for studying creativity, we chose to focus on the *product*, as it is usually easier for teachers to teach how to produce a particular product and evaluate it than to delve into issues related to processes and personality; (ii) In line with Silver (1997), we recognize the centrality of problem posing and problem solving processes in mathematics within the creative act. In particular, in the case of problem posing, Silver maintains that although mathematicians may solve problems that have been posed by others, they normally formulate their own problems based on personal experiences and interests. Therefore, the problems that are posed by students constitute "the product". It should be noted that problem-posing tasks are easy to implement and can be incorporated naturally into any math class as part of the learning process. The problem-posing approach we implemented is based on Brown and Walters' (1990) strategy, 'What-If-Not?' (abbr. WIN). This strategy suggests that modifying the components of a given problem can yield new and stimulating problems that ultimately may result in some interesting inquiries that may lead to the uncovering of mathematic regularities; (iii) Based on our assumption that it would be easier for teachers to assess products through psychometric measures (e.g., grades), as they typically do, the assessment tool is based on Torrance's psychometric approach to measuring creativity (Torrance, 1974). Torrance's methodology uses four indices: fluency, flexibility, originality, and organization, where fluency is measured by the number of different problems posed; flexibility is measured by the number of different categories of the posed problems; originality is measured by the relative infrequency of the problems; and organization is measured by the number of problems formulated as generalizations. Then, an overall score for creativity is determined by assigning a relative weight for each index (depending on the teacher's educational goal).

Furthermore, the view of creativity as a personal trait that can be nurtured in school students requires a distinction between relative and absolute creativity (Leikin, 2009). While absolute creativity is associated with remarkable historical works of prominent mathematicians, relative creativity refers to discoveries made by a specific person within a specific reference group. Therefore, for each of the four indices, as well as for their weighting, each student receives both a "personal" score and a score that is relative to his or her classmates; (iv) Acknowledging the benefits of self-assessment of creativity and its development (Chamberlin & Moon, 2005), after every task each student receives a graphical display of his or her relative scores, as the personal scores are in fact task depended. Starting from the second task, the graphical display includes cumulative scores, so that the students are able to examine their progress/retreat relative to their classmates. Figure 1 presents two examples, a cumulative graphical display of Ruth and one of Michael for five problem-posing tasks (t1-t5). The relative scores for fluency, flexibility, originality, organization, and creativity are indicated by flu, fle, orig, org, and cre, respectively. The score for creativity was calculated so that each of the four indices received equal weight (Shriki & Lavy, 2014). Studying the graphical display of scores, the students are asked to reflect on modifications in their relative scores and try to explain apparent changes.

Further details about the learning environment and the scoring process can be found in Shriki (2013).

Figure 1. Ruth's and Michael's cumulative scores for task 1 (t1) to task 5 (t5).



#### 4. The study

The study aimed at examining students' perceptions regarding the effect of the described self-assessment process on the development of their mathematical creativity. It should be noted that the first graphical display is given to students only after experiencing several WIN tasks and receiving a detailed explanation of the creativity indices and the meaning of relative scores. The process took place without the active involvement of the math teacher with the goal of monitoring student development independently of external guidance.

**Research questions.** Two research questions were derived from the research objective: How do students perceive the effect of the self-assessment process on (i) their self-efficacy as posers of mathematical problems; (ii) their development of mathematical creativity (as measured through psychometric indices).

**Research participant.** During the past few years, over 300 high school students participated in the study. The students studied math at various levels (low, medium, high). In each group, the study was carried out during five consecutive weeks (one problem-posing task per week), while the self-assessment process was performed between two successive tasks. In this paper, we focus on two students, Ruth and Michael, whose cumulative scores are presented in Figure 1. Both were 11<sup>th</sup>-grade students who studied medium-level mathematics in the same class. Ruth's and Michael's average grades in mathematics were 86 and 82, respectively. The reason for focusing on these two students is the fact that they constitute a representative example of the possible opposite effects of self-assessment of creativity in the case of relative scores.

**Research tool.** The graphical display was given to the study participants together with a questionnaire that included three open questions (the third question was excluded from the first questionnaire): Observing the graphical display, what can you tell about: (i) your creativity with respect to posing mathematical problems?; (ii) your ability to pose mathematical problems?; (iii) the development of your mathematical creativity. Try to explain apparent changes or lack of changes.

**Data analysis.** Students' responses to the questionnaires were analyzed by means of analytical induction, aiming to identify the main themes and typical patterns that emerge from the responses. This process was done by implementing open and axial coding in order to form the unifying categories and sub-categories (Strauss & Corbin, 1990).

## 5. Results and discussion

Ruth's and Michael's average grades in mathematics before starting the study (86 and 82, respectively) indicate that they are not considerably different in terms of their mathematics knowledge. As can be seen from Figure 1, Michael's starting point was slightly better than Ruth's, and both relative scores of total creativity were rather low. However, while Ruth's relative scores constantly increased, namely, she has improved relative to her classmates, Michael's relative position has decreased. This raises questions regarding the factors that influence the change in relative scores of the indices of creativity, and in any case, contrary to Chamberlin & Moon's (2005) findings, it indicates that self-assessment of creativity does not seem to work well with everyone.

Looking for a framework for analyzing Ruth's and Michael's responses to the questionnaires, we found Sternberg and Lubart's (1991) investment theory of creativity as suitable for this purpose. According to the theory, creativity is an interactive function of six resources— intellectual processes, knowledge, intellectual style, personality, motivation, and environmental context. Creative performance results from a confluence of these resources, thus in order to assess creativity, there is a need to look at all of them. In what follows are several quotations taken from Ruth's and Michael's responses. The brackets show the task number (t1-t5) and the question number (i-iii).

**Quotations Ruth's responses.** “My scores were very disappointing, but I can only blame myself for not giving it enough time...I will surely work harder on the next task” (t1, ii); “I wasn't satisfied with my scores for originality. I think that more than other scores this truly reflects creativity. So I promised myself to think ‘big’ next time” (t2, i); “I can see that my efforts paid off in all but originality. I think of myself as a creative person, so it's a bit annoying, but I'm not giving up“ (t3, iii); “This time I changed my tactic, and it worked! I thought that if I would pose more problems, then I'll increase the chance of being original” (t4, ii); “These tasks truly gave me a chance to think differently. At first, I was afraid to think too wild, because the teacher said that the problem should be appropriate. But when I saw my scores for the three tasks I realized that if I would limit myself to simple problems I will not go far. So I really tried to think of original and generalized problems...and as you can see [the teacher], I am one of the most creative students in the class! Yeah!!!” (t5, iii).

**Quotations from Michael's responses.** “I tried to think of many types of problems, and I thought it would be enough. But then I saw my score of creativity and realized it wasn't enough...O.K., so I am not very original and creative, what does it say about me?” (t1, i); “I tried to prove to you [the teacher] that I can be original, but now I know I'm not...Actually, instead of getting better, I'm getting worse” (t2, iii); “It is the same as before. Perhaps I just don't know how to pose problems. We never did it in class...I'm starting not to like these tasks” (t3, i); “It is not hard to see that other students are much more creative than me, so I give up” (t4, iii); “I understand that what we did was some kind of an experiment, but you [the teacher] probably had to explain it better or tell me what I was doing wrong. If you had asked me a month ago if I could pose mathematical problems, I would definitely say “yes”, but it turned out I'm not very good at it” (t5, ii).

According to the investment theory, the **intellectual resources** relate, among others, to the ability to escape the boundaries of conventional thinking, recognize which ideas worth pursuing, and willingness to invest time thinking in new ways (Sternberg, 2009). Ruth's self-testimony regarding her behavior meets these skills, and it is apparent that she takes responsibility for her achievements. Ruth realized she had to spend more time working on the tasks in order to attain the goal she set for herself: improve her relative scores, especially the score of originality (t1, t2). This goal was set as a result of perceiving originality as the essence of creativity (t2), and the fact she considered herself to be a creative person (t3). It appears that Ruth's **intellectual style**, namely, decisions about how to organize the available skills (Sternberg, 2009) and her **personality** resources, in particular, her eagerness to overcome obstacles and take risks supported her improvement. Evidently, Ruth is consciously monitoring her actions, for example- changing her strategy and posing more problems (t4), ‘thinking big’ (t3), and thinking of ‘wild problems’ (t5). Her self-efficacy as a creative person, combined with her willingness to overcome obstacles and take risks, proved to be what Ruth called ‘pay off’. Clearly, these resources might not be adequate, if Ruth had no motivation. Intrinsic, task-focused motivation is essential for creativity. Nonetheless, motivation for itself is not inherent in a person but rather depends on one's decision to be motivated given a certain stimulant (Sternberg, 2009). Ruth's motivation to improve was primarily intrinsic, driven by her wish to prove to herself that she was as creative as she believed (t2-t5). Michael, on the other hand, demonstrated a different behavior of resource exploitation. At the first task, he used his **intellectual** resource for thinking of various types of problems, believing this was the right approach (t1). However, although he realized that it was insufficient for attaining high scores he did not make any attempt to escape the bounds of his conventional thinking. Michael seems to have given up quickly (t1, t3). Seemingly, Michael lacks the **personality** resources required for overcoming obstacles and taking

risks, and his low self-efficacy is expressed already after t1. Michael's utterances (t1-t4) indicate that he perceived the process as some kind of a 'competition' among his classmates, and being uncompetitive not just impeded the development of his creativity, but also harmed his self-efficacy and suppressed his intrinsic motivation. It appears that Michael's central motivation was to prove something to his teacher, rather than an intrinsic one (t2). Consequently, he 'blames' his teacher for not providing him proper conditions to succeed (t3, t5). As Sternberg (2009) noted, people may have all the essential internal resources to think creatively, however, if they do not get support from the environment, or alternatively- receive negative feedback, they will not be able to demonstrate their creativity. In t2 and t5 Michael turned directly to his teacher, wherein t5, he explicitly expressed his need for help. Unlike Ruth, who is able to resolve her conflicts by herself, Michael needs his teacher's guidance and support.

## 6. Conclusions

The case of Ruth and Michael suggests that self-assessment of creativity can be valuable for students who possess an optimal confluence of resources from the outset. Such students are able to advance their creativity and adapt themselves to the environment. Conversely, students who lack a certain degree of a threshold for one or more of the six mentioned resources might be harmed from this process. Further study is needed in order to understand issues related to this threshold and its relation to the self-assessment of creativity. Moreover, given the importance of environmental context, it is clear that self-assessment of creativity through the use of a graphical display of relative scores is not equally suitable for all students. Perhaps Michael could realize his creative potential if he had received his teacher's immediate support or a display of his personal scores rather than the relative ones. These two issues also need to be considered in further study.

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# **SOUTH AFRICAN AT-RISK UNDERGRADUATE ENGINEERING STUDENTS' PERCEPTIONS OF THE REMEDIAL INTERVENTION DESIGNED TO ENHANCE THEIR ACADEMIC PERFORMANCE IN MATHEMATICS AS A KEY KNOWLEDGE DOMAIN**

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## **Abstract**

The complexity of the articulation gap between school and higher education poses enormous challenges to institutions of higher learning in South Africa. In response to this predicament, various strategic interventions were adopted with a view to adequately address student under-preparedness for tertiary studies. As a gateway knowledge domain, mathematics forms an integral part of various curriculum programs geared towards the cultivation of skills required by the mainstream economy. However, inadequate student academic performance in mathematics remains a pervasive pedagogic challenge afflicting meaningful enhancement of human capital development through inculcation of critical skills. In recognition of this fundamental challenge, this study explored at-risk undergraduate engineering students' perceptions of the remedial intervention which was implemented to enhance their academic performance in mathematics at a South African university. Additional critical academic support was provided to this cohort of students as mathematics repeat students in order to maximise opportunities for success with a view to subsequently ensure their survival of academic exclusion on the basis of sustained inadequate academic performance. The students expressed positive sentiments about the efficacy of the remedial intervention implemented as it provided meaningful opportunities to improve their academic performance in mathematics as a key knowledge domain. The students indicated that the implementation of remedial interventions of this nature serves to safeguard future prospects for under-prepared students while boosting the throughput rates of higher education institutions. Furthermore, the students provided contextually appropriate recommendations for strengthening remedial interventions of this nature to ensure the academic survival of at-risk students in particular. Implications for meaningful enhancement of human capital development are discussed.

**Keywords:** *Articulation gap, remedial interventions, human capital development.*

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## **1. Introduction**

Student under-preparedness for tertiary studies remains a fundamental challenge facing higher education institutions in South Africa. This fundamental challenge is intrinsically linked to the complexity of the articulation gap between school and higher education. Higher education institutions in South Africa responded in a variety of ways to this predicament. Some of the key measures adopted included the implementation of extended curriculum programs which essentially provided additional critical academic support for under-prepared students. Admissions policies provide tertiary education access to diverse student populations and this renders higher education institutions agents of social mobility for at-risk students in particular (Skidmore *et al.*, 2014). There is a need to scaffold mathematics instruction to cater for the needs of at-risk students. Wass, Harland, and Mercer (2011) posit that teaching practices that scaffold instruction should be more widely applied within tertiary instructional settings. It is for this reason that this study explored South African at-risk undergraduate engineering students' perceptions of the remedial intervention which was designed to enhance their academic performance in mathematics as a key knowledge domain.

## 2. Research design and methodology

A remedial intervention was implemented to enhance academic performance of at-risk undergraduate engineering students in mathematics at a South African university. Additional critical academic support was provided to this cohort of students as mathematics repeat students in order to maximise opportunities for success with a view to subsequently ensure their survival of academic exclusion on the basis of sustained inadequate academic performance. An evaluation questionnaire was subsequently administered to unearth students' perceptions about the efficacy of the remedial intervention implemented.

## 3. Findings

Table 1 below provides distribution of students' responses to the evaluation questionnaire. The students demonstrated fundamental appreciation of the structural nature and efficacy of the remedial intervention. Evaluation areas included workshop content, workshop design, efficacy of the workshop as well as self-paced delivery.

*Table 1. Distribution of students' responses to the evaluation questionnaire.*

	<b>WORKSHOP CONTENT</b>				
	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly agree</b>
I was well informed about the objectives	4	3	12	40	32
This workshop lived up to my expectations	3	7	24	40	17
The content is relevant to my studies	2	1	12	40	37
<b>WORKSHOP DESIGN</b>					
The workshop objectives were clear to me	3	4	17	45	21
The workshop activities stimulated my learning	1	5	19	40	24
The activities in this workshop gave me sufficient practice and feedback	2	14	16	38	19
The pace of this workshop was appropriate	6	9	23	39	13
I had a fair opportunity to participate and contribute	2	7	22	41	20
<b>WORKSHOP EFFICACY</b>					
The workshop prepared me well for tests	4	6	17	37	24
I am able to use what I learnt in the workshop and beyond	1	2	24	37	28
<b>SELF-PACED DELIVERY</b>					
The workshop was a good way for me to learn mathematics content	2	3	21	43	21

Contextually appropriate recommendations advanced by the students on the improvement of the remedial intervention are provided in Table 2 below. The nature of the recommendations provided reflected the extent to which the students benefited from the key concomitant activities that characterized the remedial intervention.

*Table 2. Students' recommendations on the improvement of the remedial intervention implemented.*

<b>FREQUENCIES DEPICTING STUDENTS' PREFERRED RECOMMENDATIONS ON THE IMPROVEMENT OF THE WORKSHOP IMPLEMENTED</b>	
Provide better information before the workshop	45
Clarify the workshop objectives	34
Reduce the content covered in the workshop	9
Increase the content covered in the workshop	54
Update the content covered in the workshop	36
Improve the instructional methods	36
Make workshop activities more stimulating	45
Improve workshop organization	35
Make the workshop less difficult	4
Make the workshop more difficult	56
Slow down the pace of the workshop	43
Speed up the pace of the workshop	13
Allocate more time for the workshop	53
Shorten the time for the workshop	4
Improve the tutorials used in the workshop	52
Improve student active involvement and participation	43

#### **4. Discussion**

The students expressed positive sentiments about the efficacy of the remedial intervention implemented as it provided meaningful opportunities to improve their subject matter knowledge in mathematics as a key knowledge domain. The students indicated that the implementation of remedial interventions of this nature serves to safeguard future prospects for under-prepared students while boosting the throughput rates of higher education institutions. Furthermore, the students provided contextually appropriate recommendations for strengthening remedial interventions of this nature to ensure the academic survival of at-risk students in particular. This implies that every effort must be made to provide additional critical academic support to at-risk students to ensure their academic success. This requires critical understanding of the profile of at-risk students. Bulger and Watson (2006) postulate that many academically at-risk students come from under-privileged backgrounds. In addition, many at-risk students attended failing, low-performing, or under-resourced high schools (Glazerman & Max, 2014). According to Woods and Domina (2014), students coming from affluent schools are poised to succeed in their tertiary studies.

Scaffolding mathematics instruction may serve as a panacea for student under-preparedness. Affordances associated with scaffolding of mathematics instruction ought to be harnessed in order to maximize the academic experience of at-risk students in particular. Scaffolding can support a variety of learning objectives including absorbing course content and concepts, increasing self-awareness, providing motivational support, understanding how to use learning and teaching tools such as computerized learning platforms, and learning techniques to adapt to different instructional contexts (Azevedo & Hadwin, 2005). Context-specific remedial interventions can be used as meaningful platforms for providing at-risk students with opportunities to gain important information about institutional resources and courses, develop study skills, form relationships, and gain knowledge of available resources (O'Gara, Karp, & Hughes, 2009).

#### **5. Conclusion**

The adoption of innovative remedial interventions can serve as a panacea for student under-preparedness which is a consequence of the complexity of the articulation gap between school and higher education within the broader South African context. Scaffolding mathematics instruction to cater for the needs of at-risk students can provide immense benefits for meaningful enhancement of human capital development.

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## SKILLING FOR TOMORROW AT SCHOOL: A TRAINING PROJECT FOR IVET AND TECHNICAL STUDENTS' SOFT SKILLS

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### Abstract

Nowadays, policymakers and stakeholders have been supporting the relevance of aligning schools and workplaces in the field of Initial Vocational Education and Training (IVET). Accordingly, the connectivity offers more opportunities to students to develop and foster work-based skills and competencies that are predictive of a higher level of employability and entrepreneurship with several impacts on the market industries and countries' economic stability. On the one hand, there is still a debate between educational models based on workplace learning and certifications of competences for occupation in the field. On the other hand, the literature is lacking a conceptual comprehension about how, and to what extent, IVET program can include competence-based approaches to promote interpersonal and transversal skills in students. With the aim to empirically address these current issues, we devised promoted a pilot training project for students of the Italian IVET and technical schools. Thanks to the collaboration of six Italian schools, both technical and IVET schools, and the Veneto Region' authority for the manufacturing and construction industry, the project has been sponsored to help students to develop technical and soft skills (e.g., cooperation within different professional roles) during the secondary level of Italian higher secondary education. Students ( $n=168$ ) of different professions (e.g., electricians, technicians) were involved in our study and assigned to the experimental group, in which they have been redistributed into six classes. Each student of the classes had to cooperate with their peers to realize a product in 6 months consisting of (i) planning, (ii) organizing and, (iii) building. Therefore, students had the occasion to cooperate with students of different job curricula and to learn by doing in a simulated workplace. In order to assess the effectiveness of the intervention, we have combined quantitative and qualitative methods. Hence, we developed a self-report measure, namely, Scale for Market Industry Competence (SMIC), which has been used in combination with interviews and observations to evaluate the occupational profile reached by students in the experimental groups and the project features. The results seem to confirm that our pilot intervention was effective in sustaining technical and soft skills development. Moreover, the qualitative analysis allowed to map benefits of the project as well as the challenging aspects by which proposing forward projects.

**Keywords:** *Training project, IVET school, technical school, soft skills, mixed-methods.*

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### 1. Introduction

Since the '80s, the western countries have been recognizing that the creation of alignments between the arena of the world of work and Initial Vocational and Educational Training (IVET) support economic stability and competitiveness. Authors and scholars in the field have shown how this connectivity between the labor-market, schools and policies represents a key-path for citizens' employment and work innovation. On the one side, the IVET-students can develop competences and abilities that are related to the current trends of work by having experiences in the workplace. On the other side, stakeholders and employers can ensure their future workforce profiles thanks to the offers of higher-level quality of training and apprenticeship in their organizations (Hooge, 2018; Pantea, 2019).

Nowadays, there are different trends in the way of doing this connectivity. A common classification is made by authors in the field basing on the difference between the model proposed by the US and UK, and the models used in Germany, Austria and Switzerland. In the first case, the institutional policy on IVET and technical schools focuses on the precondition of the certification of the competences. In this vein, the educational offers aim to foster the employability level of the profile curriculum of students. Germany, Austria and Switzerland developed IVET schools basing on the concept, namely, *Berugliche Bildung*, of education for an occupation. This model is based on the concept of work-based learning by which students can foster their competency profile directly in the occupational field (Brockman, Clarke & Winch, 2008). Hooge (2018) argued that these two broad models are representative of the current strands of institutional policies oriented to the connectivity. Although the models can be

seen at the extremes of the same continuum of workplace-school connection concept (Hooge, 2018, Brockman, et al. 2008), both are inherently sensible to foster competence-based approaches relating to the whole person, and including different dimensions, namely; interpersonal competences, self-role accountability and collaboration.

The literature has seen a large spread of contributions on the relevance of integrating transversal and interpersonal competences with the connectivity with the workplace in IVET and technical schools. Mainly, the authors claimed the importance of skilling the future workforce on cooperation and work accountability as an increasingly important issue in educational policies (INAPP et al. 2016; Paython, 2017). Although there are different bunches of research on accountability, in the VET field it concerns the workers', or students, responsiveness of their (forward) professional categories as members of the labor, and industry market (BLANDA & Urbančíková, 2019; Brockman et al. 2008; Pantea, 2019; Sennet, 2012;). This general definition implies such a mix of competence concerning the self-role awareness of IVET students, the interpersonal competences and the ability to work in cooperation in the market industry (INAPP et al. 2016). However, how, and to what extent the precondition of connectivity between school and workplace can develop and foster these interpersonal competencies linked to professional skills?

Accordingly, the present contribution intends to present the preliminary results of a pilot study conducted in Italy between 2018 and 2019. In that period, a pilot training project has been promoted by the Veneto Region' authority for the manufacturing and construction industry in collaboration with six IVET and technical schools and the University of Verona. One of the aims of the study was to address the current issue on competence-based approach in connectivity training projects. In the following section, the project will be outlined in order to present the core aspects of our training, with which the objectives of our studies are reported. Then, results and implications are described by the authors in order to discuss forward implications for authors and IVET and technical schools' educational policies.

## 2. The Italian background and project scope

In the past decade, the Italian institutions on technical and IVET schools have supported the connectivity between schools and workplaces, according to the European trends. However, although reforms and actions have initiated the Italian schools to access the work system and industry, there is still a lack of a common system for devising this kind of projects. This is to say that the current uncertain condition can lead to huge results both at the level of schools and supporters. On the one side, the lack of a normative way of building this connectivity as well as the lack of evidence of effective programs could result in poorer training offers and, hence, affecting the educational level of students. On the other side, the lack of a financial and regulatory framework cannot be addressed online by the regional authorities and local bodies in the view of coordination and promotion of large educational programs (CNOS-FAP, 2017). In this plethora of different factors, therefore, projects comprehending different collaborations and networks – schools, regional authorities and universities – are welcomed to shed light on the current gap about creating a normative and arranged system of connections between schools and workplaces.

Therefore, the present study reports the tentative made to address (a) the quest for connectivity project and (b) answering the questions on competence-based approach in IVET and technical schools by devising a pilot project for students work-based training. As previous noted, although the promotion of innovation of training in this sector, the Italian government is missing guidance and regulatory frameworks for connecting regional authorities, IVET and technical institution and social partners. Hence, exploratory research could help to inform about effective approaches and perspectives. Moreover, both the two models of UK-US and German, Switzerland and Austria, aim to foster interpersonal competence, however, they are still facing problems about to what extent this competence might be fostered.

According to the aims, we devised a pilot project turning on school-based and work-based pathways, combining training and learning in the workplace. In this vein, we developed the project according to the definition of competences of Mulder and Winterton (2017) by who the notion of competence is seen as a holistic notion, relating to the whole person and including different dimensions. By explicitly applying this definition to the area of IVET and technical schools, the student competences regard the personal and interpersonal abilities as well as market industry accountability and work categories orientation which can be fostered and developed by learning in the workplace (Brockmann et al., 2008; Mulder and Winterton, 2017; Hooge, 2018).

Thanks to the collaboration of six Italian schools, both technical and IVET schools, and the Veneto Region' authority for the manufacturing and construction industry, the project has been sponsored to help students to develop technical and soft skills (e.g., cooperation within different professional roles) during the secondary level of Italian higher secondary education. The promoters named the project *100+100* since it involved students for at least 100 hours both in the classroom and in the workplace. Students ( $n=168$ ) of different professions (e.g., electricians, technicians) participated in our study, likewise,  $n=12$  teachers of each school were involved to conduct the project as school subject teachers or as coaches. They were assigned to the control group and to the experimental group, in which they have been

redistributed into six classes. Each student of the classes had to cooperate with their peers to realize a product in 6 months consisting of (i) planning, (ii) organizing and, (iii) building under the supervision of a teacher ( $n=6$ ) and coaches ( $n=6$ ). Each stage of the training occurred in different contexts with one teacher and coaches who helped the students in the learning processes. The stages take place in the classroom (for planning), in the workplace (for the building stage) and both at school and in the workplace for the organizational stage. Therefore, students had the occasion to cooperate with other peers of different job curricula and to learn by doing in a simulated workplace. The target of the student was to realize a studio flat consisting of two rooms and a bathroom.

## 2.1. Methods

The main focus of our study was to evaluate the effectiveness of our project, as well as, to explore the benefits of students in the development of their competence-profile. The project was administrated by teachers and researchers as a pilot study in order to propose forward normative instruments and projects characterized by high effectiveness to promote students learning. Hence, the two objectives were to (a) evaluate the outcomes of students and teachers involved in the study and (b) to define the limitations of our project procedure and propose forward applied implications. The evaluation of the effectiveness consisted of the use of mix-methods involving qualitative observations and interviews and quantitative instruments for students' competence assessment.

Qualitative data have been collected during the lessons, in the class and the workplaces using interviews coupled with the document analysis and observations. Students and teachers have been interviewed by the researchers about their experience in the study. Likewise, they have been observed by the researchers during the lessons and in the workplace taking notes about the teachers practices and students' activities. Moreover, qualitative methods aimed to understand the features of the project as resulted by the experiential contents, and the comparison with the documents made by teachers and authorities involved. Accordingly, the data collected structured the evidence concerning the profile curriculum developed and the project features (i.e., benefits and challenges). The evaluation approach of Vergani (2004) has been used as core-methodological perspective. Vergani proposed a system of qualitative evaluation based on viewing the prospects of participants of training activities and creating the evaluation system itself. Indeed, Vergani suggests to considering the point of view of the evaluated rather than applying a standardized system and making inference on the effectiveness of the training programs (2004). By the explicit comparison between all the data collected, i.e., documents, interviews and observations, the evaluation of the pilot project emerged and core aspects of the students' competence developed.

Quantitative methods have been used in order to assess student's interpersonal competence development. As noted, among the competence expected by the apprenticeship at the workplace concern the interpersonal relation, peer-collaboration and professional category responsiveness. Therefore, we developed a new self-report questionnaire for students, namely, *Scale for Market Industry Competence* – SMIC. According to the aim of the study, the SMIC has been developed by the researchers in order to have an easy and reliable instrument by which evaluating the students. Our instruments consisted of 11 items on 1-5, Likert scale of agreement. Students had to report if the sentence was representative or not of their current knowledge. The self-report measure consisted of three main categories; (1) awareness of the proper professional category; (2) awareness of being member of the market industry; (3a) interpersonal relation and (3b) the connected work accountability. Before submitting the questionnaire, the instrument has been evaluated by the teachers of the VET schools whose opinions have helped to review the items. Finally, a classical experimental design has been used to collect quantitative data. Students completed the questionnaire, *pre-* and *post-* training. Moreover, a control group has been involved to compare the results of the experimental group.

## 3. Results

163 students were involved in the study (average age, 16 years old,  $SD=1.19$ , 5.9% female). 135 attended the training project while the other students composed the control group. Students in experimental group belonged to different classes (2<sup>nd</sup>, 3<sup>th</sup>, and 4<sup>th</sup>) and equally from the 6 different VET schools of Veneto Region. After the preliminary observations and interviews of students ( $n=20$ ), teachers and coaches ( $n=6$ ) and schools leaders ( $n=9$ ), the researchers decided to shed light on two main categories concerning each of the two groups of participants. On the one side, the qualitative methods have been used to look at the benefits of students according to their answers and the observations as well as basing on teachers' opinions. On the other side, in line with the nature of the project, interviews evaluated the challenging features of our piloted training. Finally, all the data collected have been compared with the document analysis in which we have found the central characteristics of the project. The compared analysis helped us to understand the researchers' observation notes and interpret the interviews.

In this vein, qualitative data have been divided into two groups according to the two groups of participants; teachers and students according to the two broader groups of *project benefits* and *project challenges*. Qualitative data analysis of students shown three main categories of (a) active engagement, (b) unity and collaboration and (c) work accountability, among which, work accountability inherently represents a challenge according to the aim of the project. In fact, although students showed to be able to cooperate between each other, not all the students recognized the activities as linked to the market industry suggesting the needs for a specific training module. However, according to the document analysis, one of the central characteristics of the IVET profile and technical students market industry accountability is represented by the interpersonal competences and active engagement. As for teachers, they reported to have many difficulties in dealing with all the tasks required both in classrooms and in the workplace. In fact, they recognized the opportunity offered by the core aspects of the project to enhance students focused activities and fostering their knowledge. However, teachers reported the need for specific training in order to promote best didactical practices in line with the aim of the project. Moreover, the researchers noted that some of the problems reported by teachers were linked to their accountability of the project. This suggested that not all the teachers acknowledged the main aim of the pilot project.

The questionnaire has been administered pre-training in the experimental group and post-training in the both groups. In order to verify the hypotheses concerning the differences between the measures, a preliminary analysis concerns the reliability of the questionnaire. It resulted to be highly significant both at time 1 ( $\alpha=.84$ ) and time 2 ( $\alpha=.82$ ). Our results indicated that it is possible to aggregate the results in unique synthetic measure of SIC. Therefore, the quantitative analysis verified the hypotheses that the experimental group' post measures would show significant higher results if compared (H1) with the pre-measures and (H2) with the control group post-measures of the aggregated items of SIC. Time 1 measures resulted to be significantly lower than the time 2 measures,  $t(135)=-11.25$ ,  $p<.001$ , with an higher effect size, Cohen's  $d=.99$ , by the paired sample  $t$ -test. Likewise, the independent sample  $t$ -test reported that time 2 measures of the experimental group were significantly higher than of the control group,  $t(163)=-5.114$ ,  $p<.001$ , with an higher effect size, Cohen's  $d=1.08$ .

#### 4. Discussion

The turbulent time for work and employability of the first decade of the third millennium has prompted the Italian government to create a renovate its initial VET system (CNOS-FAP, 2017). However, schools and industrial institutions are still lacking a normative way of doing and many steps are needed to reach the European and international standards (INAPP, et al 2016; Hooge, 2018; CNOS-FAP, 2017). In this vein, we proposed a training project with the aim to address the current Italian issues and the current debates on the competence-based approach in the field. As we noted, there is still a lack of agreement between what twist and turn will take the Anglo-Americans and Germans' models concerning the interpersonal competences. Our project explicitly advocated for a suitable couple of work-based learning and competence-based approach stressing the importance of peer-collaboration for professional curriculum accountability of students. Whereas it was just a pilot study, our project seemed to confirm what is discussed in the literature on VET and interpersonal competences.

Firstly, the alignment between schools and workplaces allows students to promote their technical and manual knowledge (Tacconi & Messetti, 2018). Our project was not a real example of integration between work and school. Indeed, students worked and studied together in the classroom during the stages of planning and organizing, at the end of which, they worked together in a simulated workplace environment at the building stage (Perini & Pentassuglia, 2018). However, our results confirmed the development of self-role awareness as seen by the qualitative and quantitative results, although, we did not involve measures of the skills development and self-role performance. As a core limitation, this aspect calls for the inclusion of other measures as students' grades, and teachers' evaluations.

Secondly, one of the objectives of our study was to comprehend methods able to foster interpersonal competence and students' role-accountability. As Sennet (2012) outlined, unity and similarity are straightforward of collaboration and responsiveness. In our project, we followed this assumption by explicitly creating teams and co-workers giving them an objective as well as meeting occasions for sharing their knowledge and opinions. According to our results, we found that students in the experimental group reached higher significant level in core dimensions of the SIC measure than the control group and the *pre*-measures.

Based on the data collected, the preliminary findings of the study reveals promising opportunities for IVET and technical schools. The impact on the interpersonal competences and a self-role awareness as shown by the qualitative and quantitative data includes teachers experience. Simultaneously these results suggest possible forward implications in order to offer a higher impact training both for teachers and for students. Firstly, the teachers quest for instructional module for dealing with the project calls for a renovated project with a specific focus on teachers and trainers. Moreover, an explicit inclusion of the teachers in the organization stage of the project is suggested in order to foster the sense of belonging in

teachers by which trying to increase their engagement. Secondly, students work accountability and self-role awareness were not resulted to be concretely fostered as seen in the qualitative data. Therefore, two main suggestions can be made. Students of IVET and technical schools do not receive teaching modules on market industry basing on the Italian program. Hence, preliminary meeting about the project could promote the self-awareness of students thanks to rise of students' knowledge and literacy. Secondly, the rise of the number of hours and months of co-work suggesting a long-term project could promote both cooperation, collaboration and the sense of unity with class.

## 5. Conclusion

As the literature pointed out (Brockmann et al., 2008; Hooge, 2018; Pantea, 2019), the alignment of workplace and school plays an important role countries economic stability and competitiveness. As noted, this connectivity between the labor-market, schools and policies represents a key-path for citizens' employment and work innovation. In this project we have tried to promote a feasible training program for students and schools. Indeed, the project also aims at offering an evidence for forward perspectives and Italian institutional policies on IVET and technical schools, with a specific focus on soft skills for the workers of the industry of tomorrow. Finally, this is to say that the current VET institution policies in Italy support the realization of project for connectivity and in the literature there are other similar examples. However, there is a lack of a regulatory system by which local bodies, schools and region authorities can based their projects to turn school into an innovative paths of education.

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# PEDAGOGICAL PRACTICES ADOPTED BY TEACHERS WHEN USING IMPROVISED RESOURCES IN LIFE SCIENCES CLASSROOMS

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## Abstract

Pedagogic innovation is central to meaningful enhancement of human capital development. Concerted efforts geared towards meaningful science teaching and learning hinge to a large degree on a myriad of crucial factors which serve as key ingredients for creating a conducive environment within which envisaged learning outcomes can fruitfully be realized. In recognition of this key strategic imperative, the study explored pedagogical practices adopted by teachers when using improvised resources in Life Sciences classrooms at South African township schools. The study adopted a case study design located within the interpretive research paradigm. Data was collected through semi-structured interviews and lesson observations involving three purposively selected Life Sciences teachers. The cohort of teachers observed employed various pedagogic strategies such as inquiry-based learning, collaborative learning, cooperative learning as well as heuristic learning when using improvised resources to stimulate effective teaching and learning in Life Sciences classrooms. However, the selection and deployment of appropriate improvised resources proved to be an arduous task for the teachers although they fully acknowledged the significance of integrating improvised resources in science lessons. In addition, meaningful opportunities for harnessing learners' prior knowledge as a scaffold for navigating new content were created. Implications for pedagogic innovation are discussed.

**Keywords:** *Pedagogical practices, improvisation, pedagogic innovation.*

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## 1. Introduction

Pedagogic innovation is central to meaningful science teaching and learning. The provision of science instruction in resource-constrained environments is a pervasive fundamental challenge facing teachers in South African township schools. While considerable emphasis has been placed on the adoption of contemporary pedagogic approaches such as inquiry-based learning to foster meaningful science teaching and learning, adequate attention ought to be devoted to continuous professional development of teachers on the coherent implementation of these innovative pedagogic approaches. Demystifying abstract scientific concepts remains an arduous task for teachers and this professional challenge places an added pedagogic burden on teachers to adopt innovative pedagogic approaches to enhance meaningful learner conceptual understanding within resource-constrained environments. According to Driscoll (2005), understanding occurs when students actively relate new concepts to their existing knowledge. Progressive realization of this goal requires teachers as key agents of educational change to fully embrace learner-centered instructional approaches. McCombs and Whisler (1997) define a learner-centered model as a perspective that couples a focus on individual learners with a focus on learning. Pervasive fundamental challenges afflicting the provision of science instruction in resource-constrained environments underscores the need to use improvised resources in science teaching and learning. Hence, the study explored pedagogical practices adopted by teachers when using improvised resources in Life Sciences classrooms at South African township schools.

## 2. Research design and methodology

The study explored pedagogical practices adopted by teachers when using improvised resources in Life Sciences classrooms at South African township schools. The study adopted a case study design located within the interpretive research paradigm. Data was collected through semi-structured interviews and lesson observations involving three purposively selected Life Sciences teachers.

### 3. Findings

The cohort of teachers observed employed various pedagogic strategies such as inquiry-based learning, collaborative learning, cooperative learning as well as heuristic learning when using improvised resources to stimulate effective teaching and learning in Life Sciences classrooms. However, the selection and deployment of appropriate improvised resources proved to be an arduous task for the teachers although they fully acknowledged the significance of integrating improvised resources in science lessons. In addition, teachers created meaningful opportunities for harnessing learners' prior knowledge as a scaffold for navigating new content. The teachers demonstrated inadequate confidence with the implementation of inquiry-based learning in particular. This professional inadequacy calls for provision of sustainable teacher professional development opportunities with a view to enhance teacher professional expertise on the implementation of contemporary pedagogic approaches. The use of improvised resources provided hands-on learning experiences for learners. In addition, learners were afforded opportunities to engage collaboratively and this culminated in the creation of a conducive and collegial learning environment.

When using improvised resources, teachers recognised the need to provide context to learners' realities and existing knowledge as the following excerpt reflects.

*Learners become very interested and they learn a lot when they touch and feel the different parts of the heart. You find learners being surprised and wanting to learn more because this is something that they are used to and therefore can relate easily to it.*

The teachers demonstrated fundamental appreciation of the pedagogical affordances of cooperative learning. This sentiment is encapsulated in the following excerpt.

*It is good when learners do things in groups because they learn from each other. It is always the case with group work, learners think best when they learn as groups.*

The teachers displayed some measure of innovation when designing improvised resources to use in Life Sciences classrooms as reflected in the following excerpt.

*I would use washing powder to explain how enzymes work. If I want to use an acid, I use Sprite cool drink which is an acid that learners use on a daily basis.*

### 4. Discussion

This study demonstrated that teachers employ various pedagogic strategies when using improvised resources to stimulate effective teaching and learning in Life Sciences classrooms. However, the selection and deployment of appropriate improvised resources proved to be an arduous task for the teachers. There is a critical need to provide sustainable teacher professional development opportunities to enhance teacher professional expertise on the integration of improvised resources in science teaching and learning. In addition, teachers ought to be implored to adopt learner-centered approaches in order to realize envisaged curriculum outcomes. Learner-centered approaches provide opportunities to engage and co-construct knowledge in order to experience deep and meaningful learning (Schweisfurth, 2011).

Meaningful integration of improvised resources in science teaching and learning hinges to a large degree on enhanced pedagogical content knowledge. The use of improvised resources provides teachers with opportunities to enhance their pedagogical content knowledge as they actively engage in the transformation of content to make it intellectually accessible to learners. In addition, the use of improvised resources provided meaningful platforms to demystify abstract scientific phenomena in Life Sciences such as mitosis and meiosis. Clark and Mathis (2000) argue that the processes of mitosis and meiosis, while simple in nature, are conceptually difficult for the learners.

The availability of essential resources is a key requirement for provision of quality education for all. However, the South African basic education system is largely characterised by inequitable access to resources (Sedibe, 2011). In addition, a substantial number of schools in South Africa are still under-resourced. The provision of quality science education within the South African context is largely hampered by lack of essential resources. In support of this notion, Parker (2018) postulates that effective science teaching and learning requires the incorporation of instructional materials rather than undue reliance on traditional instructional methods which often stifle pedagogic innovation.

## 5. Conclusion

The integration of improvised resources in science teaching and learning can serve as a powerful instructional mechanism to enhance scientific literacy in resource-constrained learning environments. There is a crucial need to implore teachers as key agents of educational change to fully embrace the use of improvised resources to enhance their professional growth through pedagogic innovation.

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## WORK ETHICS OF SPECIAL EDUCATION TEACHERS IN SOUTH KOREA<sup>1</sup>

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### Abstract

The purpose of this study was to examine the work ethic attributes of special education teachers in South Korea, specifically for gender and experience. A total of 182 special education teachers participated in the Korean version of the Occupational Work Ethic Inventory-Short Form (KOWEI-SF) and provided usable data. An independent t-test was performed to compare means of male and female teachers. Next, a series of one-way analysis of variance (ANOVA) was performed with post hoc tests to compare teachers' work ethic for the experience. The results revealed that male teachers scored higher than female teachers in work ethic with  $t(180) = 3.634, p < .001$  (two-tailed),  $r = .26$  and that special education teachers with 0~5 years of experience scored the highest ( $M = 6.02, SD = 0.55$ ), those with 11~15 years the second ( $M = 5.77, SD = 0.63$ , and those with 6~10 years of experience were the lowest ( $M = 5.67, SE = 0.59$ ). The difference (.354) between the two groups: 0~5 years and 6~10 years was statistically significant with  $F(2, 166) = 5.655, p < .01$ , partial  $\eta^2 = .064$ . The results of the study can be used as materials for developing professional development programs for special education teachers in Korea.

**Keywords:** *Teachers' work ethic, special education teachers, teaching experience and work ethic.*

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### 1. Introduction

To sustain society and create new things, human beings should work. Work has various meanings. Work can be an expression of one's life, talents, and gifts. People can bring benefits to the community they belong to via work. Individuals can grow mentally and spiritually by working. Thus, work is intrinsically good. To do good work, a strong work ethic is needed. Work ethic is defined as "a cultural norm that advocates being personally accountable and responsible for the work that one does and is based on a belief that work has intrinsic value" (Hill & Petty, 1995, p. 60). Past studies on work ethic focused on common workers and examined for educational levels (Harvell, 2009; Kim, 2007; Park & Moon, 2018), positions (supervisors vs. jobseekers; Hill & Fouts, 2005), generations (Baby Boomers, X-ers, and Millennials; Harvell, 2009; Park & Hill, 2018b), types of employment (tenured, non-tenured, and self-employed; Park & Moon, 2018), and genders (Harvell, 2009; Kim, 2007; Park & Hill, 2018b).

Many instruments to measure individuals' work ethic have been developed as well. Most of them developed in western countries such as America were based on Weber's Protestant ethic and have been modified. Examples include the Protestant Ethic (Goldstein & Eichhorn, 1961), the Pro-Protestant Ethic Scale (Blood, 1969), the Protestant Work Ethic Scale (Mirels & Garrett, 1971), the Eclectic Protestant Ethic Scale (Ray, 1982), Work Ethic Scale (Blau & Ryan, 1997), the Multidimensional Work Ethic Profile (Miller, Woehr, & Hudspeth, 2002), and New Multidimensional Work Ethic Scale (Mann, Taber, & Haywood, 2013). Measures of work ethic which were not based on a certain religion but based on theories of work and employability skills have been developed as well. Examples are the Occupational Work Ethic Inventory (Petty & Hill, 1995), Georgia Department of Technical and Adult Education (GDTAE) Work Ethic Scale (Boatwright & Slate, 2002), the Employability Skills Assessment (Park & Hill, 2016), and the Occupational Work Ethic Inventory-Short Form (Park & Hill, 2018a).

In the past, Korean people regarded teaching as a calling (or a vocation), which means more than simply working. However, in contemporary society, teaching is considered a professional career. Even though various principles and codes of conduct for teachers have been developed, work ethic attributes for teachers have rarely been studied in Korea. Specifically, studies on the work ethic of special education teachers are sparse. Therefore, this study aimed to examine work ethic of special education teachers in South Korea.

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## 2. Methods

### 2.1. Sample

A total of 182 K-12 special education teachers in South Korea participated in the online survey in February 2020. Female teachers were 138 (75.8%; see Table 1).

Table 1. Demographic and Study Variables (n=182).

Variable	Category	n	%
Gender	Female	138	75.8
	Male	44	24.2
School Type	Kindergarten	10	5.5
	Elementary	40	22.0
	Middle	20	11.0
	High School	29	15.9
Experience	Special	83	45.6
	0-5 years	60	33.0
	6-10 years	59	32.4
	11-15 years	50	27.5
	16-20 years	12	6.6
Education	21 years or more	1	.5
	BA degree	132	72.5
	MA degree	48	26.4
	Doctorate	2	1.1
City size	Metro city	60	33.0
	Middle size city	100	54.9
	Local	22	12.1

### 2.2. Measures

**Teachers Occupational Work Ethic.** To measure special education teachers' work ethic, the Korean version of the Occupational Work Ethic Inventory-Short Form was used. The scale was developed by Park and Hill (2018a) to measure work ethic attributes in the workplace based on the factors of the Occupational Work Ethic Inventory (Petty & Hill, 1994). The OWEI-SF consists of three factors the same construct as the OWEI: Interpersonal Skills, Initiative, and Dependability (Park & Hill, 2018a). The OWEI-SF consists of 12 one- or two- word descriptors: *friendly, cheerful, likable, courteous, perceptive, effective, ambitious, resourceful, following directions, following regulations, and dependable*. The KOWEI-SF is a self-report scale and all the items are rated on a 7-point Likert scale (1=Strongly Disagree to 7=Strongly Agree). The KOWEI-SF was modified in statements instead of descriptors referring to the statements of the Employability Skills Assessment (ESA; Park & Hill, 2016; Park & Hill, 2018a). The modified KOWEI-SF was first used to measure Korean workers (Han, Park, Jang, Park, & Park, 2018). In the study, the OWEI-SF was examined to consist of one factor (Han et al., 2018). In this study, the modified KOWEI-SG was used as one dimension as well. With the current sample, the internal consistency (Cronbach's alpha) of the KOWEI-SF was .85 (n=182).

### 2.3. Data analysis

Descriptive statistics such as means, standard deviations, skewness, and kurtosis for each item of the KOWEI-SF were calculated. Next, the score of the KOWEI-SF was set as a dependent variable and gender and experience were as independent variables. To compare the means of the KOWEI-SF for gender: female and male, the independent *t*-test was performed. To compare means of the KOWEI-SF for experience, the *F*-test was performed to see if there were potentially differences in work ethic attributes between groups categorized based on their years of experience: 0~5 years; 6~10 years; and 11~15 years. The two groups of 16~20 years and 21 years or more were excluded since the sample size of each group was too small for statistical analyses. Next, a post hoc test was performed to compare means of between groups.

## 3. Findings

**Descriptive statistics.** The mean of the 12 items was 5.81 ( $SD = .94$ ). The mean of the item, *I follow the rules even if I disagree with them*, scored the highest ( $M = 6.43, SD = .67$ ), and the item, *I am eager to be successful*, scored the lowest ( $M = 4.90, SD = 1.55$ ) (see Table 2).

Table 2. Descriptive Statistics ( $n = 182$ ).

Item	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
The way I work is dependable.	5.88	.76	-.72	1.48
I am eager to be successful.	4.90	1.55	-.70	-.22
I am good at following directions.	6.25	.73	-.68	.07
I accomplish my goals.	5.81	.91	-.83	1.45
I have good manners.	6.21	.74	-.52	-.48
I do more than is required or expected of me.	5.73	.97	-1.00	2.28
I am aware of what is going on around me.	5.73	.99	-.49	-.34
People like me.	5.80	.90	-.32	-.67
I am a happy person in the workplace.	5.28	1.23	-.82	.81
I follow the rules even if I disagree with them.	6.43	.67	-1.22	2.76
I am friendly to other people.	6.34	.72	-.69	-.42
I am resourceful to find solutions to problems.	5.38	1.14	-.84	.96
Total	5.81	.94	-0.73	0.63
Cronbach' $\alpha$	.85			

**Work ethic attributes of special education teachers for gender.** There was a statistically significant difference in the mean scores of the 12 KOWEI-SF between genders with  $t(180) = 3.634$ ,  $p < .001$  (two-tailed),  $r = .26$ , which represents a medium-sized effect. Male teachers ( $M = 6.09$ ,  $SD = 0.47$ ) scored higher than female teachers ( $M = 5.72$ ,  $SD = 0.61$ ) (see Table 3).

Table 3. Work Ethic of Special Education Teachers for Gender ( $n = 182$ ).

Gender	n	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	Mean Difference	95% CI		<i>r</i>
							LL	UL	
Male	44	6.09	0.47	3.634**	180	.36	.167	.563	.26
Female	138	5.72	0.61						

Note. \*\* $p < .001$ . CI = confidence interval; LL = lower limit; UL = upper limit.

**Work ethic attributes of special education teachers for teaching experience.** Since the sample size of the two groups. The results shows that the group of 0~5 years scored the highest ( $M = 6.02$ ,  $SD = 0.55$ ), 11~16 years the second-highest ( $M = 5.77$ ,  $SD = 0.63$ ), and the 6~10 years the lowest highest ( $M = 5.67$ ,  $SE = 0.59$ ) (see Table 4).

Table 4. Descriptive Statistics of Special Education Teachers' Work Ethic for Experience ( $n = 169$ ).

DV	Group	<i>n</i>	<i>M</i>	<i>SD</i>	95% CI	
					LL	UL
Work ethic	Total	169	5.82	0.61	5.67	5.98
	0~5 years	60	6.02	0.55	5.87	6.17
	6~10 years	59	5.67	0.59	5.52	5.82
	11~15 years	50	5.77	0.63	5.61	5.94

Note. DV = dependent variable. CI = confidence interval; LL = lower limit; UL = upper limit.

The result of the *F*-test revealed that there was a significant difference in the mean scores in between at least one pair of groups with  $F(2, 166) = 5.655$ ,  $p < .01$ , partial  $\eta^2 = .064$ , which represents a small-sized effect (see Table 5).

Table 5. The Results of Between-Subjects Effects ( $n = 169$ ).

	Type III SS	<i>df</i>	MS	<i>F</i>	Sig.	Partial $\eta^2$
Corrected model	3.929 <sup>a</sup>	2	1.964	5.655	.004	.064
Intercept	5687.134	1	5687.134	16370.392	.000	.990
Experience	3.929	2	1.964	5.655	.004	.064
Error	57.669	166	.347			
Total	5794.806	169				
Corrected total	61.598	168				

Note. SS = sum of squares; *df* = degree of freedom; MS = mean square.  $r^2 = .064$ ; adjusted  $r^2 = .053$ .

The result of the pairwise comparisons between groups revealed that there was a significant difference in the mean scores between 0~5 years and 6~10 years and 0~5 years group scored .354 ( $p < .05$ ) higher than the 6~10 years group (see Table 6). However, there were no statistically significant differences between 0~5 years and 11~15 years and between 6~10 years and 11~15 years (see Table 6).

Table 6. Work Ethic of Special Education Teachers for Teaching Experience ( $n = 169$ ).

DV	Group I	Group J	I-J	SE	Sig.	95% CI	
						LL	UL
Work ethic	0~5 years	6~10 years	.354*	.108	.004	.099	.610
		11~15 years	.251	.113	.071	-.016	.518
	6-10 years	0-5 years	-.354*	.108	.004	-.610	-.099
		11-15 years	-.104	.113	.632	-.372	.164

Note. \* $p < .05$ . CI = confidence interval; LL = lower limit; UL = upper limit.

#### 4. Conclusions and discussion

The result of the study that there was a difference in work ethic attributes for gender is consistent with several previous studies (e.g., Kim, 2007; Park & Hill, 2018b; Park & Moon, 2018), which revealed that men workers scored higher in some of work ethic attributes, initiative, and thoughtfulness than women workers did. Previous studies also showed that there was a difference in work ethic for experience (e.g., Kim, 2007) that the more experienced, the stronger work ethic. However, special education teachers in South Korea showed that 0~5 years group scored the highest, which may imply that their attitudes toward students with disabilities may be more professional than the other groups due to the different curricula in colleges they had taken as pre-service teachers. The results of the current study could be used as materials for developing professional development programs for special education teachers in Korea. Further studies may include why teaching experience can affect special education teachers' work ethic via interviews of teachers.

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## **COASTRO: @N ASTRONOMY CONDO – TEACHERS’ ATTITUDES AND EPISTEMOLOGICAL BELIEFS TOWARDS SCIENCE IN A CITIZEN SCIENCE PROJECT**

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### **Abstract**

It is common to consider an attitude as a hypothetical construct related to a tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour. In the case of attitudes toward science, these cannot be isolated from the understanding of science processes: the path to produce, refute and change knowledge. Thus, it is critical to promote public engagement with science-astronomy and technology (PESaT) with the goal of understanding contents, but also of understanding what science is and how it is built.

In this context CoAstro: @n Astronomy Condo emerged – a citizen science project that starts with the involvement of elementary school teachers with the Research Group on the “Origin and Evolution of Stars and Planets” at the Instituto de Astrofísica e Ciências do Espaço (IA). CoAstro has directly reached about a thousand participants (including students, parents, astronomers and science disseminators).

To study teachers’ attitudes and epistemological beliefs towards science, as well as to analyse any changes promoted by CoAstro, a semi-structured interview (EAC) based on the Scientific Attitude Instrument and on the Nature of Scientific Knowledge Scale was prepared. After the translation of these instruments into Portuguese, scientific and linguistic validation by experts was made.

The EAC was performed before (EI) and after (EII) the development of the CoAstro. It involved 9 elementary teachers (8 females and 1 male, with an average age of 44.8 years) with no degree in science and who volunteered to participate in CoAstro.

The results show that there has been an increase of interest in astronomy that can be substantiated, namely by: i) a greater demand for news, motivated by intrinsic pleasure in astronomy (and not merely by professional necessity, as happened in EI) that became a more intelligible science; ii) a greater interest in seminars, classes or lectures; iii) an increase of interest in citizen science projects. On the other hand, teachers considered to be more knowledgeable about science, allowing them to make greater use of this knowledge in their daily lives and to assess claims about science.

Epistemological beliefs data reveal that the time between EI and EII reinforced the conviction: i) that it is possible to judge the applications of scientific knowledge, but not knowledge itself; ii) that creativity is associated with science, essentially at the beginning of the scientific process; iii) that repeatability and consistency of results are conditions for the validation of scientific knowledge; vi) the strong relationship between the various scientific fields.

For teachers, since EI, scientific knowledge is provisional and a consequence of its predecessor. The concept of parsimony that was completely strange to teachers has come to be understood, but the tendency to consider scientific knowledge parsimonious is not univocal.

Analysing the evolution of teachers’ attitudes and epistemological beliefs will help to better assess CoAstro, by measuring the relevance of a citizen science project (which combines remote interactions with systematic bilateral interactions) for a more holistic awareness and understanding of knowledge and scientific processes in Astronomy.

**Keywords:** *Citizen science, science communication, epistemological belief, attitudes towards science.*

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## 1. Introduction

Science communication can be understood as any act that aims to promote one or more of the following paradigms (Burns, O'Connor, & Stocklmayer, 2003; Oliveira & Carvalho, 2015): i) public awareness of science (PAS) - predominantly about attitudes toward science; ii) public understanding of science (PUS) - understanding of science content, methods of inquiry and science as a social enterprise; iii) public engagement with science and technology (PEST) - the engagement will correspond to an involvement of non-specialists in scientific-technological subjects, under a philosophy of reciprocal learning. Such desiderate appears to be most easily attainable if citizens can be directly involved in the process of scientific production – citizen science – in order to understand contents, but also what science is and how it is built. That was done in “CoAstro: @n Astronomy Condo”. In this paper, when we discuss the results of an astronomy project, we will use the acronym PESaT – public engagement with science-astronomy and technology.

### 1.1. CoAstro – a citizen science project

The term citizen science is used to refer the public engagement in different stages of scientific processes. This collaborative concept, between astronomers and volunteers, is becoming an increasingly popular space in non-formal science education (Price & Lee, 2013). Indeed, citizen science can easily create a win-win context: it attracts more researchers to science communication and, on the other hand, allows the public to participate directly in scientific processes (Riesch & Potter, 2014).

Thus, CoAstro defines itself as a citizen science project which, during one school year (2018/2019), had the participation of four astronomers, from the Instituto de Astrofísica e Ciências do Espaço (IA), in Portugal, nine elementary school teachers, four science communicators and one mediator (these belonging to the Porto Planetarium – Ciência Viva Center – PP-CCV). Under this project the public engagement with science-astronomy and technology (PESaT) was made with the goal of understanding contents, but also to promote “positive” attitudes and epistemological beliefs towards science.

CoAstro was organized in eight main work packages. One took a central role in the process: the involvement of elementary school teachers, with the Research Group on the “Origin and Evolution of Stars and Planets” at IA. This followed a collaborative model of citizen science (Brandt, Shirk, Jordan, Ballard, & Tomasek, 2010): data collection was accompanied by their analysis. This allowed the project to be extended to the school community with the engagement of approximately one thousand persons.

To engage teachers in astronomy research, two subprojects were developed in CoAstro: “Stars” (aiming the analysis of a standard stellar spectrum in order to allow the determination of the composition of 57000 stars and the characterization of their brightness, using *Data Release 2* from the European Space Agency – ESA – *Gaia Mission*) and “Planets” (aiming the production of a planetary transit video, using *Python* program and the analysis of light curves to signal the presence of potential exoplanets).

CoAstro assumed, from its conception that one of its objectives would be to work attitudes and epistemological beliefs towards science. Thus, it would be necessary to analyse the teachers' attitudes at the beginning and end of the project, in order to understand CoAstro's contributions to this process. It is in this context that we will now present the process that led to that assessment.

### 1.2. Attitudes and epistemological beliefs towards science

The individual science conceptions may be one of the primary conditioning sources of attitudes towards science and visions about how it is built (Tytler, 2014). Such attitudes towards science are define by Osborne, Simon, and Collins (2003, p. 1053) as “the feelings, beliefs and values held about an object that may be the enterprise of science, school science, the impact of science on society or scientists themselves”. Basically, these authors assume that the concept established is no more than the synthesis of the set of affective behaviours previously listed by Klopfer (1971): the presence of favourable attitudes towards science and scientists; the acceptance of scientific methods as a way of thinking; the adoption of scientific attitudes; the pleasure associated with scientific learning opportunities; interest in science and related activities; and the interest in pursuing scientific careers. Miller (1983) considers attitudes towards science as an element of scientific literacy: attitudes towards science and knowledge (towards activities related to science) – the social impact of science on the individual and on society itself. However, he does not isolate this domain from the understanding of scientific processes: the nature of science. For Ozgelen (2012, p. 104) this refers to “epistemology and values and beliefs for scientific knowledge and how that knowledge is developed, refuted, and changed”. Thus, Price and Lee (2013) prefer to designate this domain as epistemological beliefs about science.

This seemed to us to be the understanding that best represents what we are trying to measure in the present work. Thus, we will designate the two attitudinal components analysed using the following nomenclature: i) attitudes towards science; ii) epistemological beliefs.

## 2. Methodology

In this section, we will present the attitudes instruments and the process that led to the EAC's script.

### 2.1. Attitudes instruments for CoAstro

To study teachers' attitudes and epistemological beliefs towards science, as well as to analyse any changes promoted by CoAstro, a semi-structured interview (with the Portuguese acronym EAC), based on the Scientific Attitude Instrument (SAI) and on the Shortened Nature of Scientific Knowledge Scale (SNSKS) was prepared.

SAI is an instrument presented by Price and Lee (2013), built due to the lack of attitude instruments properly developed outside the educational context. That was our motivation to build EAC based in SAI: SAI is an attitude instrument assembled to match the characteristics of an older citizen science audience. It is "constrained in length, focus on the use of science in everyday life, and include questions that would measure behaviour unique to a citizen science audience" (Price & Lee, 2013, p. 780).

SNSKS was based on the Nature of Scientific Knowledge Scale (NSKS) established by Rubba and Andersen (1978). The items in the original NSKS included 48 items grouped into six categories of the nature of science (amoral, creative, developmental, parsimonious, testable, and unified). Each category included four positively stated items and four negatively stated items. The SNSKS kept the number of categories but reduced to four the number of items per category. That was made in response to the pilot study: the authors omitted all negative items. This shortening was necessary due to the resistance of Price & Lee's citizen science participants: they rebelled on the public discussion forums of the project. This is a common problem in citizen science (Price & Lee, 2013). SNSKS was chosen over other attitudes instruments because: i) it is based on a survey instrument with extensive pedigree (NSKS); ii) it was experimented in citizens science projects; iii) its application, simultaneously with SAI, was already tested (Price & Lee, 2013).

SAI has nine items and SNSKS twenty-four items answered with a 5-point Likert scale consisting of Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree categories. SAI's reliability ( $\alpha = 0.95$ ) and SNSKS' reliability ( $\alpha = 0.94$ ) were high. SNSKS was in general agreement with previous validation work on the original NSKS instrument, despite its shortened length.

A total of 3180 participants completed the pre-test (with SAI and SNSKS simultaneously) made by Price & Lee. They were invited to take the post-test after 6 months: 365 participants complete that task.

### 2.2. Building EAC's interview script

The above description justifies the choice of the SAI and SNSKS, as the basis for our interview about attitudes and epistemological beliefs (EAC), done to teachers involved in CoAstro. Therefore, in this section we will characterize the EAC respondents and the whole process that, starting from SAI and SNSKS, led to the adaptation and application of the EAC used in the CoAstro project.

The option for a semi-structured interview was made due to the number of CoAstro teachers: nine. Therefore, we decided to adapt SAI and SNSKS and built an interview script based on them.

In order to produce the EAC's interview script we started by translating SAI and SNSKS from English into Portuguese. This first translation was the subject of a scientific analysis by a Science Education and Communication expert. In this analysis, the expert verified the need to make some adjustments, in order to avoid changing the meaning of the SAI/SNSKS.

Subsequently, a graduate person, working in the United Kingdom for seven years, made the retroversion of that translation. This process did not reveal any important difference between the translation and the original SAI/SNSKS.

This whole process of translation, analysis, and retroversion led to a first stabilized version of the EAC that allowed us to proceed to the next phase: the interview script. The same Science Teaching and Dissemination expert also analysed it. With minor changes needed, we had the final version of EAC script. This script has the same number of question as its predecessors (SAI/SNSKS): we only translated them and validated that translation.

### 2.3. EAC's participants

EAC's participants were 45 years old, on average. Eight respondents were female and one male. Four teachers completed high school in urban areas, two in suburban areas and three in rural areas. However, at the time of the first interview five worked in suburban schools, three in urban schools and only one in a rural school. All teachers stated that they had never taken any specific astronomy course or participated in any astronomy initiative. For three of these teachers, it was CoAstro that provided the first contact with the Porto Planetarium – Ciência Viva Center (PP-CCV).

## 2.4. EAC's application

The first moment of interview (EI) ran between 23<sup>th</sup> of January and 18<sup>th</sup> of February. They took place on a “familiar” context for the teachers (school, coffee shop, their home...). At that point, teachers only have learned about CoAstro objectives. The interview was recorded with the interviewee's authorization. All nine interviews followed a common dynamic: the interviewer read each statement of the interview script; the interviewee positioned himself according to a level on the Likert scale and justified, when he deemed it was necessary, his answer. The interviewer, also when necessary, asked for clarification of any idea presented by the interviewee. Thus, 9 interviews were completed.

With the same procedure and in the same application context, the second moment of interview (EII) ran between 20<sup>th</sup> of September and 8<sup>th</sup> of October. All the nine teachers completed EII, by two months after the end of the project.

## 3. Results

We start by recalling that the data collected through the EAC had as objectives: i) to know what are the attitudes towards science and the epistemological beliefs of the elementary school teachers, involved in CoAstro; ii) verify if their participation in CoAstro has modified those same attitudes and beliefs.

Based on the interview script and on its objectives, an analysis framework was produced with categories (A and B) and subcategories (A1 and A2; B1 to B6), from which the content analysis of the interviews was made: A. Attitudes towards science (A1. Interest and proactivity; A2. Understanding and use of scientific knowledge); B. Epistemological beliefs (B1. Amorality of scientific knowledge and its application; B2. Creativity in science; B3. Knowledge construction process; B4. Parsimony in science; B5. Validation of knowledge; B6. Interdisciplinarity of science). The following summarizes some of the main results, supported by excerpts from the conducted interviews, which we translated from Portuguese to English.

Regarding category A, the results showed that from EI to EII, there was an increase in science interest, in citizen science projects, more specifically in those astronomy based; “I occasionally find myself going to TESS [Transiting Exoplanet Survey Satellite], something I never did before, (Teacher 3)”. However, that was made without high levels of proactivity when looking for news: “I don't make it my banner to go to the newspaper..., but if it has [some about astronomy], I see, I read and I'm interested, something that didn't happen before” (Teacher 6). Teachers said that they were more knowledgeable about science (although little knowledgeable), which allows them to make greater use of that knowledge to evaluate claims made about science and to place it in their daily lives (mainly in terms of their teaching practice): “In terms of astronomy yes [changed], ... because there was very little what I knew [to be able to assess scientific knowledge] ..., but today I already operate in another way” (Teacher 8).

The elapsed period between EI and EII helped to reinforce the conviction that it is possible to judge the applications of scientific knowledge, but not knowledge itself (B1 category). The reinforcement of the pre-existing belief regarding creativity in science (B2 category) was also found from EI to EII. However, for most of the interviewees, creativity in science exists only at the beginning of the scientific process: “In scientific theory we can perceive the creative way in which the scientist got there, but the concept itself, the law and theory, for me, does not have creativity” (Teacher 2). There was no change in most participants, regarding the understanding of how scientific knowledge is constructed (B3 category). The interviewees already considered at EI that scientific knowledge results from past knowledge, valid in the historic context in which was produced; it is provisional, because even at the time of its acceptance it can include errors. The concept of parsimony (B4 category) was unknown to teachers. At EII, the concept was already clear, for teachers, but the tendency to associate it with scientific knowledge is not univocal. Even so, in the period between EI and EII this issue was clearly pondered by teachers.

It is possible to establish a direct relationship between participation in CoAstro and the reinforcing of the belief that repeatability and consistency of results are conditions for the validation of scientific knowledge (B5 category): “In different parts of the world... [the] scientists will have to reach equivalent results again” (Teacher 8). In the EII, there is an almost generalized idea that observations allow the laws, theories and scientific concepts to be tested.

Most teachers, already in EI, had an interdisciplinary view of science (B6 category), although only between some specific sciences (such as Physics and Chemistry). That interdisciplinary understanding of science was unanimous, reinforced and universalized, at the time of the EIIs and already among all sciences (biology, chemistry and physics): “Biology also has chemistry and it also has physics... I think they are interconnected with each other” (Teacher 7).

#### 4. Conclusions

For the content analysis categories defined, the influence of CoAstro in B3 was not seen only in B3 (knowledge building process) and in B5 (parsimony in science). Although, this last concept became known to teachers (after CoAstro), it was not uniquely associated with scientific processes. In all others categories, there are reinforcement of beliefs, an increase in science interest and in the understanding and use of scientific knowledge. The increase in proactivity was not significant, perhaps due to the subscription of new resources (such as newsletters) between EI and EII, or because teachers started to resort to means (such as content suggestions from online services and software companies) in which the news are presented, according to their research interests.

A comparison with Price and Lee's results (2013), although it may be done, requires some caution, because: i) the data were treated in a quantitative way; ii) SAI/SNSKS were provided when participants first registered via the web site of the project – interest in astronomy and science was, already, very high; iii) the nature of the Citizen Sky Project – a web based project aiming the report, by volunteers, of visual brightness estimates for a multiple star system ( $\epsilon$  Aurigae) – is very different from CoAstro's nature.

Thus, as Price and Lee's results we detected a significant change in the scientific attitude. Other citizen science projects have not reported any change in scientific attitude (Brossard, Lewenstein, & Bonney, 2005). Also, as Price and Lee our results suggest that epistemological beliefs were reinforced, rather than restructured. This alignment with Price and Lee's results is a very important aspect because they were the firsts in the literature to show a change in epistemological beliefs through a citizen science project.

Therefore, our results reveal that a citizen science project, built on a model such as CoAstro's, supported by a collaborative view of citizen science and aligned with a PEST paradigm, can effectively contribute to the increase of interest, understanding and use of science knowledge and the reinforcement of correct epistemological beliefs. For this purpose, the key elements appear to be the involvement of teachers in astronomy research that motivated participants to undertake autonomous and, therefore, more meaningful and lasting learnings.

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# EFFECTS OF EXPERIENCE-BASED CREDIT-BEARING COURSES ON COLLEGE STUDENTS' CAREER ADAPTABILITY AND EMPLOYMENT SKILLS IN KOREA<sup>1</sup>

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## Abstract

Several universities in South Korea started to provide experience-based course-bearing courses for college students. This new curriculum was launched in 2017 to help college students develop their career adaptability and job competencies. The application process includes developing course topics, designing the whole course process, planning specific course activities, proposing their course designs and presenting to the committee, and interviews by the committee. Once their application is accepted, students can implement their courses for a semester. They can obtain 3 credit hours to 12 hours per semester. Students who are at the junior level are recommended to apply this course system. A professor is voluntarily assigned to the student whose proposal is accepted as an advisor besides an academic advisor. We examined the theoretical and empirical support for career experience at the college level. Specifically, this study sought to explore the value of experience-based career experience courses, what changed on students' attitudes toward their careers after attending experience-based career experience courses, and how do students perceive experience-based career experience courses. Five college students from five different colleges who participated in the courses were interviewed. The data collected from the interviews were analyzed, using coding and theming. The results of the interviews revealed that experience-based course-bearing courses were effective in developing students' career adaptability and employability skills such as interpersonal skills, creativity, entrepreneurship, problem-solving skills, initiatives, critical thinking skills, and team-work skills for future careers.

**Keywords:** *Experience-based course-bearing courses, career adaptability, employment skills, work-based learning at college.*

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## 1. Introduction

Thus, the purpose of this study was to explore the change of the students' knowledge, skills, and attitudes after they participated in the credit-bearing career experience curriculum at colleges and universities. To achieve the research purpose, several students who had participated in the project were interviewed as sample cases.

## 2. Method

The qualitative research method was implemented to explore the participants' views on the curriculum experience. Interviews were conducted and then the content was analyzed to identify the educational effects of the curriculum.

### 2.1. Participants

A total of five college students participated were selected as participants in this study. Three were male and the other two were female. Each participant was recommended by an administrator in the department of the credit-bearing career experience curriculum in five different universities, which had implemented the curriculum. They were recommended because they had taken the curriculum recently and had good grades in the curriculum courses. Each participant is described based on his or her educational and career experiences career. Demographic and sociological background information of each participant is presented in Table 1.

<sup>1</sup>This work was based on the findings of the research project done by Lee, M., Park, H., Go, Y., & Moon, C. (2019). *2019 대학 진로체험학점제 효과분석과 발전방안* [A research on development plan and effectiveness of career experience credit system in universities]. Project No. 기본연구 2019-37, 한국직업능력개발원 [Korea Research Institute for Vocational Education & Training]. Sejong: South Korea. Corresponding author: HwaChoon Park, hcpark@krivet.re.kr

Table 1. Demographic Information of the Participants.

Participant	Age	Gender	Major	Total credits earned through the project
Student A	23	Female	Digital media	6
Student B	25	Male	Information security	12
Student C	24	Male	Mechanical engineering	12
Student D	24	Female	Education	6
Student E	26	Male	Economics	12

## 2.2. Data

**Interviews.** Interviews were conducted with the five participants. Semi-structured questions were developed by the first author based on the relevant literature. Next, the initial questions were reviewed and edited by three other researchers who were involved in other series of this study twice. After the first author of this study and the other researcher agreed to the questions, final questions were selected. The sample interview questions are presented in Table 2.

Table 2. Sample Interview Questions.

Domain	Question
Motivation and preparation	Explain why you decided to take the course?
	Who recommended the course?
	Explain who and how prepared for application for taking the course?
	While you planned the application, what difficulties you had? What did you learn from the planning phase?
Participation	Explain how much you committed to the course?
	Talk about the administrating system-procedures for registration, the course process, the evaluation methods, and so on.
	What are the benefits or achievements of taking the course experience credit system?
Post-participation	What did you learn from taking experience-based course-bearing courses?
	Will you recommend experience-based course-bearing courses to other fellow students and junior students?
	What changes have been there in terms of your career plan after you took the course?
	How did the course taking influence your career planning?
	How satisfied are you with experience-based course-bearing courses?
	How does the course taking help you with preparing for employment in the future?
What attitudes or abilities were developed from the course taking experience?	

## 2.3. Data analysis

First, data were collected via interviews and then the interviews were analyzed, employing a qualitative case study approach. Deep interviews were conducted until sufficient data were available to understand the overall context of the cases. During the interview process, we made the interviewer's notes and recorded the contents at the same time. The recorded data were transcribed. At this time, the contents which could identify the participants were coded and processed so that outsiders other than the researcher could not identify any private information of the participants. We repeatedly listened to and read the recorded material and transcripts, and analyzed the themes for all cases. After classifying the contents, the concepts and interpreted themes were categorized. Semantic units were examined in the participant's career experience unit system, classified and compared.

Specifically, the themes of the interview contents were categorized based on the theory of career constructivism by Savickas (2002). Employability skills were also considered in terms of skills, values, and attitudes in the workplace that college students can develop through experience-based course-bearing courses based on Park and Hill (2016) pointed out such as interpersonal skills, communication skills, initiatives, and dependability.

### 3. Findings

Several themes were found that appeared in common among interviews. After taking the credit-bearing career experience curriculum while attending university, the participants expressed their changes in their perceptions of the course and in their career planning. Selected themes are presented in Table 3.

Table 3. Themes Categorized based on the Interview Contents.

Theme	Sub-topic	Semantic unit		
Changes of career adaptability	Choice of an employment type after graduation	-Starting up a firm or seeking a job to be employed -Seeking companies or industries		
	Preparation for employment	-Portfolio development: step-by-step documentation of the course projects done		
	Awareness of start-up	-Practical experience related to start-up		
	Course-taking plan for career-related courses	-Planning of course taking -Taking courses that would be useful for employment		
	Understanding and exploring fields other than the major	-Perceiving other fields and developing skills for integrating other fields with major		
Development of employability skills	Problem-solving skills	-Improvement of self-efficacy of problem-solving -Developing confidence towards problems		
	Attitudes toward school work	-Improvement of self-directed learning behaviors -Being more responsible for course-taking		
	Communication skills	-Presentation skills (including interview skills) -Writing skills (developing reports)		
	Interpersonal skills		-Developing positive interpersonal skills -Visiting professors more often -Discussing topics and exchange opinions with team members	
		Entrepreneurship		-Managing administrative work with staff -Preparation for start-up competitions -Participation in start-up competitions -Planning of the next project -Participating in academic and practical conferences -Making publications via multimedia
			Job experience	-Experiencing the real tasks in the workplace -Understand contemporary issues and trends in the workplace -Meeting a mentor from the workplace
	Management of job quality	-Making trials and efforts to produce a better quality of the job and school assignments		
	Integrity	-Processing administrative work clearly and fairly based on rules and policies -Completing projects on time		

**Changes in career adaptability.** Most of the interview participants stated that they had experienced some obvious changes such as attitudes, perceptions, and plans for career planning after attending the credit-bearing career experience courses. For example, they started to plan the next course to take very specifically considering their career, major, and prospective trends. The main sub-themes are (1) choice of an employment type after graduation, (2) preparation for employment, (3) awareness of start-up, (4) course-taking plan for career-related courses, and (5) understanding and exploring fields other than the major. These sub-themes are parts of career adaptability according to Savickas (2002). Student A expressed:

*I want to be a programmer. There are so many kinds of programmers. There are also a system program and a web. I have never done any project before and had no interest in block-chain at all, but now I have become interested in block chain and relevant apps. So I have a goal for block-chain platform developers.*

Second, most participants expressed that credit-bearing career experience courses helped them prepare for employment. In particular, writing a report of the course project to the course advisor (professor) and the supervising administrative staff during and after the project helped the participants to document their achievements, resulting in an excellent project portfolio for employment. Student B described the following.

*I found it very advantageous in terms of including the project reports in my resume, and when I re-entered graduate school, it helped me develop a portfolio to introduce myself to the interviewers. I am sure that it was very helpful for me to get a good grade on the entrance exam to a graduate school.*

Third, most respondents stated that they were motivated to think about starting up a business during the course-taking. The course-taking helped them understand the advantages and difficulties of starting up a business and then they could make a decision of either starting up a business or seeking employment. Student D pointed out the following:

*What I had not decided my career plan and further after school activities very specifically yet before I took the course. However, after I took the course, I started to think specifically about start-ups, internships, and the companies that I can apply for a job considering my major and my abilities. For I am minoring entrepreneurship in addition to my major, which is related to start-ups, I began pondering how I can connect my education experience and start-up.*

**Developing employability skills.** Most participants stated that positive changes in employability skills, which are parts of work ethic, work values, and attitudes toward work (Park & Hill, 2016), occurred after they took the courses. Sub-themes include improving (1) problem-solving skills, (2) attitudes toward school work, (3) communication skills, (4) interpersonal skills, (5) entrepreneurship, (6) job experience, (7) management of the quality of work, and (8) integrity. Participants expressed the followings:

*I learned that school work is very important since I pay a lot of money for tuition. I began to work harder on school assignments.*

*I had to visit professors more often to receive advice. Also, I contacted with office administrators to receive course fund and make reports many times. In addition, I had many presentations before professors and at competitions, explaining what I was doing with the project. This kind of series made me develop my interpersonal skills, presentations skills, and confidence.*

#### 4. Conclusions and discussion

It was concluded that students who attended the credit-bearing career experience curriculum in universities had positive changes in their career adaptability and employment skills. Specifically, they understand the real workplace issues and perceived necessary knowledge and skills that are needed in the contemporary workplace. Thus, the credit-bearing career experience curriculum was found to be very effective for students to develop their career adaptability and employment skills. This will also be helpful for graduates' transition from universities to the labor market. In 2019, a total of five universities implemented this kind of curriculum, and in the future, more universities will employ this system in Korea. This initiative is expected to bring positive effects to improve career education for undergraduate students in universities.

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## STUDENTS IN RESEARCH - EXPERIENCE WITH RESEARCH-BASED TEACHING

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### Abstract

One of the challenges of today's universities is to adapt the sharing of knowledge to the needs of modern students. Today's students want an education that is relevant, engaging and interesting, and which should provide good job opportunities. Unfortunately, it is not possible to predict what kind of knowledge will be needed in a few years' time. Therefore, universities and colleges must not emphasise specific topics, because they can be soon outdated, but they should rather emphasise innovation, curiosity, arousal of interest, partnership and interdisciplinary cooperation. Different research shows that the activity of students is critical for their learning outcome. Therefore, engaging students in present research can be a way of helping them to learn.

On Western Norway University of Applied Sciences (HVL) and Volda University College (HVO) we are working to improve the quality of teaching through research-based teaching. This means that teachers can integrate research with their own teaching and involve students in it. It is about facilitating students to contribute to innovation and research, as well as showing that their ideas can be interesting and important. Usually, students do not understand the whole research process, but can participate in some parts of it. This participation can be very helpful in carrying out smaller tasks, like collecting, analysing and processing the data.

There are many factors which can both help or prevent the process of learning. These include such elements as: teaching style, form of learning and resources. Modern teachings styles, like for example streaming, can give the students better flexibility of learning, but in the same time it can increase the distance between teachers and students. The style of teaching is also important. There are different methods of teaching; lectures, exercises, labs and projects, and all of them have different effect on students learning process.

We at the HVL and HVO have practice similar activities. We have had many projects with students participating in research with good results. In addition, our students presented their results at national and international conferences. We want to share our experience and present our projects, research and experience in close cooperation with students and discuss how this has affected their motivation to learn and develop their competences.

**Keywords:** *Active learning, integrated learning, students as researchers.*

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### 1. Introduction

Education is important for getting prepared for both everyday life and working carrier. Society, governments, researchers, teachers, parents and students are interested in effective learning and skill development. But how can universities perform good and practical education? What methods fits best for the requirements from teachers, governments and societal needs, and the expectation of students? Everyone wants to be motivated for learning and development, but not everyone prefers the same learning strategies or educational approach.

Practical education can give necessary knowledge and skills, by creating opportunities for the students to explore and gather experience in different situations. There are many new teaching concepts and approaches as Project-Based Learning, Active Learning, Inquiry-Based Learning and many more (Fojcik, Fojcik, Pollen, Helgesen & Mjånes, 2020). These concepts set student as a central person in the learning process and supports students' journey for gathering practical and applied knowledge. It means that all activities are design to approximate concepts and methods the students need for further workplace. Such approaches are usually in close collaboration with the industry or companies that desires to get well educated workers.

The other possibility, or more precise extension of previous concepts is research-based learning (RBL). This concept aspires to motivate student for exploring new concepts, models, connections and relations. The idea is to involve the students in research process, to help them understand and learn not just the practical skills for everyday life, but also the possibilities for changing the world. Universities today have at least two types of activities: education and research. Traditionally education is for the students and the research for teachers. But there is an opportunity to invite students to research. (Lillejord, Børte, Nesje & Ruud, 2018). There are many advantages and disadvantages of this idea, that the authors would like to analyse in this study based on experience in teaching RBL, mentoring and assessing students research projects and inviting students to participate in national and international research.

## 2. Background

One big advantage of RBL is to give the students to participate in discovering and exploring activities, as well as documenting and proving theories (National Academies of Sciences, Engineering, and Medicine, 2015). Students can be motivated by analysing relations between concepts that no one has done before. In today's world, there are not many more islands to find or species to discover, but there are many research fields that are still under explored. Inviting students to the research can give another perspective and new ideas to explore.

"Students as researchers" is a kind of pedagogy focused on the research process. The research can involve the use of teaching and learning methods and the use of practical tasks that relate to research (Anderson and Priest, 2014); teachers should place emphasis on practical and creative thinking skills so that students can carry out their ideas, assess the quality of their arguments or methods, and work as a group on projects.

Students in research should not be treated as subject or elements, but as young scientist that have much potential for development and are eager to learn. The students are not only supposed to acquire own knowledge, but they should participate in something completely new and unknown. It is a common misconception that humanity today knows everything, and when somebody is curious about something it is enough to "google it". Showing students that knowledge is something that needs to be explored, analysed and proved can be beneficial for extending their understanding. Students engage in research, using knowledge gained in or outside the classroom, and then prepare the research process. Involvement in research-based education can encourage students to further develop and critically appraise their experiences (Kincheloe and Steinberg, 1998).

PBL is a teaching approach for letting students acquire skills that cannot, or are difficult to acquire in other way. This method is probably more difficult, since the students are uncertain ground, where no one has been before. That makes it challenging for the supporting teacher/researcher to organize, prepare and guide students towards concrete goals, when the results are not given. In RBL the teacher/researcher should explain the methods which will be used in this project and engage the students in the process by assigning them to a suitable type of research activities. Students, without suitable knowledge, skills and experience, should not do all research work immediately and individually. The process has to be tailored to the student's skills and capabilities (Wulf-Andersen, Mogensen & Hjort-Madsen, 2013).

On the other hand, Cook- Sather (2014) suggests that research partnerships are old-fashioned concepts because they change the way we act and think, and engage in situations that may appear to conflict with common ways of doing things. In this perspective the knowledge the students acquire during research-based learning may not be directly equivalent with practical experience gathered by doing projects and learning already established and proved concepts.

## 3. Description

To involve students in doing research is not an easy task. It should be prepared in detail and according to a plan. A part of the challenge is the expectation. When PhD student is participating in research it is quite normal and even expected, but master or bachelor students have not much experience yet. That does not mean that they should not do research, it only states facts that those students should be guided and supervised through the process, which can be a challenge for the teachers. Master and bachelor students can gain experience through researching and developing skills needed in research. There are some universities which have their research program for students (Andersen, Olesen, Weber, Dybbroe, Andersen, Kampmann, Warring & Meldstad, 2005). Many examples of "students as researchers" can be found in Healey and Jenkins (2009) and Healey, Lannin, Stibbe and Derounian (2013).

There are many international conferences with special session only for student's research, and there are programs within European Union for young researchers. Those kinds of activities have a goal to promote research to younger generations and provide them with necessary resources for exploring and discovering existing research fields and developing new ones.

On Western Norway University of Applied Sciences (HVL) there are some subject in which the students have the opportunity to join research project or to prepare their own. The students are invited to share experience through participation in conferences, meetings, workshops, international research. Some students use the knowledge acquired with implementation or application of research in job-interviews, while others participate in national or international conferences, sometimes even with presenting own projects and publishing papers in Springer. From 1999/2000 till now project-based learning has been part of the learning in the bachelor's degree in automatization engineering. The goal of doing a project each semester is that the assignment or problem should be relevant to the content the students learn about, so that working both with the theory in the subject and in practical application of the project can support student learning and helping them to gain relevant experience.

There are different types of projects, from practical (as preparation of the whole parking system control system - hardware, software, installation and commissioning) to theoretical (as preparation of methods and calculations for battery ferry power plants - with dimensioning of power lines, batteries, schedules, transport possibilities, efficiency calculations and economic return). Sometimes project assessment is not easy due to different content and methods used. This requires the cooperation of many teachers from different subjects. This is time and resource consuming.

As result of projects and inspired with working with RBL some students on HVL participated on sustainable workshops – they present bachelor project amount environmentally friendly using prototype of automated woodworking machine. Some students planned, designed and made prototype of machine for studding of tires for lorries. Other participated in international research about modern communication systems – and limitations in industry data transmission. The results were presented on international conference and published.

In Volda University College (HVO) the research-based learning is used in some parts of teacher education. In some courses for postgraduate courses the students are creating own individual projects in combining programming with didactics research. The students are engaging with own pupils (in primary school) for creating robots. Such student needs to allow own pupils to participate in their projects, support pupils thinking and helping them to develop a final product. A unique robot that they made themselves. At the end of the semester every student need to collect data form own pupils and analyse the data according to own knowledge and experience both in programming and didactics. The data needs to be documented and reflected on in a final rapport that will give be assessed with the final grade of the course.

#### **4. Discussion**

Cook- Sather (2014) uses employee reflections to show that while a partnership between students and employees can be troublesome, both groups can benefit from the cooperation. This applies to both students and staff when they engage in partnerships. Such partnership is not even in the sense that both parties can do the same amount of work, or the work at the same level, but both parties can be beneficial with ideas, creativity and critical thinking. Sometimes there are different perspectives on a problem or a solution that can be discussed and compared. Students involved in research-based education can also transfer these critical thoughts from academic life to everyday life, as discussed in Sharp et al. (20xx).

As Fielding says: "Transformation requires a break with the ordinary, and this requires as much from teachers as from students. Indeed, it requires transformation of what it means to be a student; what it means to be a teacher" (2004, pp. 296). Apart from the often-troublesome aspects of this undertaking, employees and students still must cope with institutional constraints, social problems and lack of resources at the university. This may make a drastic change in pedagogy very difficult in practice and difficult without the support of the institution in which the changes are made. To achieve this, teachers and administration should create time and space in the curriculum, giving students time to work with others on projects, and create assessments that do not require students to remember facts and ideas (Martin & Hodge, 2011).

Research is often expensive (time, money, equipment) – without any guaranty to get back resources. Universities can use own funds – what is not popular – or research funds for example from European Union projects or national funds. The challenge in these situations is that there is a large competition for most of those projects, and participation of undergraduate students does not help to obtain resources since they need to be guided and supervised.

Implementing RBL in study programs in higher education institutions can help the students to organise time and place for research projects. There are institutions that introduces research in courses, in a way that can combine standard curriculum with research projects. The concepts “students as researchers”

is based on experience with such courses and programs (Elmesky & Tobin, 2005). Students as researchers can ask about the curriculum, or more broadly about education: "What is worth knowing here? How do we know this? What benefit do we derive from this knowledge?" (Kincheloe and Steinberg, 1998b, pp. 238). Therefore, planning, structuring research into working plan and communication with students through the project are crucial for their understanding and confidence. Combining RBL with lectures about topics the student research can motivate students for further learning (Andersen et al, 2005)

Another element that should be considered before combining RBL in courses and making students as researchers, is the ethical problems. How to rate student's participation in research? Should they be authors, co-authors of presentation, publication? How big was their impact to project results? All those arguments should be answered before starting the implementation of RBL as part of a course. It happens that students are mentioned as co-authors of articles in trade journals, but they are usually credited for their thanksgiving work. It is rare for students to be fully involved in both writing and reviewing. The full involvement and benefits of the research will not be realised until the reviews and publications are standard expectations of these critical experiences.

## 5. Conclusions

There are advantages and disadvantages of the RBL. The good elements are practical experience, possibility to participate in big, real research group, with communication, collaboration and common responsibility. The gained skills are, according to students' feedback, relevant to job and useful in practice. In addition, cooperation with specialist can increase motivation both to actual and further plan for work, also to teaching. This was observed in discussion with the students on HVL after finalizing the research project. The students want to learn more and ask about further projects.

One of the disadvantages is that not all of the students are interested in research – for many reasons, like not enough time, lack of interest or not enough skills. Another challenge is the plan for the course. To put research into standard course, with detailed curriculum, is very challenging. One problem is the possibility to assess students input and knowledge and grading them. In research it is not so easy to use standard forms of learning outcome, since there are many variables that can affect the results. Therefore, it is necessary to have experienced and active teachers. Teachers without experience cannot motivate and guide the students of "engage to research". The challenge is that typical teachers have not enough skills, while experienced professors have not enough time to work with students.

During many years of teaching and involving students the authors can see some patterns. Most of the students are unsure of new activities. This is an emotion that can prevent them from trying their skills in the research field. Those students need some years of experience and engagement to get involved. It is much easier to achieve if previous students can invite the younger ones.

Research-based learning can be very interesting form of teaching. It can give students competences in collaboration, understanding real problems and solving practical tasks. This method is not for all students and not for all teachers. Participation is not question about personal parameters but independent factors like lack of resources and personal motivation for discovery.

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# THE CHINESE EXPERIENCE IN PROMOTING TEACHER PROFESSIONAL DEVELOPMENT IN DISADVANTAGED AREAS

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## Abstract

Teacher is the quality safeguard of education and the practitioner of education reform. Due to the difference between urban and rural, it couldn't be ignored that teachers are exposed to the dilemma between teaching and training, the weak of teaching ability and the increasingly job burnout in disadvantaged areas in China. It's no doubt that teacher in-service training is the key to promote teacher professional development. However, there are also many problems as well, such as the rarely opportunities to training, the lack of practical content in training, the lower quality of training. In order to give full play to outstanding teachers acting as teacher educators, "Master Teacher Studio" is established. It could promote accumulating teachers' practical knowledge, improving abilities of reflection and teaching research, and alleviating teacher's job burnout, by means of expert lecture, educational research, different teaching for the same course, reading & sharing, reflection & communication. As a kind of teacher learning community, it is important to cultivate outstanding teachers and improve the quality of teachers in disadvantaged areas.

**Keywords:** *Master Teacher Studio, teacher training, teacher professional development, teacher education in disadvantaged area.*

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## 1. Introduction

As an important cornerstone of education, the quality of teachers affects and even determines the quality of education. As Chinese socialist construction enters a new era, the contradiction between the people's demand for high quality education and the unbalanced and inadequate development of education is increasingly prominent. Therefore, improving the overall quality of teachers in rural to provide students with satisfactory education has become a great pursuit of Chinese educational development.

The existing approaches to promote teacher professional development in disadvantaged areas mainly focus on teacher research, teacher reflection, teacher training, expert guidance and teacher learning. Compared with developed areas where are rich in advanced educational resources, rural teachers rarely go out of town to participate in long-time training due to the lack of opportunities and workload. It's also difficult to invite experts to the countryside with the long distance and high cost (Chen & Guo, 2018). There is study revealing that teachers in disadvantaged regions more prefer to discuss their teaching problems with peers and learn from experienced teachers. This harmony teacher cooperation makes up for the shortage of high-quality teacher training resources in disadvantaged areas. Meanwhile, this informal conversation during the rest becomes an opportunity for the development of teachers (Wohlfahrt, 2018). However, it's difficult to give their valid direction to solve the problems because of the low quality in peers. Therefore, in order to give full play to the effectiveness of teachers' cooperative learning, it is necessary to establish a high-quality teacher education resource supply mechanism (Thornton, 2006).

In March, 2018, the Ministry of Education issued "Revitalization of teacher education (2018-2022)", which calls for the establishment of "Master Teacher Studio" in primary and secondary schools, also pay more attention to the superfine teacher and expert teacher who have heavily impact on others. There is also research suggesting that it's necessary to build a teacher group full of leadership that could improve the quality of the whole teacher in disadvantaged areas. Therefore, the Master Teacher Studio must be established to give full play to the leader role of the superfine teachers, leading teacher, expert teacher and other outstanding teachers (Zhu, 2011&2019).

The Master teacher Studio is a teacher learning community composed of teaching, teaching research and training, which is presided over by an outstanding teacher and made up of a certain number of teachers. As a form of teacher training, the Master Teacher Studio has been adopted by Guangdong Province (Hu & Gu, 2011), Gansu Province (He, 2014) and other regions in China. It has the most personalized path of teacher professional development, and it is favored by novice and mature teachers. No doubt, it is worth to looking forward to its prospect (Zhu & Wang, 2012).

## **2. Master Teacher Studio**

In 2002, there are 18 Master Teacher Studios established by the Education Bureau of Baoshan District, Shanghai, that opened the episode of the development of Master Teacher Studio in China. The Master Teacher Studio is a teacher professional community organized and coordinated by the educational administration department or school leaders, named according to the name of the host or professional characteristics (Zhu & Wang, 2012). It is composed of an outstanding teacher, some of mature teachers and novice teachers (Zhu & Yan, 2019). The differences in the number and composition of members lead to different organizational structures of Master Teacher Studio.

It has strict access system and conditions. All the members must pass through strict application, assessment and selection procedures (Wu, 2012). As the host, outstanding teacher is responsible for maintaining the stable implement of the studio, planning the development goal of the studio, designing and carrying out learning activities, evaluating the result of the studio and giving play to the radiation effect of the studio (Hu, 2012). Studio host is usually selected and appointed by the provincial, local or district educational administration according to the candidates' titles and professional development degree. In addition, the selection of member teachers is in full charge of the studio host, mainly in the form of school recommendation, host assessment and free declaration.

The Master Teacher Studio aims at helping more teachers to achieve their development goals (Xu & Miu, 2012). So there are so many activities, including expert lecture, educational research, different teaching for the same course, reading & sharing, reflection & communication and others.

## **3. The advantage of Master Teacher Studio in teacher training**

Education plays a fundamental, guiding and sustainable role in poverty alleviation. Teachers are the foundation of the education and the key to improve the quality of education in disadvantaged areas (Zhang & Fu, 2016). Under the background of the teachers' demand of lifelong learning, teacher training is an effective way to promote teacher professional development (Zhu & Song, 2013). However, compared to urban teachers, there are so many issues in rural teacher training that couldn't be ignored any more. First, the opportunities to the high-quality teacher training are scarce. Overall, most rural teachers go out for training mainly at the district or county, because the provincial-level and national-level Training is untouchable for them. Even worse, a part of teachers has no chance to training any level in their career in western countryside of China (Chen & Wang, 2013). Second, the training quality is unsatisfied without effectiveness. The training is often complained because the trainers, served by scholars, are full of theory but lack of practical knowledge, even they couldn't understand what the trainees experienced in practice especially they from where are completely different teaching situation (Zhang & Wei, 2016). In addition, due to the lack of teaching equipment in disadvantaged area, the knowledge and skills learned by teachers in the training are less transferred in practice, which makes the effect of training on improving the quality of rural education not obvious (Chen & Hu, 2011). Third, the inevitable contradiction between teaching work and training is prominent. There aren't always sufficient numbers of teachers to replace to accomplish daily teaching in rural and disadvantaged areas when teachers go out to take part in training that is remote and long-term (Rong, 2014).

Compared with the traditional teacher training, the Master Teacher Studio is of great significance to teacher professional development in disadvantaged areas. First, it brings high-quality training resources to disadvantaged areas. The studio host, who is possess with profound knowledge, abundant experience and superior ability, makes it possible for others to get access to high-quality training resources. Second, it effectively promotes professional development of each one in community. In view of ecologically orientated teacher development, it tends to focus on developing by constructing relationship between members (Liu & Luo, 2012). Third, the studio host and members are from the same region so that they have the same cultural background, as a result, it is possible for trainees to learn together without the cultural barrier that could be benefit to cross-school communication. The last, it could be more efficient for teacher training. There are weekly learning activities organized by studio host that makes all of problems could be communicated instantly at any time.

## **4. The function of Master Teacher Studio**

The pursuit of Master Teacher Studio is that by attracting a group of teachers with common education ideal to build an excellent team to advocate to educational researches, explore educational principles, spread advanced teaching thoughts and methods (Xu & Miu, 2012), transfer teachers' practical knowledge (Zhu & Wang, 2012), and improve the quality and quantity of the whole teachers by means of taking advantage of outstanding teachers as learning-leaders (Quan, 2009).

#### **4.1. Master Teacher Studio integrates and provides high-quality training resources**

In disadvantaged areas, although it is difficult for general teachers to have direct access to experts and scholars by themselves, Studio host is the important and even the only way for them to get high-quality learning resources. On the one hand, studio host is the supplier as the result of its expertise that the host has own unique teaching experience, structure of knowledge, teaching skills and teacher beliefs, so that it tends to adopt different strategies while facing the same teaching problems (Quan, 2009). On the other hand, it not only provides with high quality training resources, but also knows how to integrate resources to meet the needs of members. The studio host, selected by local bureau of education, is full of social capital because it generally holds administrative positions in school or have intergenerational relations with other outstanding teachers. Therefore, studio host could introduce university or teaching experts into the studio relying on its social capital, so as to help members to broaden their horizons and enrich their learning (Zeng & Zhang, 2016).

#### **4.2. Master Teacher Studio promotes teacher professional development**

The Master Teacher Studio has become the cradle of eminent teachers by promoting teachers to accumulate professional knowledge and improve teaching skills (Han, 2015). Teacher professional development is equal to a process that they obtain practical knowledge (Wang, Xu, 2008). Practical knowledge is a kind of thoughts of education that they believe sincerely and use in practice (Chen, 2009). The core of Master Teacher Studio is to interchange and innovate their practical knowledge among members (Zhu, 2013). There are plenty of activities organized in order that studio host could stimulate members to transfer fragmentary implicit knowledge into systematic explicit knowledge so that pass it conveniently through communication (Shan & Liu, 2015). Moreover, the members' research and reflective ability also are cultivated. In general, educational research is always regard as the privilege of scholars. But now, it was broken through they carry out research for purpose of solving actual problems (Han, 2015). The last, the Master Teacher Studio aims at breaking the "plateau period" in teacher career and explore new development chance (Cui, 2015), by means of making closely contact between outstanding teachers and members. So it could help to activate teachers' agency (Zhang, 2017), recall teachers' identity, alleviate their job burnout (Dong, 2019).

#### **4.3. Master Teacher Studio improves the quality of education in disadvantaged areas**

There is study proposing that it is possible to establish Mater Teacher Studio to promote the development of education in rural and nearby areas (Rong, 2014). Dongying Shengli Central for Education has made progress on improving the quality of teachers by establishing Master Teacher Studio in remote areas of Shandong Province (Ren & Li, 2011). Meanwhile, "Wang Aihua Master Teacher Studio" has also explored an efficient approach to rural teacher training. Wang Aihua, the studio host, takes the elaborated courses and provides valid instruction to countryside. There also some rural teachers are admitted as members in her studio (Wang & Qi, 2019). Therefore, the Master Teacher Studio isn't only to promote teacher professional development. More importantly, it must aim at diffusing the achievements to the wholly district, in order that could promoting balanced education development (Xiao, 2014). In another word, the outstanding teachers who are remarkable and influential should be taken account into promoting teacher professional development as the learning-leader, and their teaching practical knowledge and education wisdom should be also explicated and learned in disadvantaged areas.

### **5. Conclusion**

The Master Teacher Studio is an important practical product of the development of education in modern. As a region-specific teacher training system, it has become an efficient form to promote the development of teachers in disadvantaged areas. As the collection of high-quality training resources, it could improve the quality of teacher by sharing the resources to the whole region, and even gives a hand to the other places. It has gradually formed a model of open-resource teacher training.

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## **PRE-SERVICE ENGINEER EDUCATORS LEARNING MATHEMATICS: MAPPING THE LIVED COMPLEXITY**

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### **Abstract**

In this paper, we adopt a systemic perspective to investigate the teaching of mathematics in ASPETE, which is a tertiary education institute in Greece that offers a two-faceted degree: an engineer degree and a pedagogical degree as engineer educators. We focus on the complex lived reality of first year Electrical Engineers students through a multileveled affective mapping of their studying in ASPETE, including: approaches to study, confidence in learning mathematics, conceptions about mathematics and its role in their studies and career, and views about mathematics teaching effectiveness (considering both what they actually experienced and what they would prefer to experience). The results of our study suggest that the students show a lack of preference for the surface approach (though not combined with a preference for a deep approach), neutral-positive confidence in learning mathematics, whilst they seemed to be satisfied by the teachers' effectiveness. Qualitative differences in the affective relationship with mathematics were identified with respect to the students' approach to study. Finally, the students' conceptions about mathematics seemed to be related with the desired characteristics of mathematics teaching.

**Keywords:** *System, approaches to study, mathematics teaching effectiveness, mathematics conceptions, mathematics confidence.*

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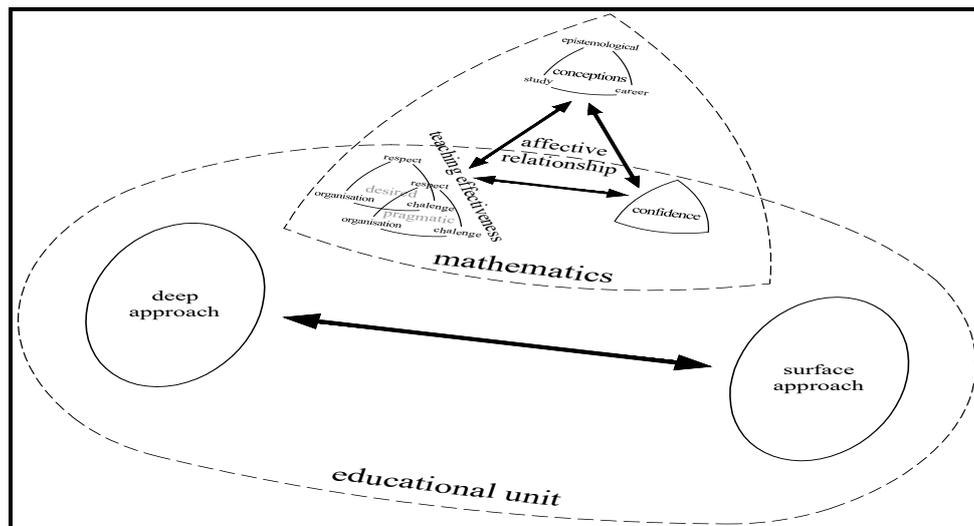
### **1. Introduction**

The modern sociocultural interactions appear to entail a continuously increasing level of quantitative and logical reasoning skills. Moreover, mathematics is at the crux of the contemporary curricula and the broader educational systems, whilst mathematics is also the language of communicating and producing scientific results. In this study, we focus on the role of mathematics in ASPETE, a Greek tertiary education institute, which offers its graduates both an engineer degree and a pedagogical degree as engineer educator (who may teach in vocational high schools in Greece). This inherently two-faceted degree constitutes a complex educational environment. In a broader research project (Mathematics education and Technological Education; MATHETE) we adopted a systemic perspective (Moutsios-Rentzos & Kalavasis, 2016) and built upon previous studies (Moutsios-Rentzos, & Kasimati, 2014) to investigate mathematics teaching and learning in ASPETE. In this paper, we report aspects of that broader project focusing on the lived complexity of first year Electrical Engineers students of ASPETE.

### **2. Mapping the lived complexity of learning mathematics in ASPETE: A multileveled affective mapping**

A system is defined as a complex whole, the parts of which are interrelated towards specific goals, thus significantly differing from a mere "heap" of parts (Bertalanffy, 1968). Hence, ASPETE may be conceptualised as an open learning system, being at the same time a subsystem of the broader educational system and the social system (cf. Kalavasis, & Kazadi, 2015). In this study, we drew upon Moutsios-Rentzos and Kalavasis (2016) to include in our investigations about mathematics the broader experience with studying in ASPETE. Hence, we map the students' relationship with studying in ASPETE, their affective relationship with learning mathematics in ASPETE, as well as their interlinkings. Our approach is diagrammatically summarised in Figure 1.

Figure 1. Learning mathematics in the educational unit: a mapping of the lived complexity (drawing upon Moutsios-Rentzos & Kalavasis, in preparation).



The students' broader studying experience in ASPETE is investigated through their *approaches to study* (Marton & Säljö, 1976), referring to the specific manner in which students respond to a study situation. Two main approaches have been identified: a *deep approach* refers to focusing on the meaning and the ideas contained in a task, whilst a *surface approach* refers to focussing on the superficial characteristics and requirements of a task. In an educational unit, approaches to study may be conceptualised as the result of the constant negotiation between the students' learning characteristics and the requirements of the specific learning environment, as reflected on the students' academic outcomes.

The students' broader studying experience in ASPETE is intertwined with their narrower experience with learning mathematics in ASPETE (see Figure 1). The students' affective relationship with learning mathematics, conceptualised as a *dynamic affect system* (Pepin & Roesken-Winter, 2014), constitutes of three interacting components: a) *conceptions about mathematics*, b) *confidence about coping with mathematics*, and c) *views about mathematics teaching effectiveness*. Considering conceptions about mathematics, we drew upon our systemic perspective to consider mathematics within diverse systems: within the system of scientific disciplines, within the educational system, and within the occupational system. The work of Wood, Petocz and Reid (2012) fits with this, as they investigated the conceptions of undergraduate students about their epistemological conceptions of mathematics, their conceptions about the role of mathematics in their future studies and in their future career. Their findings suggest that the epistemological conceptions about mathematics may be classified as: a) 'numbers/components' (individual and isolated components, techniques and calculations), b) 'abstract/models' (models of the real-world phenomena), and c) 'life' (a way of thinking and interpreting the world). The conceptions about the role of mathematics in their future studies and career, appeared to be: a) practical (focused on calculations, problem solving, and logical thinking), b) generic (referring to a generic mathematical way of thinking and of its importance in studies and career), and c) (lack of) knowledge (referring to the lack of knowing of the exact role of mathematics in studies and career).

Furthermore, we included in our mapping the students' confidence about learning mathematics, as well as their views about effective mathematics teaching. Fennema and Sherman (1976) developed the widely cited Fennema-Sherman Mathematics Attitude Scales, which included a scale that identifies the degree of confidence that an individual experiences with respect to his/her "ability to learn and to perform well on mathematical tasks" (p. 326). Considering mathematics teaching effectiveness, we chose to consider the broader educational literature to obtain a broader perspective to teaching effectiveness (Patrick & Smart, 1998). Furthermore, in our investigations we drew upon Moutsios-Rentzos and Kalavasis (2016) to differentiate the *pragmatic representation* of mathematics teaching effectiveness (referring to the perceived phenomenon as actually occurring in the educational unit) from the *desired/intentioned representation* (referring to the desired state of the phenomenon). Following these, for the purposes of this study, we adapted the research of Patrick and Smart (1998) about teaching effectiveness. They conceptualised teaching effectiveness to consists of three dimensions, namely: *respect for students, ability to challenge students, organisation and presentation skills*. In this project, the tri-faceted conceptualisation of teaching effectiveness was conceptualised to include both a pragmatic representation and a desired/intentioned representation (see Figure 1).

Consequently, in this study, we attempt to obtain a mapping of the lived complexity of learning mathematics in ASPETE, through a multileveled affective mapping. First, we investigate the narrower affective relationship with mathematics; a dynamic affect system including: the students' conceptions (epistemological, studies, career), their confidence about coping with mathematics, their views about mathematics teaching effectiveness (pragmatic, desired/intentioned) and their links. Moreover, we explore the broader relationship with studying in ASPETE through the students' approaches to study. Finally, we focus on the links between the broader and the narrower relationship.

### 3. Methods and procedures

The study was conducted with first-year Electrical Engineer students of ASPETE (N=56; 14 females), in the end of the first semester of the academic year 2018-2019. A five-section questionnaire was employed, including a section about demographic details and four sections about approaches to study, mathematics conceptions, confidence about mathematics and mathematics teaching effectiveness: A) Approaches to study were identified by Revised Two-Factor Study Process Questionnaire (R-SPQ-2F; Biggs, Kember, & Leung, 2001), as employed by Kasimati, Moutsios-Rentzos and Matzakos (2016) with ASPETE students, showing good cross-cultural validity and reliability. R-SPQ-2F consists of 20 (10 for each approach) 5-point Likert-type items. B) The students' conceptions about mathematics were identified through the questionnaire of Wood et al. (2012) as employed by Moutsios-Rentzos and Kassimati (2014) with ASPETE students, showing its good cross-cultural psychometrics. The questionnaire consists of 46 five-point Likert type items organised in three parts, in accordance with the three dimensions it identifies: epistemological (16 items), studies (14 items), career (16 items). C) The students' confidence about mathematics was identified through the Confidence in Learning Mathematics Scale (Fennema & Sherman, 1976), consisting of 12, 5-point Likert type items. D) The students' views about mathematics teaching were modified through a modified version of Patrick and Smart's (1998) instrument. Each of the 24, 5-point Likert type items of the original questionnaire was transformed to a dyad: the first part asking the students to reflect upon the actual teaching and the second part upon their desired teaching reality.

The descriptive and non-parametric inferential analyses were conducted with SPSS 25, including One-sample Wilcoxon signed rank tests and Kendall's tau correlations.

### 4. Results

The results of our analyses are summarised in Table 1. Considering the students' broader experience with studying in ASPETE, though they appear not to statistically significantly prefer a deep approach, they seem to statistically significantly move away from a surface approach.

Regarding their affective relationship with mathematics, all the measured aspects statistically significantly differed from the conceptual neutral (see Table 1). Nevertheless, the differences identified in confidence, the desired/intentioned reality of teaching effectiveness, an epistemological conception (life) and two career conceptions (generic and knowledge) were not large enough to be assigned to a different characterization from the conceptual neutral. Considering the remaining differences, the students' pragmatic representations about teaching effectiveness were on the positive, suggesting their being satisfied by the experienced mathematics teaching in ASPETE. The students appeared to conceptualise mathematics as being abstract models and about techniques and calculations. With respect to the role of mathematics in their future studies, the students appear to identify the practical and the generic aspect of mathematics, whilst they also identify the practical aspect of mathematics in their future career. Regarding the pragmatic representation of teaching effectiveness, the students expressed their statistically significantly positive experiences in respect, organization and challenge.

Subsequently, we investigated the links within the dynamic affect system about mathematics. Confidence was not statistically significantly correlated with any other aspects of the affective relationship. Considering the links between teaching effectiveness and conceptions, statistically significant correlations were found only with the desired/intentioned reality. In specific, lack of knowledge about the role of mathematics in their future career had a statistically significant negative correlation with their desire for more respect ( $\tau=-0.282$ ,  $P=0.039$ ). Furthermore, their preference for challenge in teaching had statistically significant positive correlations with their epistemological conception that mathematics is about techniques and calculations ( $\tau=0.345$ ,  $P=0.011$ ) and is related to life ( $\tau=0.281$ ,  $P=0.042$ ).

Table 1. Learning mathematics and studying in ASPETE: a mapping of the lived complexity.

		<i>M</i>	<i>Mdn</i>	<i>P</i>	<i>Deep approach</i>	<i>Surface approach</i>
<i>Deep approach</i>		3.0 <sup>1</sup>	3.0	0.837 <sup>4</sup>		
<i>Surface approach</i>		2.5 <sup>1</sup>	2.5	0.002 <sup>4</sup>		
<i>Confidence in learning mathematics</i>		3.3 <sup>2</sup>	3.0	<0.001 <sup>5</sup>	$\tau$ 0.281	-0.334
				<i>P</i> 0.027		0.008
<i>Respect</i>	Pragmatic	4.1 <sup>2</sup>	4.3	<0.001 <sup>5</sup>	$\tau$ 0.119	-0.003
				<i>P</i> 0.256		0.979
	Desired/Intentioned	3.3 <sup>3</sup>	3.0	<0.001 <sup>6</sup>	$\tau$ 0.146	-0.231
				<i>P</i> 0.181		0.034
<i>Organisation</i>	Pragmatic	4.2 <sup>2</sup>	4.4	<0.001 <sup>5</sup>	$\tau$ 0.170	-0.057
				<i>P</i> 0.109		0.589
	Desired/Intentioned	3.3 <sup>3</sup>	3.0	<0.001 <sup>6</sup>	$\tau$ -0.034	-0.129
				<i>P</i> 0.762		0.249
<i>Challenge</i>	Pragmatic	3.9 <sup>2</sup>	3.9	<0.001 <sup>5</sup>	$\tau$ 0.147	-0.069
				<i>P</i> 0.162		0.513
	Desired/Intentioned	3.3 <sup>3</sup>	3.0	<0.001 <sup>6</sup>	$\tau$ 0.168	-0.107
				<i>P</i> 0.127		0.329
<i>Conceptions</i>	Number/Components	3.8 <sup>2</sup>	3.8	<0.001 <sup>5</sup>	$\tau$ 0.131	-0.008
				<i>P</i> 0.309		0.950
	Modelling/Abstract	3.9 <sup>2</sup>	4.3	<0.001 <sup>5</sup>	$\tau$ 0.165	0.191
				<i>P</i> 0.210		0.145
	Life	3.3 <sup>2</sup>	3.3	0.008 <sup>5</sup>	$\tau$ 0.033	-0.155
				<i>P</i> 0.800		0.230
<i>Studies</i>	Practical	3.9 <sup>2</sup>	4.0	<0.001 <sup>1</sup>	$\tau$ 0.035	0.099
				<i>P</i> 0.789		0.442
	Generic	3.6 <sup>2</sup>	3.5	<0.001 <sup>1</sup>	$\tau$ 0.004	0.096
				<i>P</i> 0.975		0.460
	(lack of) Knowledge	4.0 <sup>2</sup>	4.0	<0.001 <sup>1</sup>	$\tau$ 0.152	0.181
				<i>P</i> 0.251		0.171
<i>Career</i>	Practical	3.8 <sup>2</sup>	4.0	<0.001 <sup>1</sup>	$\tau$ 0.013	0.130
				<i>P</i> 0.923		0.321
	Generic	3.3 <sup>2</sup>	3.3	0.002 <sup>1</sup>	$\tau$ 0.034	0.104
				<i>P</i> 0.790		0.416
	(lack of) Knowledge	3.6 <sup>2</sup>	3.4	<0.001 <sup>1</sup>	$\tau$ 0.075	0.183
				<i>P</i> 0.561		0.154

<sup>1</sup> '1': never or rarely true of me, '2': sometimes true of me, '3': this item is true of me about half the time, '4': frequently true of me. '5': almost always true of me. <sup>2</sup> '1': strongly disagree, '2': disagree, '3': neither agree, nor disagree, '4': agree. '5': strongly agree. <sup>3</sup> '1': considerably less frequently, '2': less frequently, '3': as frequently as it did, '4': more frequently. '5': much more frequently. <sup>4</sup> One-sample Wilcoxon signed rank test to the hypothesised median "3": "this item is true of me about half the time". <sup>5</sup> One-sample Wilcoxon signed rank test to the hypothesised median "3": "neither agree, nor disagree". <sup>6</sup> One-sample Wilcoxon signed rank test to the hypothesised median "3": "as frequently as it did". <sup>7</sup> Kendall's tau  $\tau$  non-parametric correlation.

Finally, we investigated the links between the broader experience with studying in ASPETE and their narrower experience of learning mathematics in ASPETE (see Table 1). Confidence was statistically significantly positively correlated with the deep approach and negatively correlated with the surface approach. Thus, it appears that the students who in general prefer to learn about ideas and meaning are also more confident with learning mathematics. Moreover, surface approach was statistically significantly negatively correlated with a preference for challenge in teaching. This may be related to the fact that respect for teaching is not clearly related to the subject matter of the teaching itself and, therefore, is conceptually incompatible with the surface approach.

## 5. Discussion and concluding remarks

In this paper, we discussed a multileveled affective mapping of the complex lived reality that the first year Electrical Engineers of ASPETE experience with respect to mathematics. We adopted a systemic approach to include in our investigations the broader experience about studying in ASPETE. We proposed a dynamic affect system, including confidence in learning mathematics, their conceptions about mathematics and its role in their studies and career, and their views about mathematics teaching effectiveness (considering both what they actually experienced and what they would prefer to

experience). The results of the conducted analyses in general accorded with and enriched previous studies (Moutsios-Rentzos, & Kasimati, 2014; Kasimati, Moutsios-Rentzos, & Matzakos, 2016; Wood, Petocz, & Reid, 2012) revealing, for example, that the students show a lack of preference for the surface approach (though not combined with a preference for a deep approach) and that they consider mathematics as being mainly about models and techniques. Moreover, they expressed a neutral-positive confidence in learning mathematics, and they appeared to be satisfied with the actual mathematics teaching, identifying area for improvement. Furthermore, our approach allowed for investigations both within the affective system and, importantly, between the affective system and the broader experience. Considering the mathematics affective relationships, the students' conceptions about mathematics seemed to be related with the desired characteristics of mathematics teaching. For example, those who consider mathematics more relevant with their everyday lives, would like more mental challenges in the teaching of mathematics. Moreover, it seems that the lower the conception of the exact role of mathematics in their future careers, the greater the desire to have more respect in teaching. Finally, confidence and surface approach appeared to be the main links between the broader and the narrower level of experience. Following these, it is argued that the proposed approach accords with the existing findings, allowing at the same time to *meaningfully* extend these investigations to include further relationships and inter-relationships. Consequently, current investigations within the broader research project (MATHETE) focus on systemic investigation about teaching and learning mathematics in ASPETE.

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## EVALUATION OF FACTORS THAT INFLUENCE SCHOOL FAILURE IN A GROUP OF ADOLESCENTS IN IASI COUNTY

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### Abstract

**Introduction:** school activity is characterized by high physical and mental demands. Any failure to adapt these requests to the possibilities of the age group can be associated with school failure. **Material and method:** the study was carried out on a group of 208 students from the 9th grade from a National College in Iasi (54 students), a National College in Pascani (80 students) and from an Economic High School in Iasi (74 students). A questionnaire regarding school activity and the causes of the phenomenon of school fatigue was applied. The results were processed using Pearson's chi-squared test. **Results and discussions:** The students are constantly preparing only for certain subjects (72.59%). The young people from the National College in Iasi stand out, as we find numerous answers of "I do not continuously prepare for any subject", so the calculated differences are statistically significant ( $p < 0.01$ ,  $f=4$ ,  $\chi^2=14.254$ ). In most cases (65.86%) adolescents admit that they have been trained how to study only in certain subjects. In the students from the National College in Iasi there are few explanatory answers in all the disciplines, so the calculated differences are statistically significant ( $p < 0.001$ ,  $f=4$ ,  $\chi^2=19,465$ ). Young people study for pleasure only in certain disciplines (86.53%). At the National College in Iasi there are no students who study for pleasure in all disciplines, so the differences obtained are statistically significant ( $p < 0.05$ ,  $f=4$ ,  $\chi^2=11.072$ ). Fatigue is often present in 58.65% of students, with significant differences between high schools ( $p < 0.05$ ,  $f=4$ ,  $\chi^2=11.807$ ). The students attribute the occurrence of this phenomenon to the numerous subjects they have to study (55.76% - statistically insignificant differences), the large volume of homework (51.92% - significant differences) and insufficient sleep (48.55% - statistically insignificant differences). **Conclusions:** there are many factors that generate school failure that must be known and carefully assessed in order to reduce the frequency of this phenomenon.

**Keywords:** School failure, fatigue, demanding activity.

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### 1. Introduction

In Romania, in the past few years, we have witnessed a drastic decrease in the number of young people graduating high school and passing the baccalaureate exam. It is a school failure situation that is becoming worrying. The indicators used to assess this phenomenon are represented by the early abandonment of studies, the gap between the student's potential and their results, abandoning school without a qualification and failing the final exams. The appearance of the phenomenon of school failure is favored by a number of factors related to the student, school or family (Cosmovici & Iacob, 2008).

Of the factors that regard the student, health must be given special attention. We must be aware of certain organic diseases, physical or sensory deficiencies and some individual psychological factors. In adolescents, the aspects related to nutrition and physical exercise become essential due to the current beauty ideal represented by the thin young woman and the muscular young man (Nagata, Ferguson & Ross, 2016; Salam, Das, Lassi & Bhutta, 2016). Particular attention should be paid to overweight students who will be the target of their colleagues' jokes. This will make them focus too much on their own body and isolate themselves (Abălașei & Trofin, 2016).

The school environment must ensure lasting social development, to practically guarantee the progress of society. In this sense, it is necessary to find the answers to the following questions: what are the characteristics that need to be structured to ensure the adaptation of young people to the new requirements; what kind of education do students need, to contribute to the progress of society in the future; which are the skills, information, and attitudes that are needed to ensure a better future (Xie, 2018).

The school has many roles; it also decisively contributes to promoting healthy eating, physical exercise, ensuring the physical and mental health of students, developing social relationships and avoiding the tendency of isolation (Sabinsky, Hostgaard Bonde, Sternqvist, Jessen -Klixbüll, Maindal & Tetens, 2018).

Particular attention should be paid to the school syllabus and the teaching method of the teachers. The teaching method must be oriented towards the student, in the direction of obtaining the expected results.

Teachers must focus on the issues related to the best teaching methods, methodologies and techniques. They must ask themselves the question (and find the answer) "How to teach?" and not the one related to the curriculum, "What to teach?" (Sousa, 2019).

The family plays an important role in the life and evolution of the young man. At present, it is also necessary to assess the relationship that exists between family and school. In the traditional model, the teachers carry out their activity in isolation, in their own style. Lately, we are witnessing some changes related to the structure of a close relationship with the family, the interaction between school and family. In many schools parents are invited to be part of the school program, to have the feeling of belonging (Palmieri & Palma, 2017).

## 2. Objectives of the study

Evaluation of students' learning method; assessment of the involvement of teachers in the instruction of the students on the learning method and the interest of the students for school activity: knowing the presence of the phenomenon of school fatigue and of the factors that generate it.

## 3. Material and method

The studied group consists of 208 students from the 9th grade from a National College in Iasi (54 teenagers), a National College in Pascani (80 young people) and from an Economic High School (74 students) in Iasi. Pascani is a small town located 60 km from Iasi. The city of Iasi has a large number of inhabitants, while also being the county capital. The National College in Iasi is an elite high school for Iasi County and even for the entire country.

The students completed a questionnaire with questions regarding the school activity and the causes of the phenomenon of school fatigue. School activity was assessed with the help of 3 questions. "Do you study continuously, without losing a lesson?" - yes, in all subjects; only in certain subjects; I am not constantly preparing myself for any subject. "Did the teachers explain how to learn and solve the problems in the studied discipline?" – yes, in all subjects; only in certain subjects; no, in none of the studied subjects. "Do you study for pleasure?" – yes, in all subjects; only in certain subjects; no, in none of the studied subjects.

Fatigue was assessed with the help of two questions. "Do you feel tired? - often; rarely; never." "What causes your fatigue?" (choose the answers that you think are most important) - subjects are too difficult; the classes are too numerous (every day or during the week); the large volume of homework; I don't get enough sleep;

Also concerning the problem of fatigue, we will address issues related to the number of hours of sleep per night (under 8 hours; 8-9 hours; over 9 hours).

The results were processed using the Pearson CHI square test.

## 4. Results

We will address two basic aspects related to school activity and the presence of fatigue.

Sustained school activity strains the student from a neuropsychological and physical point of view. Obtaining meritorious school results can be achieved only under the conditions of a systematic study in all subjects. Unfortunately, such a situation is present in only 16.82% of young people. In most cases, students pay attention only in certain subjects (72.59%) (Table 1).

*Table 1. Learning method of students.*

School	Pascani College	Iasi College	Iasi High School	Total
yes, in all subjects	14	7	14	35-16.82%
only in certain subjects	61	34	56	151 – 72.59%
I am not constantly preparing for any subject	5	13	4	22 – 10.57%

Our attention is drawn to the 10.57% of students who are not constantly preparing for any subject. Such answers are more frequent at the Iasi College, so the calculated differences are statistically significant ( $p < 0.01$   $f=4$ ,  $\chi^2=14.254$ ). It is a surprising result given that the college in Iasi is an elite school.

Students receive explanations on learning methods only in certain studied disciplines (65.86%), so only from certain teachers (Table 2).

Table 2. Frequency of explanations received by students on learning methods.

School	Pascani College	Iasi College	Iasi High School	Total
yes, in all subjects	29	4	27	60-28.84%
only in certain subjects	50	45	42	137-65.86%
I am not constantly preparing for any subject	1	5	5	11 -5.28%

We can observe that 28.84% of teenagers chose the “yes, in all subjects” answer. Such answers are less frequent in those from the college in Iasi, so the calculated differences are statistically significant ( $p < 0.001$   $f=4$ ,  $\chi^2=19.465$ ).

Most of the students study for pleasure only on certain subjects (86.53%), with only 3.84% studying seriously in all subjects (Table 3).

Table 3. The number of students who study for pleasure.

School	Pascani College	Iasi College	Iasi High School	Total
yes, in all subjects	2	0	6	8-3.84
only in certain subjects	75	45	60	180-86.53%
I am not constantly preparing for any subject	3	9	8	20 -9.61%

There are young people who do not study for pleasure in any discipline, a situation which is alarming. Such a response occurs more frequently in students from the Pascani college, the differences calculated being significant ( $p < 0.05$   $f=4$ ,  $\chi^2=11.072$ ).

Intense school demands lead to certain responses from the body and fatigue. Fatigue is often felt by 58.65% young people (Table 4).

Table 4. Frequency of fatigue.

School	Often	Rarely	Never
Pascani College	43	36	1
Iasi College	42	11	1
Iasi High School	37	35	2
Total	122	82	4
%	58.65%	39.42	1.92

For students from the college in Iasi the dominant answers are “often”, so the calculated differences are statistically significant ( $p < 0.05$   $f=4$ ,  $\chi^2=11,807$ ).

Students attribute fatigue to the large number of hours in the school program (55.76% - with insignificant differences among schools  $p > 0.05$ ,  $f=2$ ,  $\chi^2=1.330$ ), to the high volume of homework (51.92% - significant differences  $p < 0.05$ ,  $f=2$ ,  $\chi^2=6,900$ ) and the reduced number of hours of sleep per night (48.55% - insignificant differences  $p > 0.05$ ,  $f=2$ ,  $\chi^2=3.353$ ) (Table 5).

Table 5. Causes attributed by students to the occurrence of fatigue.

School	Pascani College	Iasi College	Iasi High School	Total
subjects are too difficult	23	15	24	62 – 29.80%
the classes are too numerous	48	27	41	116 - 55.76%
the large volume of homework	34	27	47	108 - 51.92%
I don't get enough sleep	36	32	33	101 - 48.55%

Insufficient sleep is one of the factors that cause fatigue. In students, the normal number of hours of sleep per night is 8-9 hours, an answer which is present only in 29.80% of situations. In most cases (66.82%) students sleep fewer than 8 hours per night, which is not physiological and explains the onset of fatigue (Table 6).

Table 6. Hours of nighttime sleep.

School	Pascani College	Iasi College	Iasi High School	Total
Under 8 hours	44	37	58	139 – 66.82%
8-9 hours	32	17	13	62 – 29.80
Over 9 hours	4	0	3	7 -3.36%

Most students from the Iasi College sleep fewer than 8 hours per night, the differences calculated being statistically significant ( $p < 0.01$   $f=4$ ,  $\chi^2=12.334$ ).

## 5. Discussions

Concerning school activity, the workstyle of each student is very important. In the studied group there are many students who systematically study only certain subjects and who enjoy studying certain subjects. There are numerous differences between students in a class that have to do with the characteristics of physical development, intelligence, interest, perception, abilities, learning style and personality. Starting from these aspects it would be necessary to adapt the lesson plan to the students' learning style and speed, and not focus on collective education (Kubat, 2018). If these aspects are not taken into account, we may reach a situation similar to that of the students in the studied group where in 9.61% of cases they do not study for pleasure any subject in the school syllabus.

Learning style is influenced by a number of psychological, physiological, emotional, social and environmental factors, so the talent of the teachers is essential in solving these problems and in finding the best methods of teaching and stimulating the students (Ozdemir, Alaybeyoglu, Mulayim & Uysal, 2018).

In solving these problems, an essential role rests with the teachers who can instruct the students on learning methods in each discipline of study. Unfortunately, in the studied group most of the answers (65.86%) are for explanations "only in certain subjects". This is where the experience of the teachers comes in, as well as their working environment represented by job satisfaction, the recognition of efforts, their well-being (De Stasio, Boldrini, Ragni & Bacile, 2019).

School activity is inherently associated with the occurrence of fatigue of greater or lesser intensity. In the studied group, fatigue is most often present in 58.65% of students. We notice the students from the Iasi College, an elite high school, where competition is a basic element and where fatigue is more prevalent. In the case of students from computer science high schools in the area of Moldova, fatigue often appears only in 42.39% of situations, the dominant answers being "rarely" (50.54%) (Albu, Dima, Dorofte & Abdulan, 2017). At technical colleges, fatigue occurs mostly "rarely" (53.76%), "often" representing only 34.17% of the total responses (Albu, Dima & Badaluta, 2017).

We must pay attention to insufficient sleep, as it can lead to chronic fatigue. In adolescents the recommended number of hours of sleep per night is 8-10, which is recognized by only one third of the questioned students. In a study also carried out on teenagers from high schools in Iasi, the situation is even worse because only 16.87% answers of "8-9 hours" and 7.17% answers of "more than 9 hours" are present. Practically, only 25% of students have an adequate number of hours of sleep per night (Albu A., Hodorca R.M., Onose I., Negrea M. & Cracana I., 2016). In a study carried out on adolescents in Ecuador, 72.1% of young people do not comply with the rules regarding sleep duration. This is a worrying result because in Brazil's adolescents there are only 39% cases of insufficient sleep, and in Argentina 49%. In these young people the average sleep duration is 7.96 hours for younger students and decreases for older students down to 7.08 hours (Villa-González, Huertas-Delgado, Chillón, Ramirez-Vélez & Barraco-Ruiz, 2019).

In Rhode Island adolescents, the average sleep duration is 8.79 hours, so it is a better result compared to adolescents in Ecuador (Miller, Janssen & Jackson, 2017). In adolescents from Japan in 2017, the number of cases of sleep under 6 hours was 43.9% much higher compared to the one obtained in 2003 of 36.6% (Yamamoto, Ota, Minematsu, Motokawa, Yokoyama, Yano, Watanabe and Yoshizaki, 2018).

Special attention should be paid to students who have insufficient hours of sleep because they can easily reach the point where they use substances that remove the feeling of chronic fatigue and even some legal drugs such as coffee, alcohol and tobacco (Baciu 2019; Miller, Janssen and Jackson, 2017).

## 6. Conclusions

It is necessary to pay special attention to the way students adapt to school requirements. In the studied group there are many young people who do not constantly prepare for all subjects and who study for pleasure only certain subjects. A particular problem is the one related to teaching style because the students received explanations on learning methods only in certain subjects.

Fatigue is present in most students, but students from elite high schools are most exposed to this reaction. A particular problem is that of fatigue, which is due to the large number of hours in the school program, the large volume of homework and insufficient sleep. Insufficient sleep is a problem for most students because it favors the onset of chronic fatigue followed by school failure.

Such studies are essential for maintaining the health of the students and ensuring the expected school results.

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# THE CONTRIBUTION OF DRAMA AS AN ALTERNATIVE TEACHING APPROACH TO REFUGEE STUDENTS

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## Abstract

Differentiation is nowadays a rule in contemporary education, as it is generally accepted that today's classrooms are mixed ability classrooms and present heterogeneity in the interests and the characteristics of the children, their abilities and skills. Consequently, there is an urgent need for differentiating the educational process in order to respect the evolutionary stage and the needs of all students, as well as encourage active participation of them and academic achievement. The school provides the foundations for the educational process and for this reason the trainees must follow some basic principles that will form the basis for a successful project. Learning is a creative process that is constantly being built and the goal of education must be to seek a pedagogical act that helps students broaden their spiritual horizons, develop important skills such as critical thinking and, through experimentation and active participation, lead them to a joyful conquest and experience of knowledge. This study aimed at exploring the use of differentiated pedagogical techniques, focusing on drama techniques, for teaching Greek vocabulary in refugee students who learn Greek as a foreign language.

**Keywords:** *Drama techniques, refugee students, vocabulary, differentiation, education.*

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## 1. Introduction

There are many examples of the role that arts have traditionally played in the education, particularly in teaching foreign languages (Giebert, 2014, p. 138). Research has shown that arts in education encourage the conflation of the content of teaching as well as the active participation of the students as they respond to a variety of learning styles. It is also generally accepted that arts support social development of children, as through them the first find their voices and use them without fear, providing opportunities to boost self-confidence (Rachel & Jonathan, 2006). In addition, arts play a fundamental role in teaching and learning, providing students with challenges and opportunities to explore their own questions and take responsibilities (Goldberg, 1997).

One of these forms of art is also drama, which has positive effects on teaching different subjects especially in preschool age where learning fields are varied and student becomes a multi-message receiver (Winston & Tandy, 2001). The benefits of using drama as an alternative teaching method vary from the socio-emotional and mental development of the children to the enrichment of the vocabulary in the process of learning a foreign language (Rubin & Merrion, 1996). Research has shown that drama can help students broaden their spiritual horizons, develop important skills such as critical thinking and through experimentation and active participation, lead them to a joyful conquest and experience of knowledge (Dickinson & Neelands). At the same time, drama enhances the self-confidence of children and help in socialization, teamwork and co-operation and finally it is a source of pleasure, joy and satisfaction (Rachel & Jonathan, 2006).

## 2. Purpose and theory

### 2.1. Purpose of study

The purpose of this study was to explore the use of drama as an interdisciplinary approach, in order to teach Greek as a foreign language to refugee students and also to evaluate a series of courses using drama techniques. The study aimed at exploring the use of differentiated pedagogical techniques, focusing on drama techniques for teaching Greek vocabulary in refugee students attending their first year of primary school in Greece. In the process of learning a foreign language, vocabulary is one of the most important and basic elements, as the conquest of it gives the speaker the opportunity to have a

conversation but the insufficient vocabulary knowledge can often cause problems in both written and oral communication (Saville-Troike, 2012, p.10). Therefore, it is important for teachers to support students in the process of learning new vocabulary in a variety of ways, diversifying teaching and adapting the program to the respective conditions (Wizel, 2018). It is also important to have high expectations for all children without discriminating about their potentials and offer them a range of different and equally important learning perspectives (Rubin, 1996).

## **2.2. Theoretical background**

Lev Vygotsky was a psychologist who is best known for his sociocultural theory of Development, according to which a person's cognitive development is largely influenced by their surrounding culture (McLeod, 2007). Vygotsky believed that cognitive development is not a direct result of activity but it is indirect, as other people, who are more knowledgeable and skilled must interact with the learner to facilitate the learning process and then, cognitive development may occur. He believed that language plays two critical roles in cognitive development. It is the main means by which adults transmit information to children and becomes a very powerful tool of intellectual adaptation. According to Vygotsky, educators can progressively advance the learning process by giving students tasks that they cannot do easily on their own and providing them with the guidance they need to accomplish these tasks that are included students' zone of proximal development (McLeod, 2007). As the psychologist explains "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978). It is therefore important for teachers to be able to identify children's zone of proximal development, so that they can offer them experiences that fall into it and thus achieve the best possible result (Leat & Nichols, 1997).

## **3. Methodology**

### **3.1. Research design and participants**

The most appropriate method for the service of the purpose above was considered to be the case study, as this method provides data taking into account the complexity of social conditions and is a research strategy that investigates a phenomenon within its real-life context (Cohen, Manion & Morrison 2013). Participants were 25 mixed-ability students, aged 6-12, including male and female and were all refugees who have Persian as their native language. The Greek writing and oral proficiency of most students was at the intermediate and low levels.

The preparation was divided into two parts. In the first own 8 course plans were developed and evaluated, only 4 of which were based on drama techniques and the rest were based on traditional education methods. Each course aimed at learning new Greek vocabulary related to some general topics such as the animals, the weather, school. The second part included two educational seminars for teachers who were involved in the research, during which they became familiar with the drama techniques and their use in education.

### **3.2. Data collection and analysis**

The data collection was based on the development and the implementation of the courses which were evaluated by non-participant observation as well as by the use of interviews conducted at the beginning and at the end of each course, so as to identify the number of new gained words.

## **4. Results**

The analysis of the results was made by counting and comparing the data from the interviews and recording the frequency and quality of the participation of the children during the courses. In order to evaluate the effectiveness of the courses, student's answers were analyzed before and after them and their comparison was made as follows:

1. Vocabulary comprehension (new gained knowledge).
  - a) Conceptual understanding.
  - b) Ability to recall the new words.
2. Active participation and interaction of the individual with the group.

The following tables illustrate the result of the comparisons for the conceptual understanding and construction of new vocabulary. The results showed (Table 1 and Table 2) that when teaching is based on drama techniques, students have better chances to learn new vocabulary than when it is based on typical forms of education.

Table 1. New vocabulary gained by courses using traditional pedagogical methods.

Teaching in the traditional way	Vocabulary knowledge before the courses (words)	Vocabulary knowledge after the courses (words)	New gained knowledge (words)
Course 1: My school	5	9	4
Course 2: Objects	4	7	3
Course 3: Farm Animals	6	14	8
Course 4: The weather	6	15	9
<b>Total new gained knowledge (words)</b>			<b>24</b>

Table 2. New vocabulary gained by courses using drama techniques.

Teaching using drama techniques	Vocabulary knowledge before the courses (words)	Vocabulary knowledge after the courses (words)	New gained knowledge (words)
Course 1: Halloween	4	12	8
Course 2: Food	3	14	11
Course 3: Jungle Animals	7	31	24
Course 4: Space	6	25	19
<b>Total new gained knowledge (words)</b>			<b>52</b>

Similarly, from the comparison of the figures below (Table 3 and Table 4) it is clear that the total time of children's active participation during each course is much longer when this is based on drama techniques. Based on the analysis of the observation and the interviews collected during the research, was noted an increase in the ability of students to recall new vocabulary without much support from the teacher, in the implementation of this vocabulary and in the ability to use it in written and oral language. Furthermore, an increase was also noticed in the teamwork and the cooperation of the students since drama gave them much more opportunities to work together.

Table 3. Time of children's participation in courses using traditional pedagogical methods.

Teaching in the traditional way	Time of children's participation
Course 1: My school	11 min
Course 2: Objects	8 min
Course 3: Halloween	5 min
Course 4: The weather	7 min

Table 4. Time of children's participation in courses using drama techniques.

Teaching using drama techniques	Time of children's participation
Course 1: My school	18 min
Course 2: Objects	25 min
Course 3: Halloween	20 min
Course 4: The weather	26 min

## 5. Discussion

The analysis of the data reinforces the encouraging results already mentioned, in relation to teaching new vocabulary, since it seems that the use of drama techniques not only enhances the demystification and recall of the new vocabulary, but also the exploitation of this new knowledge in different circumstances as well as the active participation of the students during the course. It is clear that drama can create memorable and practice-oriented learning experiences that improve learners' language-competence and personal development. Therefore, the results highlight the importance of differentiating teaching so that each student has the opportunity and the means to enrich his vocabulary to the maximum extent.

However, in order the learners to benefit from these techniques, their teachers need to be familiar and comfortable with drama at school. Usually teachers don't feel confident to use a method they have not been trained in (Gaudart, 1990). Thus, it is necessary to strengthen the teachers, through formal and informal training, to enhance and enrich their teaching practices with drama techniques. Also, creating an online platform that will allow teachers to communicate, share and exchange material as well as examples of good practices would be a useful tool. Such a platform would offer opportunities for teachers to share material and exchange ideas, which will help them, use their time more effectively.

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# TEACHERS' PREPAREDNESS AND EXPERIENCES IN TEACHING MEIOSIS TO GRADE 12 LEARNERS IN LIMPOPO PROVINCE

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## Abstract

Over the years, learners have failed to perform satisfactorily in the final examinations in Grade 12 Life Sciences in South Africa. Examination reports have consistently cited the poor performance by learners in questions on meiosis and related topics. In a qualitative case study research design, three Life Sciences teachers were purposively selected to determine their preparedness and experiences in teaching meiosis to Grade 12 learners. Data collection involved administration of a test on meiosis, observation of each teacher four times whilst teaching meiosis and interviewing each teacher once. Teachers' test scores were analysed using descriptive statistics and observations and interviews were coded manually. The findings showed that only one teacher possessed satisfactory levels of the content required to teach meiosis and was very versatile in her teaching. One teacher relied heavily on the textbook, the other employed teacher-centred approaches. The findings provide implications for in-service teacher professional development.

**Keywords:** *Meiosis, life sciences, teacher preparedness, teacher experiences.*

## 1. Introduction

In this paper we seek to determine teachers' preparedness and experiences in teaching meiosis to Grade 12 learners. Notably, teachers' efficacy in making concepts accessible to the learners is of paramount importance. Based on such imperatives, the current study draws from Botha and Reddy (2011)'s postulation that good teaching entails a deep and comprehensive knowledge of subject matter knowledge and an understanding of alternative ways of presenting such knowledge to learners. In this case, the teachers' knowledge and understanding of meiosis and their abilities to devise and deploy the pedagogical resources appropriate to teaching such concepts is important.

According to the National Senior certificate 2018 Diagnostic Report, performance of learners in Life Sciences final examinations has not shown any significant improvement particularly for 40% and above achievement level. In fact, there was a decline from 52.1% to 51.7% for learners in this category from 2017 to 2018. Learners' performance on meiosis and reproduction were way lower compared to other topics in the 2018 Life Sciences Examination Paper 1.

Research in South African schools, showed that teachers were still using direct transmission (chalk and talk) as a way of teaching (Rogan, 2004). In order for learners to understand concepts of meiosis, and to allow learners to expand their knowledge and observe the relationships between related concepts to meiosis, it is important that the science teacher acquires knowledge in multiple areas to ensure those concepts are integrated by using a variety of teaching strategies and instructional methods (Botha & Reddy, 2011). The purpose of the current study was to determine teachers' preparedness and experiences in teaching meiosis to Grade 12 learners. The following research questions guided the study: 1. How well prepared are teachers to teach the topic meiosis to Grade 12 learners? 2. What are the teachers' experiences in teaching meiosis to Grade 12 learners?

## 2. Literature review

Previous studies have proved that the concept of meiosis is so difficult that even university students find it very challenging to understand (Murtonen, Nokkala & Södervik, 2018). The difficulties these students experience, might have emanated from the way they were taught the same topic in their high school years. Teachers may transfer their misconceptions to their learners (Hashweh, 1987). According to the South African Curriculum and Assessment Policy Statement (2011) the concepts on meiosis start from Grade 10 with the cell structure and function and the role of organelles; and in Grade 12 with DNA as the code of life, and meiosis which then further extends to gametogenesis under the topic Human Reproduction.

In a study to examine major sources of misconceptions and learning difficulties in genetics amongst school learners, Longden (2010) found that some learners' misconceptions were related to the nature of the concepts in genetics, such as the frequent representation of meiosis by fixed inanimate stage diagrams. These problems could also be pedagogical in nature in that the time between the presentation of some of the concepts in meiosis and those in genetics is too wide that learners forget and fail to make connections (Longden, 2010). In a study to examine difficulties Biology teachers face in teaching cell division in the secondary schools in Turkey, Öztap, Özay and Öztap (2003) found that biology teachers perceived cell division as one of the most difficult topics. In particular, teachers isolated meiosis as the most complex concept to teach compared to other concepts on cell division.

### 3. Conceptual framework

The study used Pedagogical Content Knowledge (PCK) as the lens through which teachers' preparedness and experiences could be assessed and interpreted. This is because PCK is the ability by teachers to transform the subject matter knowledge they possess into powerful pedagogical forms (Shulman, 1987). The researchers adopted Mavhunga's (2012) Topic Specific Pedagogical Content Knowledge (TSPCK) model to explicate the teachers' transformation of the concepts on meiosis. PCK is both an external and an internal construct, as it is constituted by what a teacher knows, what a teacher does, and the reasons for a teacher's actions.

### 4. Methodology

The study employed a qualitative case study research design which shares its philosophical foundation with the interpretive paradigm. The interpretive paradigm supports the view that there are many truths and multiple realities. As observed by Schwandt (2011) this type of paradigm focuses on the holistic perspective of the person and environment which is more congruent with the worldview studies.

#### 4.1. Selection of participants

Using purposive sampling technique, three Life Sciences teachers from three different schools of Limpopo province were selected. These teachers had taught Grade 12 Life Sciences for more than three years in which meiosis is one of the topics. Within three years of teaching meiosis, teachers should have developed and established the competency in teaching the topic. Table 1 shows the three teachers' profiles.

Table 1. Teacher profiles.

	Teachers' pseudonyms		
	Bridget	John	Sarah
Gender	Female	Male	Female
Age	51	34	54
Qualification	Diploma	Bachelor of Education	Diploma, Bachelor of Arts & BEd honours
Teaching experience	26	7	28
Experience in teaching Grade 12	5	3	11

#### 4.2. Data collection and analysis

Multiple methods of data collection were used to ensure methodological triangulation (Merriam, 1998). A test was first administered to the three teachers to determine their conceptual understanding of meiosis. The test required teachers to demonstrate their knowledge of meiosis as they differentiated, illustrated, identified and explained chromosomes under different stages of meiotic division. Test items came from activities in the textbooks teachers used to teach Life Sciences to Grade 12 learners. Secondly, each teacher was observed four times whilst teaching different concepts on meiosis. Non-participant observation method was appropriate as it allowed observation of teachers' practices in "real life" classroom contexts (Genzük, 2003). Thirdly, each teacher was interviewed once using a semi-structured interview schedule to get clarity especially on the issues that the researchers did not understand during classroom observations. Analysis of documents such as teachers' lesson plans for each teacher was done. Data analysis involved descriptive statistical analysis of the test scores and coding of data from interviews and lesson observations using Saldana (2009) manual. The different teacher knowledge domains in the TSPCK model (Mavhunga, 2012) were used to assess how well-prepared the teachers were to teach the topic. Validation of the findings were done through member checking.

### 5. Findings

The findings are presented in three sections that follow.

### 5.1. Teachers' preparedness in teaching meiosis to grade 12 learners

Table 2 shows the teachers' scores in the test they wrote on some concepts on meiosis, which shows a wide range between the three teachers' performance.

Table 2. The three teachers' scores obtained from the test on meiosis.

	Teachers' scores	
	Out of 55	Percentage
Bridget	17	31
John	31	56
Sarah	51	93
Average	33	60

From the table it shows that both Bridget and John had poor content knowledge regarding meiosis and only Sarah possessed satisfactory levels of the content required to teach meiosis to Grade 12 learners. From the test scripts it was evident that Bridget only answered questions whose answers she knew and avoided any questions with unfamiliar content. Her reason was,

I did not prepare for this test because it is not my responsibility as a teacher to know what is in the textbook. I am not the one who will be writing the examinations at the end of the year. This is the responsibility of the learners.

It is disturbing that Bridget had such negative attitude towards continued learning because the Framework for K-12 Science Education and Next Generation Science Standards (NGSS) (2013) indicate that all teachers need to acquire new knowledge and skills regardless of their qualification and experience. Bridget was the only one without a degree qualification as she only had a diploma qualification, which then explains her poor content knowledge of the concepts on meiosis.

There is however a discrepancy between John's levels of content knowledge, considering that he had a degree in Biology education and at the same time he was the youngest, meaning that he could have covered those concepts at both high school and university modules. This confirms Ball, Thames and Phelps (2008)'s justification of the need for teachers' continued learning of content since content knowledge for teaching is different from the content knowledge acquired during university learning. Sarah had the highest score, which could be explained by her higher qualification (BEd honours degree), continued exposure to the content on meiosis, as she had the longest teaching experience (28 years) and particularly 11 years in teaching Grade 12 content.

### 5.2. Teachers' experiences in teaching meiosis to grade 12 learners

Sarah's lesson plans were the most comprehensive compared to other teachers' lesson plans with details of expected learning outcomes, how she would introduce the concepts, how she would develop the lesson to ensure learner acquisition of the content and inclusion of assessment activities to check for learner understanding of meiosis. During lesson observations, Sarah used guided instruction (Magnusson, Kracijk & Borko, 1999). Sometimes she used a video to introduce the concepts on meiosis, and then asked probing questions, which stimulated learners' interest. Sarah explained the concepts whilst involving learners in group activities, which engaged learners throughout the lessons. When asked why she taught in that way, Sarah justified her active involvement of learners when she said, "When learners become actively involved in their own learning, they experience science in a different, interesting and enjoyable way; they will be able to think critically, solve problems and be able to work with other learners". She also justified her frequent use of questions as a way of assessing learners' understanding throughout the learning process. Her teaching was learner-centred.

John's lesson plans had the basic required components such as the aims and objectives, which guided the scope of the content of his lessons. John followed the sequence of the content as given in the learners' textbook. In one of the lessons for instance, John introduced the lesson by showing learners a picture of a child with Down Syndrome. He then asked, "Which abnormality is this?" Instead of building up his lesson on this, John just explained concepts on meiosis such as karyogram, chromatin, chromatid, karyotype, reduction division, without making proper reference to his introduction. John justified his excessive use of learners' textbook as the only source of content, examples and activities when he said, "It is easy for the learners to follow the textbook while they study at home by themselves". The main characteristic of John's teaching was teacher-centredness; but, he sometimes allowed his learners to share their ideas and frequently asked topic related questions. His engagement with learners took the form of a simplistic dialogue based on interaction-response-feedback. Though John had taught Life Sciences for seven years, he had taught Grade 12 content for only three years, which made him teach like a novice.

Bridget's lesson plans were sketchy. When observed teaching, Bridget did not engage learners, other than giving them page numbers to read from the textbook without any guidance. She also tasked them to write an activity in that same textbook soon after reading. Bridget justified her teaching strategy when she said, "It is not my responsibility as a teacher to know the content, learners are supposed to read and know the content while the teacher is only responsible for 10%, which is to check if learners are

doing well". Bridget did not guide learners on what to look for when reading or interpret the instructions and questions, and even brainstorm on the activities with the learners before assigning learners some work. The main characteristic of Bridget's teaching was largely textbook-centred. Learners were left to do everything by themselves without the guidance of the teacher.

### **5.3. The relationship between teachers' knowledge of meiosis and their teaching practices**

In this section, the teachers' Topic Specific Pedagogical Content Knowledge (TSPCK) is assessed, which Mavhunga and Rollnick (2013) denoted as responsible for teachers to pay particular attention to certain aspects of the content of the topic (meiosis) in relation to what learners already know and with respect to topic structure. The focus is specifically on how the teachers structured the content and their knowledge of learners' difficulties in learning meiosis, and the teachers' identification and use of appropriate teaching strategies for specific concepts within the topic meiosis. The three teachers had taught in these schools for a number of years, as a result, they were considered to be knowledgeable about their teaching context, which informed their teaching. For instance, Bridget pointed out that her learners came from poor socio-economic background and had problems in understanding and communicating in English, which is their second language. Unfortunately, her teaching did not take into consideration those learners' difficulties.

From the interview responses and lesson observations it depicts that Bridget had poorly developed PCK to teach meiosis. This is also evidenced by her low score in the test on concepts on meiosis. This is confirmed by Lee (1995) who pointed out that because of poor subject matter knowledge, a science teacher relies solely on the textbook as a teaching tool and avoids class discussions which could give learners autonomy to explore further and ask questions.

Unlike Bridget who failed to identify specific concepts under meiosis that her learners had difficulty in, John and Sarah identified crossing over and random segregation; and differentiating meiosis 1 from 11. According to John, these concepts are very abstract and unfamiliar to the learners. Based on his low test score (56%) and his limited experience (3 years) in teaching the topic, John's presentation of lessons was mostly teacher-centred. This confirms his poor TSPCK because in a study to determine South African physical sciences teachers' perceptions of new content in a revised curriculum, Ramnarain and Fortus found that the teachers who had difficulty in conceptualising the new topics shifted their pedagogy towards more teacher-centred approaches which provided them with more authority and autonomy in managing learning.

Sarah displayed well developed PCK when planning, teaching and assessing learners' understanding of the concepts of meiosis. She was knowledgeable about the concepts on meiosis.; she was very versatile in responding to learners' difficulties; and used various teaching strategies that engaged learners.

## **6. Discussion**

From the findings, it shows that out of the three teachers, only one teacher possessed adequate content knowledge level to teach concepts on meiosis. One teacher showed a negative attitude towards continued learning. Bridget's teaching was textbook-centred and John's one was teacher-centred. Though classroom teaching experience is an important factor in enhancing teachers' PCK (Drechsler & Van Driel, 2008), the findings showed that experience alone is not adequate for effective teaching because the two most experienced teachers, Bridget and Sarah, taught differently and showed a wide range of variation in PCK development. This can be explained by previous researchers who in relating subject matter knowledge to classroom practices indicated that subject matter knowledge is considered as a prerequisite to and the main source of PCK (Lemberger, Hewson & Park, 1999). Bridget had limited knowledge of the concepts on meiosis, which made it difficult for her to explain it clearly to her learners.

## **7. Conclusions**

The study investigated Life Sciences teachers' preparedness and experiences in teaching the topic meiosis to Grade 12 learners. The findings showed that only one teacher had adequate knowledge about meiosis. The other two teachers showed lack of knowledge on the concepts of meiosis. As a result, their teaching was compromised in that one teacher relied heavily on the textbook and the other teacher used teacher-centred methods, which denied learners an opportunity to engage in the teaching and learning process. We conclude that teachers' confidence in knowledge of the concepts to be taught determines how they teach the learners. The confidence comes from teachers' preparedness in terms of subject matter knowledge and pedagogical skills. The study contributes significant information to the field of Life Sciences education in that the level of teacher qualification to teach a subject should be taken seriously. In-service teacher professional development programmes are inevitable.

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## VALUE OF EFFECTIVE FEEDBACK TO CANDIDATES LEADS TO IMPROVING THE LEARNING GOAL

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### Abstract

Feedback is designed to respond to candidates' work in an online environment and/or face-to-face environment. University faculty members can give feedback to candidates in many ways such as oral and written responses with attached notes for improvement. For the purpose of clarity and accountability, feedback in written form is preferred in most academic settings. In order for candidates to know how they are performing, feedback is necessary. Using a qualitative study, these researchers provided a perspective of what graduate candidates thought about the feedback that was rendered to them by faculty and faculty members gave their own views regarding the rendering of effective feedback being given to graduate candidates. Emphases for this study included best practices, ways to give online and off-line feedback timelier. The major finding suggested that there was a disconnect between what candidates and faculty members thought about how feedback was given. In this study, the findings further suggested that faculty members felt that candidates received feedback very well and timely feedback on work presented. However, candidates felt overall that feedback was not done timely enough so that their work could be improved upon in the class now, not after candidates leave the class. In conclusion, faculty members must do a better job giving helpful, relevant feedback and must give feedback timelier were the common words expressed by candidates.

**Keywords:** *Effective and timely feedback, perspectives, learning outcomes.*

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### 1. Introduction

Feedback is an invaluable respond to candidates' work at the university. Faculty members need to provide candidates with feedback to explain their grades and the improvement of a task performed but more importantly faculty members need to help candidates use feedback to promote their learning throughout their time at the university. Feedback given by faculty members can help candidates recognize the value of feedback and how feedback can assist candidates in being more productive on current and later coursework assignments for productive learning. The feedback from faculty members can help clarify requirements and expectations for candidates' coursework and to discuss how each assignment connects to candidates' learning experiences. The feedback to candidates can help faculty members too, to realize how to gauge the level of instructional services to candidates in an improved manner. It is important to note the question is what works best in the teaching and learning environment and the importance of constructive feedback being given to students (Atherton, 2011).

In order for candidates to know or to receive some sense of the quality of their work, feedback is necessary. It is important to give candidate feedback on work performance, faculty should frequently give formative assessment feedback to candidate so that candidates have the opportunity to improve their performance. Formative feedback techniques include many interactive classroom activities, homework and surveys. Formative would also be weekly or bi-weekly assessment of candidates' performance. By way of contrast, summative feedback typically falls at the end of a topic or semester. It provides an evaluation of how much a student and the class has learned and is often connected to a grade for the course. However, effective feedback formative or summative by faculty members should provide candidates with specific information about their performance based on a prescribed rubric for the course and activities within the course (Shute, 2008).

### 2. Best practices for feedback

It is important for faculty members to stay focused on why the feedback is being given, just in case the candidate has questions about the feedback. Always be professional in selecting words for

feedback to candidates. The guiding principle for feedback should be candidate-centered and should be objectively given in a professional manner and timely (Cowan, 2003). All feedback to candidates should focus on the work completed or ongoing work on a project engaged by candidate and the academic needs of the candidate. If the quality of the work needs improving, give specific suggestions how candidates may wish to rewrite or clarify their work. It is important too, to give all feedback on candidates' work that would help candidates to move closer to the target expectation. Feedback should be descriptive not negative or judgmental by faculty members and faculty could look at what feedback appears to work best for different candidates' needs (Atherton, 2011).

### 2.1. Statement of the problem

For this study, graduate candidates have expressed that faculty members overall do not give feedback to them in a timely manner in order for candidates to improve their learning experiences in various courses. A critical review has shown that 40-60 percent of doctoral students do not finish programs of study, because they have not received needed advisement, feedback and general support from faculty members concluded that high attrition of doctoral students results in loss of time, talent, and finances for the university, the faculty and doctoral candidate themselves. Effective feedback and advisement have contributed to candidates staying in college; therefore, support to candidates in very important (Orrell, 2006).

### 2.2. Purpose of the study

The purpose of this qualitative study is to provide a perspective of what graduate candidates think about the feedback that is rendered to them by faculty and what are the views of faculty member regarding the rendering of effective feedback being given to graduate candidates. This study is to make a true awareness to faculty that there is a need for faculty members to do a better job supporting candidates' needs by giving meaningful feedback timelier.

### 2.3. The framework and process for giving feedback practice

A feedback framework seeks to demystify the process of reviewing performance in the workplace and student learning environment. Feedback is a common evaluative response to candidates' work for the purpose of improving the quality of the work performed by candidates. Feedback on assessments is an integral feature of effective and efficient teaching and learning and can be one of the most powerful ways in which to enhance and strengthen candidate or student learning in a helpful manner (Cain, 2019). Feedback enables learning by providing information that can be used to improve and enhance future performance. The purpose of a typical framework is to establish a series of protocols for feedback which set expectations for feedback on assessment as part of the implementation of the learning, teaching and assessment strategy such as being specific, prescriptive, positive and professional. The intention is not to inhibit the academic success of courses by micro-management or over simplification, but to provide a broad framework to encourage sound practices and guidelines for staff and students.

### 2.4. Research questions

This study was led by the use of qualitative inquiry narrative questions as follows:

**Candidates:** 1). *Do you feel that the feedback given to you improved your skills and knowledge?* 2). *Do you feel that the courses taken and the ways that these courses were taught were aligned with educational leadership practices at the building or district level?* 3). *Do you feel that online or a hybrid platform was an effective learning experience instructionally speaking?* 4). *Was feedback given to you in a timely manner?* 5). *Do you feel comfortable asking faculty members for help, when you have a need?*

**Faculty:** 1). *How would you rate your different types of communicative feedbacks given to candidates?* 2). *What types of platforms have you used to give feedback to candidates?* 3). *Do you give positive and unfavorable feedback to candidates in written form?* 4). *Do you enjoy using different types of platforms to delivery instructional services to students?* 5). *Do you submit feedback to candidates in a timely manner?*

### 2.5. Limitation of this study

This study included only one comprehensive university, n=29 graduate candidates and n=6 graduate faculty in the leadership department.

## **2.6. Assumptions**

It is assumed that participants in this study have provided honest responses, because their identification (name and university) will be concealed and their confidentiality preserved (Simon & Goes, 2013).

## **2.7. Significant of this study**

This study is significant because it gives candidates clear guidance as to how to improve their learning when giving feedback in a timely manner from faculty members. Feedback can also improve a student's confidence, self-awareness and enthusiasm for learning at all ages. Effective feedback can help candidates to seek post-graduate studies, to present work in a comfort manner at conferences at the state and national level. The university faculty members can aid the transition to higher education opportunities to support student retention and give students the desirability or motivation to pursue, for example, a terminal degree for knowledge, skills and career advancement.

## **2.8. Literature review**

Historically, the quality of education that graduate students receive is greatly enhanced if candidates receive appropriate feedback in their various classes. Candidates may receive different types of feedback in courses from various faculty members; however, feedback should be given timely and for the purpose of improving candidates' learning experiences. There are several types of feedback such as: informal, formal, formative, summative, peer, self and constructive. It is important to know the effectiveness of the different types of feedback (Poulas & Mahony, 2007). Each has its place in enhancing and maximizing candidates' learning experiences, thus where possible, courses could provide opportunities for a range of feedback types. There could be a combination of feedback types as mentioned. In this study, many faculty members stated that they would sometime encourage self and peer evaluation in various courses in order to give candidates time to review and reflect on their own performance (Carless, 2006).

## **3. Giving online feedback**

Today, the use of e-feedback can provide faculty members with the opportunity to review candidates' work online in a timely manner. It is the belief by some researchers that e-feedback is very effective, because faculty members can quickly review candidates' work by using email feedback, audio, blackboard platform, screen-casts feedback and also by using a blended learning approach for feedback. Using online feedback has the following advantages: software is in place for use by faculty members and computers could be programmed to give ongoing feedback tirelessly and serve as an interactive tool for candidates' use. Candidates can focus on and digest comments at a time of their choosing in the absence of their peers when e-feedback is given (Piccinin, 2003). Also, feedback is more legible than written comments by hand. Electronic feedback can help candidates to refer to cumulative comments as they move through the curriculum. Candidates may find greater engagement with electronic feedback. There are also two major types of effective feedback such as elaboration and verification. Elaboration feedback gives the candidate relevant cues toward correcting the task assignment and verification is given if the answer is correct or incorrect as an immediate response (Hummell, 2006).

## **4. Methodology**

This qualitative inquiry narrative study sought to gain a perspective from graduate candidates and faculty members on the value of effective feedback. The research for this study involved the use of survey and one-on-one interviews using open-ended questions.

### **4.1. Research design**

This study used a qualitative narrative approach by submitting electronic brief survey with graduate candidates and conduct an interview face-to-face with faculty members who taught graduate courses. Also, conducted in-depth interviews, read documents, and look for themes; in other words, how does an individual story illustrate the larger life influences that created it (Braun & Clark, 2006). Often interviews are conducted over weeks, months, or even years, but the final narrative doesn't need to be in chronological order. Rather it can be presented as a story (or narrative) with themes, and can reconcile conflicting stories and highlight tensions and challenges which can be opportunities for innovation. The qualitative narrative approach for this research, because the researchers looked at and recorded individual experiences.

## 4.2. Participants

This research used a very small sample  $n=29$  doctorate candidates/graduated participants and  $n=6$  graduate faculty members whom all gave their perceptive on effective feedback. This qualitative inquiry narrative study only focused on graduate candidate and graduate faculty members in the Department of Educational Studies and Leadership at a comprehensive university in mid-Western location of the United States. The researchers used data survey questions for each group of participants.

## 4.3. Instrumentation

The survey information and questions were taken from the Post-training Evaluation Survey form, Published on: 28 Jan 2019 by Aris Apostolopoulos, ©IMS Survey, 2019. These survey questions came from sections of IMS that included course, structure, delivery, design and outcomes.

## 4.4. Reliability and validity

Reliability for qualitative research lies with consistency. A margin of variability for results is tolerated in qualitative research provided the methodology and epistemological logistics consistently yield data that are ontologically similar but may differ in richness and ambience within similar dimensions. Validity in qualitative research means “appropriateness” of the tools, processes, and data. Whether the research question is valid for the desired outcome, the choice of methodology is appropriate for answering the research question, the design is valid for the methodology, the sampling and data analysis is appropriate, and finally the results and conclusions are valid for the sample and context (Bansal & Corley, 2004).

## 4.5. Collection of data

For this qualitative study data were collected from  $n=29$  students and  $n=6$  faculty members participated in this study from January 10 thru 25, 2019. Data collection for this qualitative study comes in the form of participants’ observations and generalizations, with conclusions drawn from these observations.

A total of 40 candidates were surveyed electronically initially, but only 29 electronic responses were returned and all 6 faculty members participated fully in this study. The participating faculty members were surveyed before classes started during the pm. Interviewing process was audio-taped and transcribed verbatim between 40 minutes and a total of 3 hours among the 6 faculty members.

The six (6) faculty participants for this study were faulty members who taught graduate courses full-time at the comprehensive university located in the mid-Atlantic region of the United States. The purpose of this study was to hear the voices of faculty and their feedback experiences and perspectives of the voices of graduate candidates. The faculty participants were seasoned individuals in graduate degree programs in the department of educational studies and leadership and who had taught graduate courses for seven to eleven years.

The researchers documented codes and linkages based on thematic analysis provided a rich and detailed account for formal data analysis (Braun & Clarke, 2006). The analyses of this study were based on an inductive approach that focused on emergent themes that were derived from the surveys and interviews. The survey responses and interview transcripts were analyzed using coding categories, or common themes as referred by Bogdan and Biklen (2007) as, “words and phrases developed to be used to sort and analyze qualitative data” (Bogdan and Biklen, 2008, p. 271).

## 4.6. Results and findings

### *Findings from Common Themes Derived from Students*

1. Confidence Building and Motivation: When feedback is given in helpful in a professional manner I am motivated to learn more and the feedback could help me when taking future graduate courses.
2. Proofreading and Assessing my Own Work: Will be motivated to learn and will be confident with new or challenging experiences.
3. Acceptance of Constructive Feedback: More open-minded about feedback given if it is useful.
4. Timely Feedback: Too many faculty members do not give feed timely and frequently enough in order for candidates to improve in that specific course.
5. Technology Use: Perhaps more faculty member should use more types of technology to give feedback timelier to students.

### *Findings from Common Themes Derived from Faculty*

1. Feedback Rating Overall: Feedback is given to candidates frequently to improve their writing skills.

2. Delivery System of Feedback: Give feedback when candidates are assessed mid-term and the end of the semester.

3. Communication: Give feedback on papers by writing helpful comments on candidates' paper.

4. Timely Feedback: Yes, I give feedback timely to candidates.

5. Online Platform: I may use sometimes a form of online ways to give candidate feedback.

Findings further suggest, that faculty members felt that candidates received feedback very good and timely feedback on work presented. However, candidates felt overall that feedback is not done timely enough so that their work could be improved upon in the class not after they leave the class. Also candidates felt, if faculty members used more technology platforms, faculty members could perhaps respond more timely with needed feedback to candidates.

## 5. Conclusion

Measuring the quality or effectiveness of feedback is important. It is essential to look at some known qualities of effective feedback based on research. Different references or comments may give various types of feedback. However, the effectiveness of the most common feedback can occur when the behavior of candidates change based on the intention of feedback from faculty members. The overall intent of feedback is to assist candidates with improving the quality of their work. Feedback should be given to encourage and motivate candidates, too. It is hoped that this experience would help to move candidates toward continuous progress related to their educational learning goals (Shute, 2008). However, faculty members can best serve candidates and students by providing clearly written feedback electronically and/or handwritten in a timely manner in order to help candidates and students to improve their performance (Kulhavy, 2009).

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# TOEIC SCORE PREDICTION ACCORDING TO STUDENT'S LEARNING PERFORMANCE ON UNIVERSITY ENGLISH COURSES

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## Abstract

With the development of globalization, "English" has become an important international language. The test of English for international communication (TOEIC) was established in 1947 by the Educational Testing Service (ETS). The test is designed for non-native English people. The TOEIC score represents the familiarity of the subjects in communicating with others in English in the international workplace. The TOEIC is based on the English language of daily life in the workplace, so it is often used as the industry's standard for measuring the English communication of job applicants.

The study object is students of the Department of Applied English from the University of Technology, Taiwan. The department uses the students' TOEIC of simulation score as an assessment tool to check the student's learning effectiveness in the four years of college. The purpose is to ensure that the student's workplace English communication ability meets the needs of the industry and strengthen the student's employment ability.

For understanding students' TOEIC performance in advance, the learning performances of required English courses (at least three courses) in Grade 2, 3, and 4 were collected and applied to predict their TOEIC scores. The traditional linear model, linear regression (LR), and an advanced nonlinear machine learning model, support vector regression (SVR), were used and compared in this study. Comparing the true TOEIC scores and the prediction TOEIC scores, the average absolute differences of LR are between 21 and 63. The average absolute differences of the nonlinear models, SVR, are between 14-34, whose range is quite small. Hence the prediction of SVR is more accurate than the traditional and linear model, LR. The prediction results can help teachers to understand students' abilities. Teachers can provide some personalized teaching materials according to the predicted achieved results of students to increase students learning performance on TOEIC.

**Keywords:** *TOEIC, learning performance prediction, machine learning, artificial intelligence.*

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## 1. Introduction

In order to connect with the world, "English" has become an important international language. In 2019, the Taiwan government proposed the "Blueprint for the Development Taiwan into a Bilingual National by 2030". The policy aims to build Taiwan into a bilingual country by 2030 and enhance the competitiveness of Taiwanese nationals to enhancing their English proficiency (National Development Council, 2019), which shows the importance of English to Taiwan.

Moreover, companies gradually pay attention to English communication skills in the workplace, and English communication has become an important skill in the workplace due to the connection with the world. There are many ways to identify English ability in Taiwan, such as TOEIC, GEPT, Cambridge Assessment English, TOEFL, CSEPT and other tests. The test methods and expressions of different tests are different according to their goals. TOEIC scores are for identification. When a job seeker (or employee) is familiar with English in an international workplace environment, the industry often uses it as a standard to measure the job seeker's English communication level.

The participants of this research test are students from the Department of Applied English at a university of technology in Taiwan. The department uses TOEIC as a tool to check students' learning effectiveness and has a graduation threshold. Students must have a TOEIC of 750 points (CEFR B2: high class) before graduation, that ensures students' workplace English communication ability meets the needs of the industry, and strengthen students' employability in the workplace. In terms of learning effectiveness check, after the students are enrolled, the department will conduct a TOEIC simulation test on each semester. We hope students can gradually achieve TOEIC 750 points or more in English course training.

Hence, this study wants to understand whether students' scores of TOEIC can be predicted by the scores of courses in the university. Moreover, the department can help students whose predicted scores are below a certain criterion.

## 2. Literature review

### 2.1. TOEIC

The test of English for international communication (TOEIC) was established in 1947 by the Educational Testing Service (ETS). The test is designed for non-native English people. The TOEIC score represents the familiarity of the subjects in communicating with others in English in the international workplace, it is often used as the industry's standard for measuring the English communication of job applicants.

TOEIC® is divided into TOEIC® Listening and Reading Tests and TOEIC® Speaking and Writing Tests. In the listening part, you will listen to various questions and short conversations recorded in English, and answer multiple-choice questions based on what you hear. The reading section requires reading various topics and answering multiple-choice questions based on incomplete sentences, incorrect recognition or text completion, and reading paragraphs (Donald E. Powers et al., 2013). The oral test is to present and express the content of six types of test questions and give a review score after digital recording. The writing test is to pass three types of test questions and must organize words or articles that fit the situation. In this study, we use the student's listening and reading simulation scores to analyze data.

### 2.2. Linear regression (LR)

Regression analysis uses the linear relationship between two variables for interpretation and prediction. LR is to analyze the linear relationship between the independent variable (X) and the dependent variable (Y) (Qiu, Hao-Zheng, 2013) when the linear relationship hypothesis holds, and the linear variable is called simple linear regression (SLR), more than one independent variable is called multiple linear regression (MLR). The purpose is to find a function that can best represent all the observed data, and point out the relationship between the variable and the phase we want to understand. In addition to explaining the past data, we can also predict the future value of the dependent variable from the independent variable. The function equation is:  $y = \beta_0 + \beta_1x + \varepsilon$  ( $\beta_0$ : intercept,  $\beta_1$ : slope,  $\varepsilon$ : error) (Lu, Hui-Fen, 2017). This study uses multiple linear regression for prediction.

### 2.3. Support vector regression (SVR)

Nonlinear regression is widely used in various fields and is an extension of linear regression. When the dependent variable (y) and the independent variable (x) cannot be presented in the form of a linear function, and the various curves of different types appear on the graph, the analysis is performed by nonlinear regression. The solution of nonlinear regression is divided into linearization and non-linearization. The linearizable regression model refers to the process of transforming it into a linear regression model independently, such as Multiplication Model and Reciprocal Model; the nonlinear regression model can be converted to a certain function to make it becomes a linear function. Therefore, it is necessary to use the nonlinear model to calculate the change of the estimated value (T.H. Lin, S.S. Lai, 2007). The more common non-linear regression prediction models such as the quadratic curve equation, exponential curve equation, and Logistic curve equation produce multiple models (Lu, Hui-Fen, 2017).

SVR is derived from Support Vector Machine (SVM), which is one of the nonlinear regression models, the purpose is to find out the most hyperplane in space to accurately predict the distribution of data (Lu, Hui-Fen, 2017) Is a learning algorithm based on the principle of structural risk minimization (Kong, Fan-Yu, et al., 2007). SVR can be divided into linear support vector regression (LVR) and nonlinear support vector regression (NLVR). It uses training data to establish regression equations that the testing data or the minimum error prediction result. The regression equation is  $f(x) = (wx) + b$ ,  $w \in R$ ,  $b \in R$  ( $w$ : weight vector,  $b$ : constant) (Lu, Si-Xian, 2015, Lu, Hui-Fen, 2017).

## 3. Methods and results

In this study, multiple linear regression (MLR) and support vector regression (SVR) were used for analysis. This study collects the final performance of required subjects (at least three courses) and the TOEIC simulation test courses with every semester for students in the second to fourth grades. This study uses the R program to predict and analyze the listening, reading and total scores of the TOEIC. The required subjects courses of the department are progressive teaching, which mainly cultivates students' five basic skills of listening, speaking, reading, writing, and translating in English, so as to gradually improve the passing rate of graduation threshold for students with TOEIC. The course map is shown in Figure 1.

Figure 1. Required Course Map.

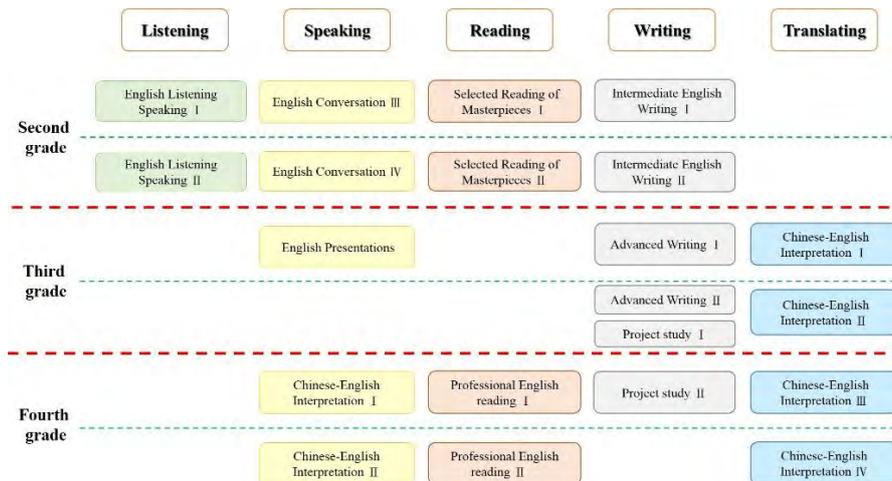


Table 1. RMSE of LR and SVR.

Grade	Second grade		Third grade		Fourth grade	
	Semester	Autumn	Spring	Autumn	Spring	Autumn
LR	Listening	42.7710	55.8744	36.9909	79.0964	41.7422
	Reading	40.1051	39.3890	47.8523	63.8081	25.1763
	Total	62.0870	80.5034	70.7357	133.0488	45.4825
SVR	Listening	31.3008	37.1885	28.8447	23.5114	41.3727
	Reading	33.3493	30.2924	39.2760	33.5456	22.0953
	Total	41.2312	54.9448	55.0252	38.0821	40.0228

Table 2. MAE of LR and SVR.

Grade	Second grade		Third grade		Fourth grade	
	Semester	Autumn	Spring	Autumn	Spring	Autumn
LR	Listening	28.1674	43.1615	28.8514	28.1674	33.2461
	Reading	29.6696	31.5038	40.7336	29.6696	21.6283
	Total	45.8481	63.8348	54.2891	45.8481	38.3814
SVR	Listening	16.6184	24.1239	20.6457	16.6184	19.0205
	Reading	20.5391	18.2430	25.7040	20.5391	14.3539
	Total	27.5920	34.8158	33.3631	27.5920	20.6807

The linear regression analysis results show that the "English Conversation" course and the "English Listening Training" course have a significant help on the listening test scores of the TOEIC, and the "Advanced Writing" course has a significant help on the reading test results of the TOEIC because of the corresponding p-values of coefficients are below than 0.05. With each grade of the TOEIC test, as the grade improves, the listening test and reading test results will interact with the test results of the previous semester.

Compare MLR and SVR, in the root mean square error (RMSE), the value of MLR is bigger than SVR. For example, in the third-grade spring class, the total score of LR is 133.0488, SVR is 38.0821, the value of SVR is much smaller than LR. As shown in Table 1. In the mean absolute error (MAE), MLR is between 21 and 63, and SVR is between 14 and 34 in Table 2. Comparing both, the range of results of SVR prediction is smaller and more accurate than the prediction results of MLR.

#### 4. Conclusion

The research results show that the prediction result of SVR analysis is more accurate than the prediction of MLR analysis. Hence, we suggest the department can analyze and predict the TOEIC scores of students at the end of the semester. Moreover, the department can provide additional courses or workshops in the summer or winter vacations for the students whose scores below certain criteria. In addition, teachers can provide some personalized textbooks according to the students' expected achievements to improve the students' academic achievements on TOEIC, as a basis for checking students' learning effectiveness.

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## TEACHER ENHANCEMENT OF INTERACTIONS IN LIFE SCIENCES ENGLISH-SECOND-LANGUAGE LEARNERS CLASSES

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### Abstract

Classroom interactions shape the teaching and learning process in science classrooms and can be influenced by the language of teaching and learning, and the teachers' choice of teaching strategies. Teaching Life Sciences to English-second-language learners can be a challenge when learners do not have a rich vocabulary of the medium of instruction. The use of English language by second-language-speakers have a negative impact on meaningful classroom interactions especially in the case of township school learners. Previous researchers alluded that Africa remains the only continent where formal education is conducted in instructional languages that are foreign to most learners and their teachers. In particular, some researchers found that poor performance of South African learners in science and mathematics are related to deficiencies in the language of instruction. Interactions encourage the exchange of talk, teachers' and learners' roles and simultaneously develops learners' cognition skills for effective communication in the science classrooms. Through sharing their own ideas, learners co-construct new scientific knowledge. Not only do these English-second-language speakers struggle with the medium of instruction which is different from their home languages, they also struggle to understand the technical and non-technical language of science, which compounds the problem. The current study sought to document how teachers assist learners in such classroom contexts. The study was guided by the research question: How do teachers assist learners in enhancing meaningful interaction in life sciences classrooms with English-second-language learners? In a qualitative case study, two Grade 11 Life Sciences teachers were purposefully selected from two different schools. Each teacher was observed whilst teaching two lessons to a Grade 11 Life Sciences class and then interviewed once to make a total of four lesson observations and two interviews. Data was analysed using Saldana (2009) manual coding. The findings showed that teachers engaged learners in question and answer sessions, debates, class discussions and class presentations to motivate them to communicate their ideas. Code switching was also used to explain the concepts in both English and learners' home languages. Some of the teachers acknowledged that learner participation was minimal due to their lack of fluency in English. Classroom interactions improved when learners were allowed to discuss in their home languages. The findings help in building a repertoire of teaching strategies teachers can employ in a class of English-second-language speakers.

**Keywords:** *Classroom interactions, life sciences, English-second-language speakers, township.*

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### 1. Introduction

With the importance of English in today's world, teachers look for a significant method to meet the demand of learners using this language for communication. However, the use of the English language by second language speakers may have a negative impact leading to ineffective classroom interaction (Lee, 2000), especially in the case of township school learners. This is because township school learners are second if not third speakers of the English language and having to learn sciences in English may have an impact in learners not fully participating in the teaching and learning, and resulting in less classroom interaction. Language of instruction is a powerful tool of transmitting knowledge and communicating within a classroom (Resane, 2016), because it ensures active and positive classroom interaction between learners-teachers and between learners-learners. According to Yore and Treagust (2006) the utterances of both teachers and learners within a classroom are important in ensuring effective teaching and learning and positive learner interaction in class. However, the utterances need to be on a common ground and uttered in a common language to ensure understanding.

## 2. Literature review

According to Wells and Arauz (2006) classroom discourse, language use and interaction are the basis of good teaching and learning. Teachers' ability to fuse all of them within the teaching and learning will ensure active learner participation within the lesson. Classroom is a built atmosphere where formal learning process takes place. It is an important environment where learners and teachers, learners and their peer groups come into contact to share information in their quest for knowledge, this relates to. Classroom interaction involves reciprocal actions that take place in a room between the teacher and the learners. This implies that the teacher formally instructs the learners, while the learners react in response to the teacher's instruction. According to Poonam and Sarita (2017) classroom interaction refers to the interaction between the teachers and learners and amongst the learners in the classroom. This interaction is a practice that enhances the development of two very important language skills which are speaking and listening. Main purpose of classroom interaction is encouraging the learners to communicate with their peers and teachers easily. The role of the teacher is to create an enabling learning atmosphere inside the classroom that motivate learners to come out with new ideas related to the topic.

The use of interactive technologies, including smartphones, tablets, interactive whiteboards, and classroom response systems by teachers have generated active discussions that focus on enhancing classroom interaction of learners and their learning performance and abilities (Gikas & Grant, 2013). Many teachers use these interactive technologies because their versatility and mobility may afford learners active and collaborative experiences in the classrooms. However, not all South African schools have access to such advanced interactive technologies. Many teachers apply various techniques in their classroom with the aim of enhancing interactions within their classes. The various techniques which teachers apply in their respective classes create a borderless classroom which enables the students to freely explore knowledge without limits or boundaries. The study sought to answer the research question: How do teachers assist learners in enhancing meaningful interaction in these life sciences classrooms?

## 3. Methodology

The study used a mixed method research design (Creswell, 2014), which is a combination of both quantitative and qualitative research designs. The use of this design was appropriate as it combined the strengths of both quantitative and qualitative methods to compensate for their limitations (Pluye & Hong, 2014). Using the quantitative method, the researcher collected data through classroom observations, analysed, and interpreted the data to determine the methods teachers use in enhancing meaningful interaction in Grade 11 life sciences classrooms with English-second-language learners. In addition, the researcher also collected qualitative data through interviews to authenticate the actions observed in the lessons and any misunderstanding that were encountered.

### 3.1. Context of the study

The study involved two township high schools in a district in Klerksdorp. From each school, two Grade 11 classes were selected for the study. In total the sample included four Grade 11 classes and two teachers. The two township schools enroll learners of different home languages placed in different classes. One class comprises of Setswana/Sesotho speakers and the other isiXhosa/isiZulu speakers. Both schools use English as a medium of instruction. The nature of the sample is suitable for the study because of the diversity of both learners and teachers in terms of home languages, values, economic status, and culture, which may influence the degree of the classroom interactions (collaborative, individual, authoritative, and dialogic) that take place during the teaching and learning process.

### 3.2. Data collection

Data collection involved a single two-45-minute lesson observation for each of the four classes. During the classroom observation, the researcher observed the four communicative approaches as espoused by Mortimer and Scott (2003). The four communicative approaches which were being observed during observations were: Interactive/Authoritative (IA), Non-interactive/Authoritative (NA), Interactive/Dialogic (ID) and Non-interactive/Dialogic (ND). For each school, each teacher was observed teaching lessons and all the lessons were observed in one day during separate times. The researcher observed how the learners responded to the teachers' questions and how teachers responded to the learners' questions, and made use of learners' responses to enhance further communication in terms of authoritative or dialogic approaches. The second phase of data collection involved structured interviews with the teachers to allow teachers to articulate how they assisted learners in enhancing meaningful interaction in their classrooms. The interviews were done after the observations on the same day, to seek clarity on the observed acts, and also to authenticate data from the lessons observed.

### 3.3. Data analysis

Based on the results from the analysis of lesson observations, interview data was coded, in order to classify the reasons and elaborations given by teachers about the observed classroom communicative approaches in their lessons. Aspects of language difficulties were examined, which were some of the reasons that the teachers gave. Analysis of the discourse of the science lessons involved an iterative process of moving backwards and forwards through time, trying to make sense of the episodes as linked chains of interactions. Tehmina (2003) identified this coding method of data analysis as a crucial aspect of analysis, which is effective in organising and making sense of textual data obtained through observations. The researcher used a coded-method in analysing the data from the interviews. Similar responses uttered by the teachers were grouped in similar codes, while codes sharing the same characteristics were grouped into categories. Similar categories were then grouped into themes.

### 3.4. Findings

The presentation is done according to themes that were drawn from the analysis of interview data to ‘unpack’ classroom interaction patterns in Grade 11 life sciences English-second-language learners’ classes. It should however be noted that the researcher also included some information gleaned from the four lessons observed, which were then authenticated by findings from the interviews. The language of teaching and learning influenced the level of classroom interaction in all four lessons observed from the two schools. In seeking clarity from the observed discourses, and obtaining the teachers’ views on certain aspects of the language of teaching and learning in their classrooms, the two participating educators in this study were interviewed. The researcher wanted to assess how the two teachers assist learners in enhancing meaningful interaction in Grade 11 life sciences classrooms with English-second-language learners. The set of questions which the researcher asked the teachers were centred on the language of teaching and learning, and how it influences the level of classroom interactions within their classes.

During the interview, Mrs Ngubo acknowledged code-switching during her lessons and she strongly emphasised that she code-switched only to enable her learners to grasp the scientific concepts being taught. Mrs Ngubo fears that by allowing her learners to participate in their mother-tongue or code-switch to their mother-tongue will make them answer their assessments in their home-languages. Mrs Ngubo prefers the use of English over the learners’ home languages, this could be because Mrs Ngubo does not understand the benefits of allowing learners to code switch their home-languages. Code-switching should be viewed as fostering understanding.

Mrs Ngubo in the interview was asked what strategies she applies in order to enhance classroom interaction in her lessons was the use of drawings and charts and place them on the board and ask the learners to identify whatever concept they will be treating and that time. According to Mrs Ngubo, she believed that such strategy helps. The strategies Mrs Ngubo mentioned were not evident in the two lessons observed, what was seen in the lessons was Mrs Ngubo dominating classroom talk.

From the two lessons observed it was difficult to believe that Mrs Ngubo do apply the strategies she mentioned to actively engage the learners in lessons. Mrs admitted to allowing her learners to code-switch whenever they do not understand but in grade 11A Mrs Ngubo requested one of the learners to give an answer to the question she asked in English and the learner opted to sit down.

During the interview, Mr Nthorela emphasised that he understands his learners’ background and he knows what to do, and when to do it, in order to engage his learners during the lesson. Mr Nthorela stated that he often encourages his learners to read more informative newspapers and magazines in order for the learners to familiarise themselves with the English language. Mr Nthorela’s method of encouraging learners to read and familiarise themselves with English supports Richard’s (2006) assertion that learners should be encouraged to take the initiative to participate and dare to express their ideas, it does not matter whether they use the language properly, but at least, they need to try and improve it through constant repetition. When asked in the interview what type of teaching strategies does he apply in order to enhance classroom interaction patterns, Mr Nthorela mentioned classroom presentations of topics and debates of the topics being treated.

Mr Nthorela believes that such a strategy is the best possible way to help the learners to be free to clarify complex life sciences concepts with one another and to best understand them. In addition, Mr Nthorela emphasised that this teaching strategy allows the learners to express themselves in the way in which they understand a particular given topic and also helps with motivation and boosts the learners’ confidence. However, during the two lessons observed, Mr Nthorela did not use any of the two strategies he mentioned during the interview. The only two methods which were evident in the two lessons observed were code switching and the question and answer method. Unlike Mrs Ngubo, Mr Nthorela prefers both teacher-centred and learner-centred lessons. The way learners engaged in Mr Nthorela’s lessons it can be true that learners do engage and participate in Mr Nthorela’s lessons on a day-to-day basis. Learners in Mr Nthorela’s classes are second speakers of English language, they do not have a rich

vocabulary of English. Mr Nthorela stated that he would prefer to teach life sciences in Setswana because it will enable him to deliver meaning as intended to his learners. Mr Nthorela acknowledges that his learners struggle to express themselves in English during teaching and learning, having to teach life sciences in a language learners will understand it will help to improve classroom interaction.

#### 4. Discussions

Research findings showed that lack of language of teaching and learning affects the level of classroom interactions despite teacher efforts in enhancing classroom interaction. Both teachers recognised the value of using the learners' home languages in their teaching, in order to ensure understanding and engage their learners. This finding confirmed Probyn's (2009) argument that teachers have an obligation to use learners' home languages to explain scientific concepts for meaningful learner understanding. Additionally, during interviews both teachers admitted that their learners never engage in classroom discussions using English, but that they always use their home languages when engaged in discussions. Both teachers mentioned similar methods to enhance classroom interactions in their respective classes on a day-to-day basis, both teachers mentioned classroom presentations and debates of certain scientific concepts as a common strategy they employ in their classes. This is in agreement with Aguiar et al.'s (2010) assertion that learning through group work provides a space where individual rhythms of learning can be taken into account. Group works also provides opportunities to reinforce the understanding of those learners who have already come to understand the scientific view from whole class debate, as these students now try to talk through classmates' questions and objections, which may result in a dialogic interaction pattern. Both teachers emphasised that their choices of strategies were aimed at enhancing classroom interaction, and aimed to help learners build their confidence and boost their self-esteem.

*Table 1. An example of the coding and analysis of data from interviews.*

Codes	Category	Emerging themes
<ol style="list-style-type: none"> <li>1. Give them concepts/topics and they must go and prepare and come back and debate about the given concepts</li> <li>2. Present to us on what they have discovered or learned.</li> </ol>	<ol style="list-style-type: none"> <li>a. Code-switching</li> <li>b. Debates</li> <li>c. Classroom presentations</li> </ol>	Strategies teachers used in enhancing interaction in their classes
<ol style="list-style-type: none"> <li>1. Only attempt to answer in English whenever I tell them to translate</li> <li>2. Big struggle</li> <li>3. Few individuals who are smart participate.</li> </ol>	<ol style="list-style-type: none"> <li>a. Minimum learner participation.</li> <li>b. Learners engage in discussion using their home languages.</li> </ol>	Learners' participation in class when using English.
<ol style="list-style-type: none"> <li>1. Allow them to ask in their mother-tongue and learner participation increases.</li> <li>2. Allow them to code-switch to their home languages</li> </ol>	<ol style="list-style-type: none"> <li>a. Home-languages</li> <li>b. Code-switching when struggling with English.</li> </ol>	Learners preferred to use their home languages in classroom discussions.
<ol style="list-style-type: none"> <li>1. Accepted their responses</li> <li>2. Only allow to use their mother-tongue when I see that they are struggling</li> </ol>	<ol style="list-style-type: none"> <li>a. Learners are allowed to code-switch to their mother-tongue</li> <li>b. Help the learner to remember.</li> <li>c. Increases classroom Participation on a day-to-day basis.</li> </ol>	Learners allowed to code-switch to their mother tongue.

#### 5. Conclusion

The findings revealed that the teachers' choice of teaching strategies during lessons enhanced classroom interaction mostly between teachers and learners. No meaningful learner-learner interactions were observed in the four Grade 11 life sciences classes. During the interviews, the teachers highlighted that their learners hardly participate in class using English. Findings from the interviews revealed that

both teachers emphasised the use of various methods such as classroom debates, presentations, and discussions to enhance interactions in their classrooms. However, the findings from the classroom observations indicated that neither of the teachers used these strategies except for question and answer and code switching strategies. Additionally, findings revealed that teaching and learning of life sciences is still largely teacher-centred, characterised by learner passivity and rote learning, teachers' questioning aims at knowledge recall. The methods teachers mentioned in the interviews were not evident in all four observed lessons.

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# INVESTIGATING THE IMPACT OF LEARN BY DOING IN CIVIL TECHNOLOGY CLASS: STUDENTS ACTION

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## Abstract

Learn by doing is one of the critical teaching approaches in Civil Technology as a subject, of which it consists of both theoretical work and practical skills. The study aims to explore the effectiveness of hand-on skills learning as a teaching approach in Civil Technology class. While the main objective of the study is to examine the impact of hands-on skills learning in Civil Technology. The study used a mixed-method approached to collect data which of consist quantitative (practical test) and qualitative (presentations). Purposive sampling was used to select 20 participants, from different gender (males and females) also from a diverse background. Findings of the study reveal that students managed to demonstrate competence in totality (both theory and practical) and also by completing their work within the scheduled time.

**Keywords:** *Learn by doing, hands-on, civil technology.*

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## 1. Introduction

Learn by doing regarded as significant teaching and learning approach which is exploring students in reality through critical thinking and problem solving. It also promotes the integration of theory and practical of which is key aim of the subject civil technology to prepare student in-totally which means students should be found competent in both theoretical content knowledge and practical work. Maeko and Makgato (2014) proclaim that subject Civil Technology is developed to equip students with a sound technical foundation skill that merge theory and practical. Hence, Mokhothu (2019) attest that Civil Technology's main aim and objective are to prepare and assess students as critical problem solves. Therefore, above mentioned aim and objective can be achieved and validated through or when students are hand-on.

## 2. The conceptualisation of the study

### 2.1. Learn by doing

Learn by doing is an explanation of a concept action learning, which is has been describe by many authors such as Revans (1980); Mumford (1996; 2006) and McNiff (2013) when pronounce that action learning is "learning by doing" and its strength is grounded by group work (sets). Which should serve as producers of "development, intellectual, emotional or physical that require its subject", through responsible meeting in some actual problem that will expand their learning skills (Revans, 1982; McNiff, 2013). Therefore, Pedler (1991), argues learning by doing from perspective of the quotes "there is no learning without action and no sober and deliberate action without learning" which kick start the statement saying learning by doing is an approach to the development of both students and lectures, which grasp activity as reinforcement for learning.

### 2.2. Civil technology

Civil Technology is a subject which is offered at high school level in South Africa from grade 10 to 12 and is divided into three categories: Construction, Civil Services and Woodwork. Its main focus is to introduce learners to the concepts and principles in the built environment and technological process. Moreover, it promotes theory that involves scientific and mathematical principles and practical skills (DoE, 2014; Mokhothu, 2015-2019). According to Maeko and Makgato (2014:324) the subject Civil Technology is designed to provide learners with a sound technical foundation that integrates both theory and practical competencies.

### 2.3. Hand-on

According to Kennedy (2011) Hands-on skills are found in many fields of technology education, such as electrical technology, mechanical technology and civil technology (Kennedy, 2011:54). In Civil Technology, hands-on expertise in healthy working practices will be built through the combined completion of the theoretical work and the practical assessment tasks (PAT); good housekeeping; first aid procedures; structural erection; working with precise measurements; and laboratory practice. (Department of Basic Education, DBE, 2011:9; Maeko and Makgato, 2017:227).

### 3. The aim of the study

The study aimed to investigating the impact of “learn by doing” in Civil Technology class through student’s action theory and practical work to promote hands-on.

### 4. The objective

The main objective of the study is to measure the impact of “learn by doing” in Civil Technology class through student’s action/ hands-on.

### 5. Proposition

“Learn-by-doing” has a significant impact on critical thinking, creativity, innovation and critical problem-solving skills in the integration of theory (content knowledge) and practical work in civil technology.

### 6. Methodology

#### 6.1. The context of the study

A formal Civil Technology class was attended by student enrolled Bachelor of Education Senior Phase and Further Education and Training Phase: Technology (B.Ed. SP&FET). Setting-out of foundation, topic was presented by lecturer. The study was conducted during the third term of their first academic year of studies. At the end of presentation, the assessment task was assigned to students which consist of: Practical test and Video presentation.

#### 6.2. Participants

Participants were all Civil Technology first year students enrolled at one of University of Technologies in South Africa. The total number of participants was 64 consist of 38 (59.4%) males and 26 (40.6%) female all from different cultural groups. All participant’s respondent positively (100%).

#### 6.3. Measures

In the first stage, students were instructed to divide into 8 groups consisting of 8 members of the group and also to record a video of the entire process from the initial stage to the end. The lecturer carried out an assessment activity which states as follows: students should identify their own construction site, perform site clearance using the correct tools, use the correct tools to set up a foundation using the 3-4-5 method, and develop an observation tool to report on a video recorded. Submit your video by e-mail before the date of play (presentation).

### 7. Results presentation, interpretation and discussion

#### 7.1. Practical test

Table below present the results of practical test form site clearance to setting-out. The results presented in frequency, marks and percentage (%)

Table 1. Practical test results.

Groups	Frequency	Marks (50)	%	Average
Group A and C	2	41	82	75.5
Group B and F	2	40	80	
Group D	1	38	76	
Group E, G and H	3	34	68	

The results above indicate that group A and group B has obtained the highest score percentage (82%), followed by group B and F with the score of (80%). While group D managed the score of (76%), then group E, G and H has scored the lowest at (68%). However, the average score is high with 75.5%. therefore, that means students managed to enjoy practical work (hands-on) as deemed it has allowed the students to apply their own critical thinking and creativity to solve their own problem. Which the above results concur with Revans (1980); Mumford (1996; 2006) and McNiff (2013) when they pronounce that action learning is “learning by doing” and its strength is grounded by group work (sets). Which should serve as producers of “development, intellectual, emotional or physical that require its subject”, through responsible meeting in some actual problem that will expand their learning skills (Revans, 1982; McNiff, 2013).

## 7.2. Presentation

Table below present the results of presentation of the video and observation to reflect on the performance. The results presented in marks and percentage (%)

Table 2. Presentation results.

Groups	Marks (50)	%	Average
Group A	40	80	71.8
Group B	40	80	
Group C	40	80	
Group D	36	72	
Group E	36	72	
Group F	35	70	
Group G	30	60	
Group H	30	60	

Table 2 above presents that group A, B and C has managed to score high with the percentage of (80%), followed by group D and E with the percentage of (72%). When group F managed the score of (70%). Then group G and H came last with percentage score of (60%). But the average percentage score still maintained high score of 71,8 % which confirming that students managed to lean on their own while doing and trying and eventually found competent while their reflecting their practices from the observation tool and video. Data collected above concur with Maeko and Makgato (2017:227) when they affirm that in Civil Technology, hands-on expertise in healthy working practices will be built through the combined completion of the theoretical work and the practical assessment tasks (PAT); good housekeeping; first aid procedures; structural erection; working with precise measurements; and laboratory practice. Therefore, Pedler (1991) was accurate when stating that learning by doing from perspective of the quotes “there is no learning without action and no sober and deliberate action without learning”.

## 8. Conclusion

In conclusion, this study has proven that learn-by-doing is one of the significant teaching and learning methods in Civil Technology. As it allows the student to hand-on and uses tools and experience on their own. Students managed to survive and grasp a clear individualised interpretation of theory and transfer it to actual practical work. Therefore, the study has also proved that Civil Technology student should not be overloaded with theory only but be allowed to integrate theoretical content with practical work to advance their technical skills.

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## A ‘DIGITAL PEDAGOGIES’–BASED LEARNING PLATFORM

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### Abstract

Virtual Learning Environments and Online Learning Platform have been around for some time, yet the problem with the majority of them is that they either attempt to replicate the Face-to-Face equivalent, or are simply development and deployed without a learning model or theory at their basis. In this paper we present a bottom-up development of a learning platform that is entirely based on a sound educational principles that include Ubiquitous learning, Active knowledge making, Multimodal meaning, Recursive feedback, Collaborative intelligence, Metacognition, and Differentiated learning. We will show how this platform has been employed for these last few years and has provided ample data to evaluate the added advantage that digital pedagogies provide especially as the same data is employed through the learning analytics feature that has embellished the platform in this last year. We draw numerous conclusions and recommendation on our experiences as well as on the feedback received from numerous learners and educators that have made good use of the same platform.

**Keywords:** *Digital pedagogies, e-learning, virtual learning environment, ubiquitous learning, learning analytics.*

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### 1. Introduction

The proliferation of online courses is testament to the increased demand and rising awareness of education, as the widespread pervasiveness of information technology in all sectors of our society paved the way for educational institutions to easily and conveniently have access to a wider audience. The effectiveness of e-learning courses has been shown over the years (Russell, 2001; ulHaq, et al., 2018) that there exists no significant difference in learning outcomes when compared to the traditional mode of delivery. However, the distinction between good and bad e-learning has also been outlined by a number of studies (Al-Mahmood & McLoughlin, 2004; Zou, 2006; Connell, 2009), and reported to be no different from the poor and inadequate use of any other medium as a teaching platform. The early e-learning stages focused mainly on transferring face-to-face classes and the familiarization of the instructors with underlying technology which it heavily depends on, and thereby characteristic inefficiencies as well as optimal engagement of the electronic medium tend to be much more dominant, influential, and explicitly discernible. The popularity of e-learning courses and the onset of Massive Open Online Courses (MOOCs) brought about additional issues related to assessment (Admiraal, et al., 2015), critical thinking (Akyüz & Samsa, 2009), and a sense of isolation and detachment (Camilleri, et al., 2013). As a result, the next stage of online learning witnessed a shift in the attention of educators and e-learning specialists from transfer of knowledge to knowledge building and management, seeking to enhance innovative approaches while redefining better processes of learning. This is the case with our online writing and assessment environment, called Scholar, that since 2009 with the support of the Institute of Educational Sciences, the Gates Foundation, and sub-award funding from NSF (Cope & Kalantzis, 2013; Cope, et al., 2013; Olmanson, et al., 2015) we have taken full advantage of new e-learning affordances (Cope & Kalantzis, 2017) to pedagogically design and develop it based on a reflexive ideology whereby complex reasoning skills such as critical and creative thinking form part of the process. Additionally, Computer Science collaborators employed available learning analytics and data mining techniques to automate critical thinking assessment through topic modelling (Zhai, 2008; Kuzi, et al., 2018), as well as semantically analyzing text to assess peer reviews (Zhai, et al., 2004; Shubhra-Kanti, et al., 2018).

In this paper we investigate, propose and implement a learning platform that takes into consideration this new learning approach whereby digital pedagogies disrupt the traditional learning environments and create new affordances that were not possible or available before. This innovative virtual learning platform is entirely based on sound educational principles that include Ubiquitous

learning, Active knowledge making, Multimodal meaning, Recursive feedback, Collaborative intelligence, Metacognition, and Differentiated learning, and has been deployed and adopted by numerous educators at all levels for a number of years. At the University of Malta we have employed this platform for the last couple of years in an effort to collect data and investigate the added advantage that digital pedagogies provide especially as the same data is employed through the learning analytics feature that has embellished the platform in this last year. The rest of the paper is organized as follows. The next section will delve into the benefits of Digital Pedagogies based on Web 2.0 technologies due to their incorporation within the virtual learning platform as part of the empirical study. Section 3 will cover the learning platform itself, from the underlying education principles and theories it is grounded on, to the affordances it enables as a result of the innovative approach. The details of the empirical study are presented in the following section whereby the methodology, participants and results are given in some detail together with an evaluation and discussion of these same results. Finally, we close the paper with numerous conclusions and recommendations drawn from our findings as well as on the feedback received from the participants and educators that have been involved in this study.

## **2. Digital pedagogies**

The WWW evolved over time from a static document repository where users could access documents through their web browsers in a read-only fashion to a read-write environment with dynamic content and possibilities for users to contribute, author and participate. This change to the second generation was not as simple as it seems as numerous other factors played an important role. The web browsers themselves went through a drastic operational evolution to support such a functionality as a struggle between a number of browsers was going on to acclaim absolute control of the web users as increase their revenue. On the other hand, the World-Wide Web Consortium (W3C) were also working hard to ensure that the required standards and protocols are in place. Other technologies that played an important role in the evolution of Web 2.0 was the Semantic Web itself together with the support of the eXtensible Markup Language (XML) that was also striving to destabilize its application and effectiveness. Berners-Lee et al. (2001) set out to define how the new web generation had meaning and thereby set the trend to develop higher-level applications (Hendler, et al., 2002) that could exploit the enhanced capabilities of a smarter web (Frauenfelder, 2001). From an educational point of view Web 2.0 technologies and applications have enabled a novel medium which educators and learners alike can benefit from as such technologies have “blurred the line between producers and consumers of content and has shifted attention from access to information toward access to other people” (Brown & Adler, 2008, p. 18). In this way Web 2.0 empowers educators and learners to communicate and interact in new and natural ways that was not previously possible over the web thereby creating a new educational medium that educators have to rethink and eventually require re-training. The reason behind such reasoning as this novel medium moved the goalposts from students that are receptive to a more interactive and creative. Educators are required to push the boundaries on their students to motivate them to share, comment, post, create, produce, edit and assess other students’ work and contributions. This also helps students gain confidence in themselves as they adopt critical thinking skills as well as useful social skills as they interact with peers, educators, knowledge providers and other web users that will assist them during the education process and life in general. From a practical point of view in reality learners are already making extensive use of Web 2.0 applications in their life outside the educational arena, so employing tools which they are already accustomed to and which they are happy to use is an added advantage to the educational process that facilitates the educator’s life. The challenge here is for the educator to select the most suitable Web 2.0 tool to employ that appropriately fits with the pedagogy being adopted.

## **3. The virtual learning platform**

The current state of online learning portals is still unfortunately conservatively stuck in the didactic pedagogy state of mind whereby the electronic medium is no different from the physical face-to-face environment. Transferring academic programmes from the classroom to their e-learning counterparts is a well-known misconstrued yet highly-followed practice that helped in giving e-learning a bad name and a fair chance of providing sound educational experiences. The trend did improve over the years as e-learning designers, usability experts, and HCI researchers helped enhance and redesign learning portals to reflect learning outcomes rather than academic syllabi. However, three inherent e-learning challenges still remain not fully addressed as online learning portals evolve from ecology to another mainly subject and conditioning by the evolution in the underlying technologies. Formative assessment, high-level intellectual skills, and personalization have proven to be the three weakest spots that have enfeebled the successful and academically sound implementation of e-learning environments.

The ideological basis of the virtual learning environment presented here is based on Benjamin Bloom’s (Bloom, 1968) philosophy on how to aim towards mastery learning, together with our own educational model of new learning affordances [36] (Kalantzis & Cope, 2012) made feasible through new media. Furthermore, from the computing perspective, we employed machine learning techniques to mine and leverage the masses of data gathered through a variety of ways to better understand student learning and use of online learning environments. Now we need to investigate, research and look into how to apply this acquired knowledge and information to address these three challenges and specifically tailor our education expertise and computer science techniques to personalize the entire e-learning experience. The conceptual grounding is based on Cope and Kalantzis (2017) idea of e-learning ecologies that adopt a reflexive ideology that heuristically segments their model into seven “new learning” affordances, namely, ubiquitous learning, active knowledge making, multimodal meaning, recursive feedback, collaborative intelligence, metacognition and differentiated learning. These seven affordances, depicted in Figure 1, represent an “agenda for new learning and assessment” that redefines the relationships between knowledge and learning, recalibrating traditional modes of pedagogies in an effort to create learning ecologies which better suit the educational needs and goals of our time.

Figure 1. The seven e-learning affordances (Cope & Kalantzis, 2013).



The learning platform developed employs Web 2.0 techniques to create a ‘Social Network’ look and feel that take full advantage of available digital pedagogies. For example, it provides ‘updates’ and ‘creator’ apps to complete weekly and term assignments through a system of communities of learners within which learners and educators can communicate, share and create with update areas that partly function as a blog that can include embedded video, audio, data and external links. Another example is one where educators can share course contents, or notify a deadline or an agenda, and for learners to present on chosen and assigned topics, providing comment areas below to facilitate peer-to-peer and student-with-admin discussion. The creator section, for term papers, is a semantic editor and multimodal working space, which goes beyond the word processor. Digital objects, including image, audio, video, text, math, live links, dataset and embedded external media, from YouTube videos to GitHub code, can be all inserted inline within the body of the text.

#### 4. The empirical study

This platform was made available to undergraduate students within the Faculty of ICT at the University of Malta over the last two academic years and quantitative data has been collected through a number of ways both explicit through polls and surveys, but also implicit directly through learning analytics that the same system was designed and developed to collect while the participants are making use of the same platform. Participants were able to compare their traditional experiences using the classical virtual learning environment whereby downloading of content and submission of assignments is allowed together with a thread-based forum area as the only means of communication.

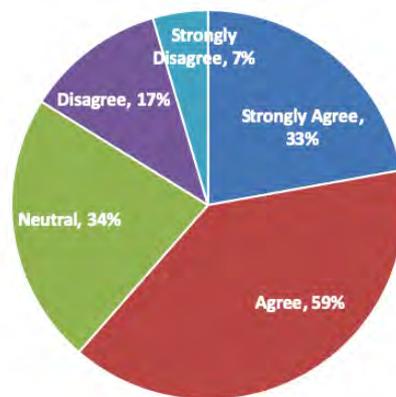
The results obtained, shown in Table 1, indicate a drastic positive preference to an environment that is student-based rather than content-based as the seven affordances highlighted in Section 2 were individually tested to evaluate the effectiveness of this innovative learning platform.

Table 1. Empirical Study Results.

	Strong Agree	Agree	Neutral	Disagree	Strong Disagree	
Ubiquitous	16%	37%	37%	11%	0%	Novel platform promotes use anywhere more than traditional VLE
Knowledge Making	18%	59%	0%	24%	0%	Use of Web2.0 apps assist rather than single summative task
Multimodal	18%	65%	18%	0%	0%	Rich editing environment in new env. better than traditional VLE
Rec.Feedback	31%	31%	13%	19%	6%	Posting updates, comments, favs & sharing helped academically
Collective Int	13%	38%	38%	13%	0%	Comments from the community provided beneficial educational input
Cognitive	25%	56%	19%	0%	0%	An online learning environment should provide access to Dig. Pedagogies
Personalised	38%	38%	13%	13%	0%	Novel platform is more student-centered rather than content-centred VLE

The overall results provided by the participants on the use and adoption of a ‘digital pedagogies’-based virtual learning environment are depicted in Figure 2 as they experienced the rich environment through different digital pedagogies that have not only help elevate the quality of the learners’ education but facilitated the holistic academic experience.

Figure 2. Overall participants’ outlook on the adoption of new learning portal.



### 5. Conclusion

New media offer students the possibility to refine and represent their understandings in multimodal ways, where traditional textual knowledge can be supported by image, diagram, video, visualization, dynamic dataset, and embedded external media. In this paper, we have described a new e-learning environment for added-value experiences whereby new learning affordances are possible through digital pedagogies. Our trials have demonstrated the capacity for students to create a new genre of multimodal work, offering students opportunities to represent their understandings that far exceeds those of traditional tasks. The richness evidenced in their submitted work is statistically measured, as well as their affinity to employ the adequate medium to express whatever they need to transmit to their peers and tutors has also been recorded through the empirical study reported. The learning portal itself represents a number of significant developments in the field of online education and effectiveness of e-learning system as it captures individual and whole cohort progress in learning with a level of granular detail not previously achievable. We strongly recommend that such learning portals are designed and developed bottom-up with the student needs and interests as the main drivers while taking full advantage of digital pedagogies that are freely available online, intuitive, and based on social networks look and feel that learners as well as educators are accustomed to and make use on a daily basis. This research demarcates the beginning of a promising way forward as new research avenues are uncovered characterizing the future of online education and student-centered e-learning platforms while promising to improve and enhance learners’ interaction and attitude towards e-learning and online education in general.

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## HISTORICAL ANALYSIS OF STUDENTS' PERFORMANCE: AN AGE AND GENDER PERSPECTIVE

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### Abstract

It is possible that innate characteristics can have a certain effect on the students' performance. Two of the most important characteristics of a person are their gender and their age. Universities are institutions that must be opened for every person, not mattering their age of gender, however it could be possible that these factors could represent a decisive factor over students' performance. For this reason, educational analytics must be performed for determining if there is a relationship between the age, the gender and both of them over students' performance. The goal of this work is to show if there is a relationship between age and gender over the performance of engineering students. Results show that gender is not a decisive factor for determining if a student will finish their studies, but age clearly represents a topic to be considered.

**Keywords:** *Students' performance, measurements in education, educational analytics, age and gender influence.*

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### 1. Introduction

Several factors that can affect the performance of students during their studies, labor, personal or familiar ones that can occur during the time students course a superior level of education. However, it is also clear that innate characteristics can have a specific effect on the students' performance. Two of the most important characteristics of a person are their gender and their age. Universities are institutions that must be opened for every person, not mattering their age of gender; however, it could be possible that these factors could represent a decisive factor over students' performance.

In the Mexican university Universidad Autonoma Metropolitana Azcapotzalco (UAM), students of Engineering programs invest twice the time originally established, and a high percentage of students do not finish their studies. For this reason, several studies are being performed for finding the factors that can have a higher impact on the fact that a student finish or not her/his studies.

Nowadays, there is much information that educational institutions store; however, a huge amount of data make difficult the analysis, thousands of registers from students stored in a textual way are almost impossible to analyze for finding patterns of interest, however, applying concepts like Information Visualization as mentioned in Herman (2000) or learning analytics, Siemens (2011), allows presenting data in a way that it is easier understandable for humans.

There are several studies considering eventual gender differences, most of them suggest that women have higher achievements in Higher Education. For example, Vasconcelos & Leandro (2018) observed that in Portugal at the end of the first semester, women present a higher rate of successful curricular units than men in engineering courses. They describe that women dedicate more time studying, obtain higher average grades, show greater time and activities organization, and are self-regulated learners.

It's true that more women are in school today than ever before but not always have the same opportunities as men. According to the UNESCO report by Chavatzia (2017), women are under-represented in science, technology, engineering and mathematics (STEM) education, with only 35% in higher education globally. For example, only 3% of female students in higher education choose information and communication technologies studies, and this is relevant because STEM carries are often referred to as the jobs of the future.

## 2. The goal of the research

It is essential to consider identifying factors or characteristics that could have a special relationship with the fact that a student could or not finish their studies. Both of the most important features of students are their gender and their entrance age, this is, how old they were when they were accepted into UAM. For this reason, educational analytics must be performed for determining if there is a relationship between age, gender and both of them over students' performance. This performance is measured considering if students finished their studies or not, and if they finish them, how many times do they need it. The goal of this work is to show in a clear way if there is a relationship between ages and gender in the fact that student's finish or not their studies.

## 3. Data analysis

Statistical analysis was considered for this work, also using different visualization techniques were applied; these two knowledge areas nowadays are being very used in education analysis for finding interesting patterns.

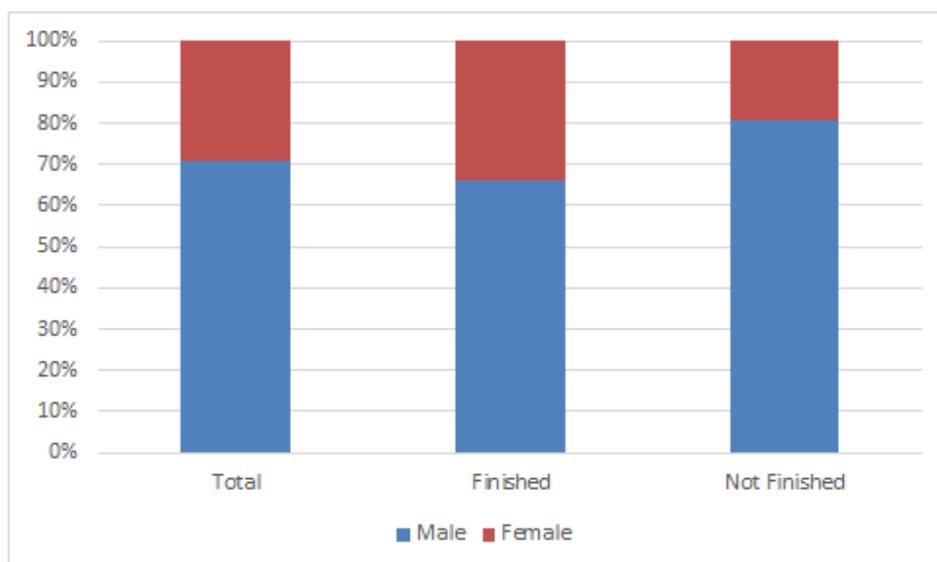
For this study were analyzed 3055 students from the ten Engineering programs of UAM considering the last 12 years. Were performed different analysis: grouping students into different age sets (considering the entrance age), grouping students according to their gender, and finally, combining age and gender.

Results were presented using different Information Visualization techniques according to the desired information to show. Some traditional graphs like bar plot graphics were used; however, for showing the distribution in certain groups of values, it was considered the boxplot graphic, a very useful tool for showing distribution's analysis, Williamson (1989). The statistical analysis has shown:

- Percentage of male students that have finished or did not finish their studies.
- Percentage of female students that have finished or did not finish their studies.
- From those who finished, the distribution of years that the needed for finishing, this for male and female students.
- Distribution of entrance ages of those students that finished or not their studies.
- Distribution of entrance ages for those male and female students that finished their studies.
- Distribution of entrance ages for those male and female students that did not finish their studies.

The number of analyzed students which enrollment UAM from 2008 to 2016 was 3055, this considering only those who had or had not finished their studies, students that are studying were discarded. Figure 1 shows the overall percentage of engineering students at UAM.

Figure 1. Overall percentage of engineering students considering gender that enter, finish or not in UAM.



Distribution of needed time for finishing their studies for those students that finished their studies considering their gender is shown in Figure 2.

Figure 2. Distribution of years needed for finishing studies according students' gender.

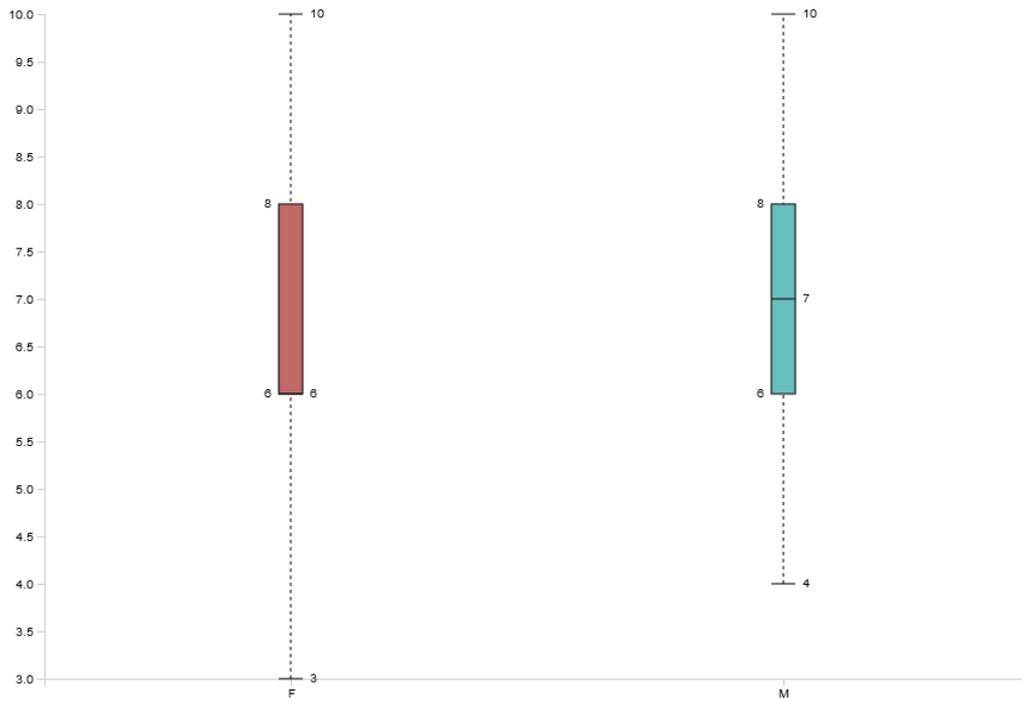
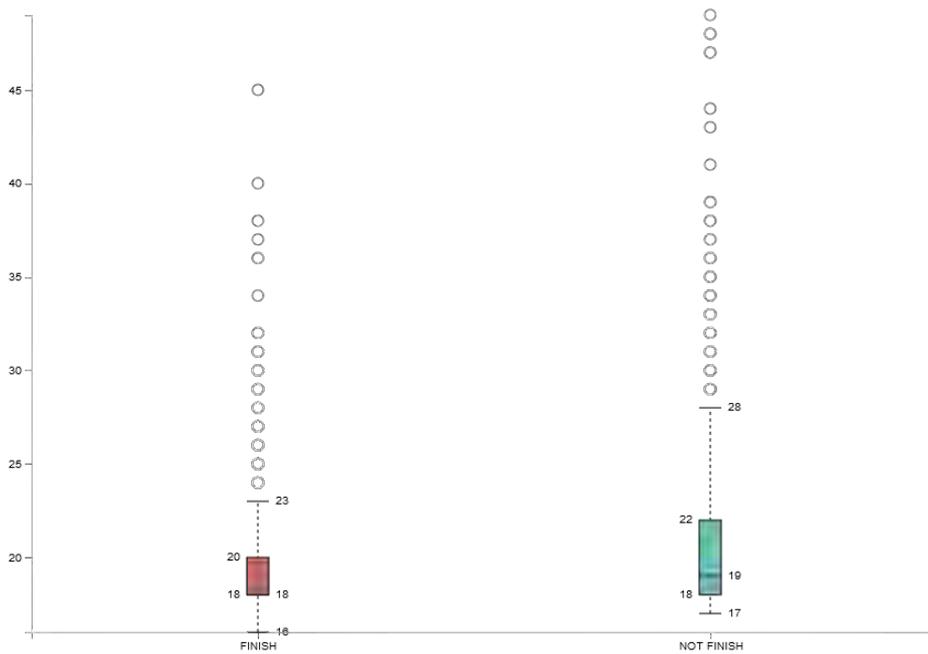


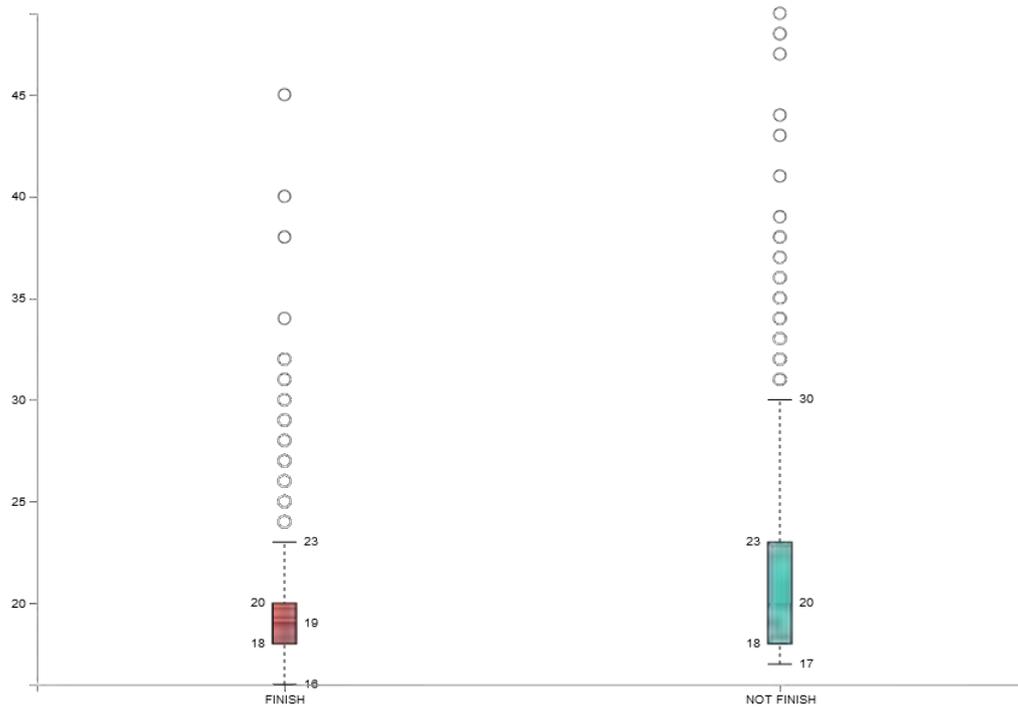
Figure 3 shows how does the entrance age is distributed for those students that finished or not their studies.

Figure 3. Distribution of entrance age of students according if they finished or not.



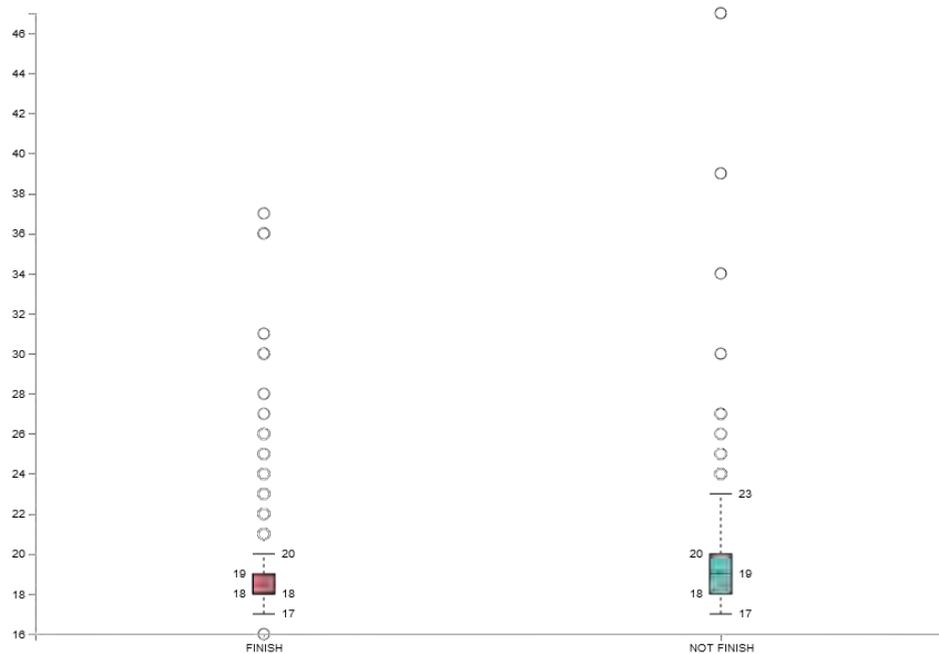
For male students, the distribution of entrance ages according to if they finished or not their studies is presented in Figure 4.

Figure 4. Distribution of entrance age for male students.



Finally, the distribution of entrance ages for female students according to if they finished or not their studies is presented in Figure 5.

Figure 5. Distribution of entrance age for female students



#### 4. Analysis

After generating the different graphs, they were analyzed, the results are presented next: Figure 1 shows that the total number of male engineering students is considerably larger than female students. The percentage of female students that finish their studies is more significant than the one of male students, approximately 18% bigger. This is also shown in Figure 1, where male students have a little more than 60% of success, and female students has nearly 80%.

Figure 2 shows the distribution of needed time for finishing their studies according to the student's gender, and it is clear that the behavior is very similar, 50% of both genders required from 6 to 8 years and 25% needed from 8 to 10 years. Again, female students have better behavior because 25% of them required from 3 to 6 years for finishing, meanwhile 25% of male students needed from 4 to 6 years, one year of difference.

Figure 3 shows that 25% of students are between 16 and 18 years old, 50% of students that finished their studies are between 18 and 20 years old, and 25% between 20 and 23. Students aged more than 23 years that ended their studies are considered atypical values. For those students who did not finish their studies, 25% is between 17 and 18 years old, 50% between 18 and 22 and 25% between 22 and 28 years old. This means that at an older age, it is most common that students did not finish. Ages older than 28 years that did not finish are considered non typical.

The same information, but only for male students, presented in Figure 4, shows a similar behavior, however, the limit of ages for being considered atypical for not finishing higher studies raises two years, passing from 28 to 30. This means that there are more male students which entered older to UAM, but, commonly, they did not finish their studies.

Finally, distribution of ages for female students, presented in Figure 5, shows that the limit for being considered atypical for finishing their studies is 20 years, three years younger than male. Meanwhile, the older for being considered not atypical for not finishing is 23 years old, seven years younger than the male one. Male and female students have a similar behavior for those that finished their studies.

## 5. Conclusions

Student gender has not a significant impact on the fact that students finished or not their studies. Female students have a little better performance considering the percentage of students that completed engineering programs and the distribution of years needed for finishing, but it is not very clear. The rest of the behaviors are very similar to both genders.

From the entrance age, it is clear that those students who enroll UAM in ages from 18 to 20 have more opportunities for finishing their studies. Students who are older than 23 years old and complete their studies are considered atypical values, meaning that if they finish, this does not necessarily represent that this range of age could complete their studies. However, students that enter older than those 23 years old (or even, 22 years old) and to 30 still have a significant relevance in the group of students that did not finish their studies, meaning that the fact that they do not complete their studies still is not due to coincidence or an atypical case.

The topic of entrance age is interesting: older age students could have other responsibilities, as their own family or a job that did not allow them to focus on their studies as younger students could. However, any higher education institution could not select students according to their entrance age, it is a discriminatory issue. On the other hand, accepting students older than some age could represent that they could not finish their studies, generating problems for the universities whose percentage of successful students will be affected.

It is an excellent opportunity to bring individual support for those students who are in high-risk groups of not completing the engineering programs. To diminish high dropout rates in engineering programs are a semi-face-to-face program to go to UAM only one day a week. This program just started a quarter ago, and it is still too soon to have results.

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# IMPROVING KNOWLEDGE TRANSFER IN SIMULATION GAMES BASED ON COGNITIVE LOAD THEORY

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## Abstract

The aim of this paper is to develop a framework for case study teaching with the combined measurement of the student's cognitive load supporting by an integrated learning management system. Therefore, the authors have implemented some pre-studies and collected lots of experience before establishing this particular, on literature-based, framework how the case-based teaching could be transferred to a new digitalization level. The motivation therefore is based on the lecture topics of the authors and the curricula they are teaching in bachelor and master classes. All necessary theoretical background information as well as the in details explained framework of how to implement the correct setting is explained in this paper.

**Keywords:** *Simulation game, case study teaching, cognitive load.*

## 1. Introduction

One known challenge in teaching process management/quality management and governance in a master class of business informatics students is the abstractness of the topic, especially for students who do not have any practical experience. Therefore, the authors decided to implement some gamification aspects for planning and executing a simulation game. Students are more willing to engage within this setting to learn, further on have a higher satisfaction rate, and the knowledge transfer is more sustained. The benefits of this learning setting are apparent.

A further step would be to find out more about the perceived stress levels of the students during the process of knowledge transfer. There is one theory standing out to get more insights about the perceived stress level: the theory of cognitive load (Hart, 1986). This paper presents a possible framework of how cognitive load measurement could be implemented to gain more in-depth knowledge of the student's situation. First of all, the unique situation in our information systems courses is displayed in more detail by the layer concept shown in table 1. In section 2 all theoretical backgrounds about cognitive load theory and knowledge transfer are mentioned. The methodology used and the results gained from the study are explained in section 3 followed by the framework in section 4. Section 5 closes the paper with showing up the limitations of this work and giving an outlook in section 5.

Business informatics students have to deal with all the interfaces and information flows in the whole stack which is mentioned in table 1 to be able to learn about the challenges of system architects which is one of the skill levels they need. Students have to understand all the requirements given from the external perspective (layer 6) and break them down to the shop floor (layer 1) based on the integrated process view but also the supporting software systems has to be taken into consideration. To reach this level of integrated thinking and knowledge at the students, the authors aim for case study design with the integration of gamification aspects.

*Table 1. Layer Concept for Simulation Game.*

Layer	Layer Name	Integrated
6	Governments and External Authorities	Simulation / Gamification for Knowledge Transfer Methods
5	Enterprise Governance	
4	Data Analytics Layer	
3	ERP System Layer and Process Management	
2	Manufacturing Execution Layer	
1	Shop Floor Layer	

There are two different groups of students identified in the author's classes: (1) students with experience in corporations regulated by any quality norm with governance processes in place and (2) students without any practical experience or in companies without any quality management norm. The idea of the authors was first to measure the different levels of the cognitive load for every group and every student individually. Later on, deliver the prepared materials (seen as small knowledge transfer nuggets) to ensure, that every student can follow them on his own speed. In parallel, the level which is to reach for the whole class has to be set and further material for the fast lane students has to be provided. The measurement of the cognitive load is not trivial. This paper will give an idea of how it could look like for a group of 35 master students at MCI divided into two groups and afterward compare the results of the two groups.

## 2. Theoretical background

This section will give an overview of the two main concepts used for this research paper. First of all, it is about the knowledge transfer from teachers to students and in parallel the measurement of the perceived stress at the student's side.

### 2.1. Knowledge transfer

The aspect of knowledge transfer is embedded in the larger topic of knowledge management and very often combined with supporting IT systems. Knowledge Management is defined as "the facilitation and support of processes for creating, sustaining, sharing, and renewing of organizational knowledge in order to generate economic wealth, create value, or improve performance (Kong, 2003). Effective knowledge management for organizations is subsequently an indicator to reach competitive advantages and to tackle problems related to technology and permanent change (Lovrekovic, 2013). Especially the idea of change is important for our simulation scenario because the external requirements given by authorities leads to the need of permanent adaptation in any organization. The objectives of knowledge management include the enhancement and leverage of the company's knowledge assets in order to guarantee superior knowledge practices, better organizational behaviors and performance... (King, 2009). To shrink the explained need down to our lectures, the superior knowledge practice is important to teach students in a way that they have the skill advantages for their later jobs and positions.

Vat (2006) defines knowledge sharing as "a process of leveraging the collective individual learning of ... a group of people, to produce a higher-level organization-wide intellectual asset." Following this definition (Ortenblad, 2016; Tangaraja, 2016), knowledge sharing has the goal of improving the intellectual asset of every individual and the group as a whole. This describes exactly what the authors will reach with the lectures based on a competence-centered education, together with the BISE learning objectives. This will be the starting point for the planning of the curriculum for process management/quality management and governance. Therefore, the following learning objectives are defined in the curriculum: (1) process modeling, (2) process analysis and IT support, (3) process execution / governing the process and (4) process optimization / continuous improvement. The development of specific social and personal competence was not explicitly considered in the game design, but many of these competences were observed during the game.

### 2.2. Cognitive load theory

To secure the learning outcomes, it is important to take care of the perceived stress for students to get the right balance of challenge them but not overcharge them. Therefore, the authors will include the measurement of the whole case scenario based on the cognitive load theory, which was developed by John Sweller (1994). The theory provides a framework exploring the influence of the design of the case scenario and the learning outcomes, which goes further from the understanding than the external AACSB evaluation and the set criteria at MCI. The base idea that the human memory has limited capacity and it is bad for students if the experience given by the case overloads the capacity to process. In the next step, the knowledge transfer to the long-term memory is limited (Sweller, 1998; Miller, 1966; Van Merriënboer & Sweller, 2010). This means that the development of the case scenario has to be carefully planned and divided into small chunks which do not lead to an overload of the learner and can be carefully charged, based on the learners need and speed. There are three different components which are defined in the theory of cognitive load: (1) intrinsic load, (2) extraneous load and (3) germane load.

*Intrinsic load* (1) reflects the inherent difficulty of the task and is given by the elements for a dedicated task. Processing this specific intrinsic load can be lessened by the learner's prior experience with this task (Sweller et. al., 1998) and would be different for the two described student groups – with and without practical experience.

*Extraneous load* is described as the working memory consumed during task completion that is imposed on learners by the structure of the activity that does not enhance learning (Fraser et. al., 2015). In this component the lecturer has the most possible influence in decreasing extraneous load through tight tailoring of the case scenario and the content given. The intentional cognitive effort from the working memory dedicated to learning the particular new task and afterwards transferring the knowledge to the long-term memory is described by the *germane load* (Meguerdichian et. al., 2016). Especially by the division of the different knowledge nuggets transferred to the students with IT supported tools the overall stress at the student's side should be decreased.

All three mentioned components, describing the cognitive load, have to be summed up and should not be higher than the capacity of the working memory – otherwise learning is reduced. Based on these assumptions, the optimal design for the case scenario and the individual delivery of the knowledge nuggets avoids cognitive overload for the learners, maximizes germane load and minimizes extraneous load based on the individual ability to handle learning stress.

To measure the relative load on working memory in a case scenario, the NASA has developed a tool which will be used for the empirical part of this paper.

### 3. Methodology

The methodology used by the authors is two folded: The concept of the combination of the gamification aspects combined with a simulation game (presented in Ploder et. al. 2018) in this paper is combined with the IT supported knowledge nuggets delivery. The delivery of the knowledge nuggets is based on a self-evaluation (Klenowski, 1995) by every student to deliver the right nuggets to the right students needed and timed based on their needs. And after the knowledge sharing phase is over, the cognitive load has to be measured.

The self-evaluation of every student is based on an online questionnaire they can perform before lecture starts and this small questionnaire is delivered via our integrated LMS platform. The questions are asking about their working experience, their online education experience and their current knowledge about process management/quality management and governance with the aim to divide the students in two groups. From history we know that about half of the class still has experience or is working beside the university and the other half does not. For the later on implemented A-B testing this should be fine, that every group exists of enough students for statistical reasons. Usually students attend lectures relatively passively and find their motivation only in the final grade. That can lead to less commitment (Lei, 2010) and is a situation that should be tackled by this described way of studying and hopefully also the case study approach increases the engagement by implementing gamification and especially the idea of a playful design (Deterding et. al., 2011). The key factors which have to be implemented in every playful design are named as motivation and commitment, fun, competence enhancement in the specified area and practical applicability/sharing of knowledge.

For the measurement of the perceived cognitive load of the students, the NASA Task Load Index (NASA-TLX) (Hart 1986, Wayment 1995) is used. This is a very often applied and well standardized test which can be handled on paper with the paper and pencil package or in an online format. The NASA-TLX is based on six items, which have historically developed from nine items in the older "NASA Bipolar Rating Scale". Three dimensions relate to the demands imposed on the subject (mental, physical and temporal demands) and three dimensions to the interaction of the subject with the task (effort, frustration and performance) (Hart 2006). All the different items have to be weighted and the output of the whole measurement is an overall workload (OW) for every individual based on a particular knowledge chunk.

### 4. The framework

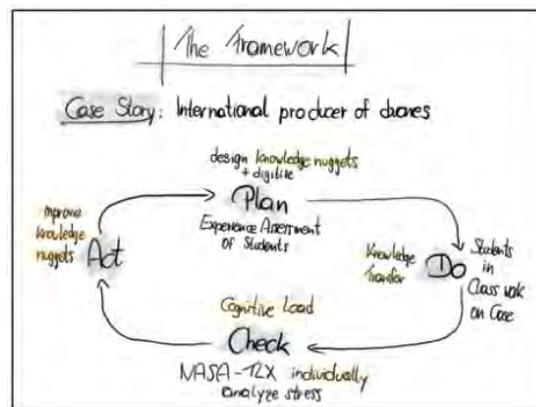
In this section the proposed framework of the authors is presented. There is lots of literature evidence (Ploder et al., 2018) combined with experience in the given topics regarding the implementation of the described simulation case. To increase the understanding of the framework figure 1 shows it in detail with all necessary steps which have to be performed.

The implementation of the whole idea is based on the well-known PDCA Cycle (also called Deming wheel) (Marquis, 2009). The framework describes all the necessary steps in every part of the framework in more detail. In the planning phase all the necessary knowledge nuggets have to be design and developed based on the curricula. Later they have to be assessed by the lecturers, the material has to be provided in the corresponding learning platform in logical order and based on the assessment marked with a "knowledge level" to be able to determine which student should get which knowledge nugget. The NASA-TLX questionnaire has to be prepared for the students – in our case we implemented that in

the integrated LMS which helps to distribute the questionnaire based on the student's assessment about experience and later on compare the data for the two groups.

When lecture is starting, the two groups of students are fixed, and all the students can work on their own pace through the knowledge nuggets. They have to communicate with each other and some of the topics have to be handled in different teams. After every step in the case study (knowledge chunk completed) the cognitive load is tested. Therefore, it is necessary to find a balance of the time working on a knowledge nugget to not make them too small because this leads to a high amount of TLX measurements which will interrupt the lecture massively. So here the authors suggest to not go for more than two NASA-TLX measures within four hours – so that means roughly around four at maximum five measures during a whole day of lectures – this has to be taken into consideration when planning the length of the nuggets. All knowledge nuggets and the following measurement on individual base is supported by the integrated LMS and can be performed every time the students reach the next level.

Figure 1. Implementation Framework for Simulation Cases with NASA-TLX Measurement.



After the whole lecture is over, it is about the collection and analysis of the results. The two groups would be analyzed separated and later on the results of the individual and grouped OWs will be compared based on the handbook of the pencil and paper handbook of the NASA (Hart, 1986). The outcome of the two groups will first be combined and then look deeper into the individual stress levels and try to get as much feedback out of the analysis. To improve the whole system of the case, the integrated LMS, the evaluation and the individual knowledge nugget allocation for the next time has to be developed based on the learnings.

## 5. Limitations and outlook

The most obvious limitation of this paper lies the fact, that the first implementation will be done in June 2020 and so there are currently no empirical results available. But there are well documented results on the positive impact of gamification usage in case study teaching given (Ploder et. al., 2018). There is a strong impact on the measurement items which are externally required by our AACSB accreditation and this does not have to influence all universities – so the application would be especially useful for universities with AACSB accreditation teaching in the BISE area.

In future the initial implementation in the upcoming integrative synopsis in our master class be end of the term is the next step. A second improvement would be the implementation of an individual control loop for improved pre-selection of additional knowledge nuggets for the next case task based on the individual student's stress level.

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## EFFECT OF STUDENTS THAT MUST REPEAT A COURSE IN THE DISTRIBUTION AND CAPACITY OF GROUPS

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### Abstract

In educational institutions, there is a need in the right use of human resources. Consider, for example, the number of groups for certain courses, the offer of professors and spaces is limited, and many times, there is many students that desire a certain course and for reasons of capacity and availability, it is not possible to satisfy their demands. Sometimes, the fact that students must repeat a course, is considered to have only academic relevance, however, this issue can have implications in other topics, for example, the resources one. In order to have a better idea of how much does this affect in a superior institution, this work presents a statistical analysis of the effect of students that must take a course twice and how this affects the available spaces for those who will take it for first time. For this were analyzed the eight more demanded engineering courses in a Mexican university.

**Keywords:** *Measurement in education, educational management, educational analytics, students' performance impact.*

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### 1. Introduction

In the Mexican Universidad Autonoma Metropolitana (UAM), when a student does not approve a course, has the chance of taking it one more time in a classroom, after that, it only could approve through an special exam called "Recuperation Exam". The problem when a student takes a course for a second time is that probably, it would be using a place than could have been used by a student that would take this course for first time, causing that this student has to wait another scholar period for taking it. It is clear that there is a problem with students that must take a certain course twice after not approving the course in their first try, causing that the total of spaces in a group were reduced for those students who will take the course for first time.

This is an interesting topic, the fact that students do not approve a course clearly has an impact in their studies progress, however many times it is not considered the impact that this could have in other areas of the educative environment.

For having a better idea of the impact of this problem, a statistical analysis for showing the proportion of students in a course that take the course for first or second time is proposed. Are considered four of the most demanded Engineering courses at UAM, which also have as prerequisite another course. For the analysis, were considered the number of students that approved a previous course and the total of students that did not approve the later one. Then is presented, using information visualization techniques as mentioned by Herman (2000), with these techniques are presented the information of students that are taking the course for first time, those ones for second time and the number of students that could not be registered for the course.

At UAM, there are three scholar periods per year named as the year followed by the letter I, P, O which represents Winter (I), Spring (P) and Fall (O) according the season when a new scholar period starts. There are new coming students in the periods of Spring and Fall (P and O).

This work is part of a bigger analysis which main goal is generating a visual system, which shows many statistics about an educative environment. Something that nowadays is necessary due to the amount of data and the need of taking decisions based on information that in a textual way would be very difficult to analyze and it is related with the concept of Learning analytics proposed by Siemens (2011).

## 2. Most demanded courses at UAM

At UAM, every engineering study program is composed by different groups of courses, but all of the 10 programs taught in the university, have a common group, this is called the General Branch which is composed by 18 courses as shown in UAM (2020). This group of courses encompass almost the first year of any engineering student. Because all the students take this courses, they are considered the most demanded, however because of the different dependences between these courses and the way in which students progress in their studies, the four most demanded among these courses are presented, among the scholar period, which corresponds to them, in Table 1.

Table 1. Most demanded courses and their characteristics.

Course	Scholar period	Depends on
Compliments of Mathematics	2	Introduction to Mathematics
Introduction to Calculus	2	Introduction to Mathematics
Introduction to Programming	3	Compliments of Mathematics and Introduction to Calculus
Differential Calculus	3	Introduction to Calculus

There are courses, which are for the first grade students, it is expected that these ones have a considerable demand; however, this courses do not represent a problem for the students that are going to take them for first time. UAM because the university assure that all of the new coming students have all their courses. However, as the students advance and begin to not approving courses, the number of places start to reduce.

## 3. Analyzing courses

For analyzing every course of Table 1, were considered from 2014 to 2018, which comprises 15 scholar periods, at UAM there are three scholar periods per year, and were obtained:

- Total of students that approve the previous course which represents the total of candidates for the next one.
- Total of students that did not approve the analyzed course, this number represents the total of students that must take another time the course.
- Total of students that took the course, considering those that take it for first time and those that take it for second time.

Considering this, for each course was generated a time graph, which shows the distribution over time of total of students that could take for first time the course, this means, and the ones that approved the prerequisite course in the former scholar period, the total of students that took the analyzed course for first and second time.

### 3.1. Compliments of mathematics

For taking the course Compliments of Mathematics, is necessary approving Introduction to Mathematics, those students that in the previous scholar period approved this one, are candidates for taking Compliments. Figure 1 presents:

- Total of students that took Compliments of Mathematics (Total).
- Total of students that were candidates for Compliments of Mathematics, this is, the ones that approved Introduction to Mathematics in the previous scholar period (Possible).
- Students that were allowed to take again Compliments of Mathematics, this is, students that in the previous scholar period did not approve it and still have a second chance (Could take again)
- From those students, those who took the course in (Second time).
- Students that took the course for first time (First time).

### 3.2. Introduction to calculus

In order to take Introduction to Calculus is necessary approving Introduction to Mathematics, those students that in the previous scholar period approved this one, are candidates for taking Introduction to Calculus. Figure 2 presents:

- Total of students that took Introduction to Calculus (Total).
- Total of students that were candidates for Introduction to Calculus, this is, the ones that approved Introduction to Mathematics in the previous scholar period (Possible).

- Students that were allowed to take again Introduction to Calculus, this is, students that in the previous scholar period did not approve it and still have a second chance (Could take again).
- From those students, those who took the course in (Second time).
- Students that took the course for first time (First time).

Figure 1. Demand and students that took Compliments of Mathematics.

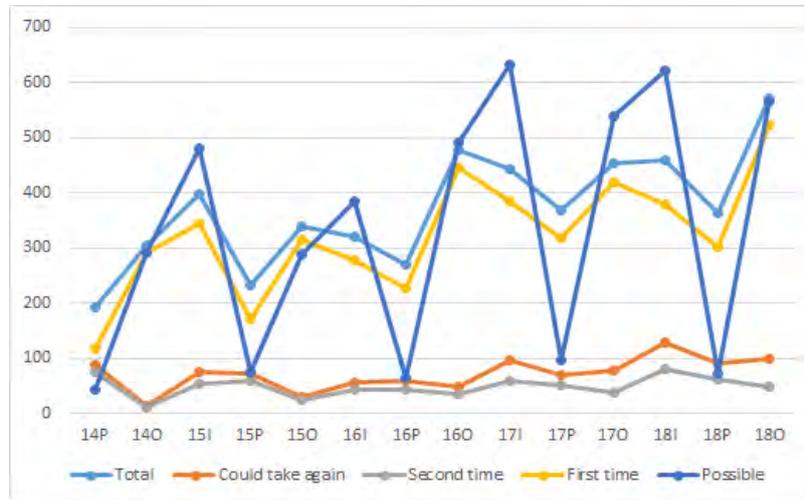
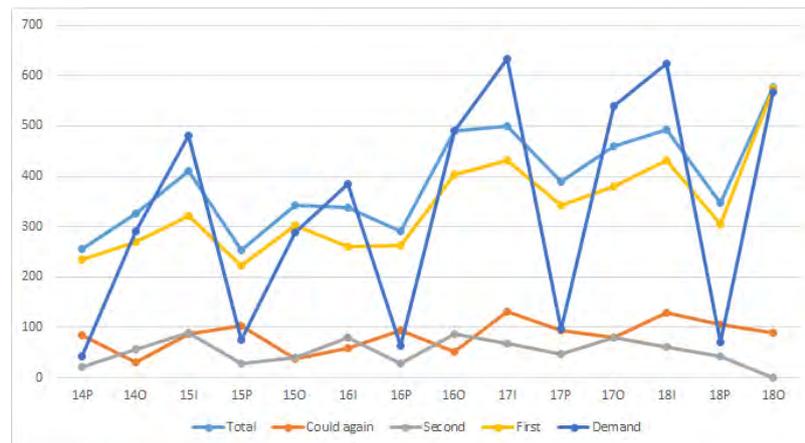


Figure 2. Demand and students that took Introduction to Calculus.



### 3.3. Introduction to programming

In order to take Introduction to Programming is necessary approving Compliments of Mathematics; those students that in the previous scholar period approved this one, are candidates for taking Introduction to Programming. Figure 3 presents:

- Total of students that took Introduction to Programming (Total).
- Total of students that were candidates for Introduction to Programming, this is, the ones that approved Compliments of Mathematics in the previous scholar period (Possible).
- Students that were allowed to take again Introduction to Programming, this is, students that in the previous scholar period did not approve it and still have a second chance (Could take again)
- From those students, those who took the course in (Second time).
- Students that took the course for first time (First time).

### 3.4. Differential calculus

In order to take Differential Calculus, is necessary approving Introduction to Calculus, those students that in the previous scholar period approved this one, are candidates for taking Differential Calculus. Figure 4 presents:

- Total of students that took Differential Calculus (Total).
- Total of students that were candidates for Differential Calculus, this is, the ones that approved Introduction to Calculus in the previous scholar period (Possible).
- Students that were allowed to take again Differential Calculus, this is, students that in the previous scholar period did not approve it and still have a second chance (Could take again).
- From those students, those who took the course in (Second time).
- Students that took the course for first time (First time).

Figure 3. Demand and students that took Introduction to Programming.

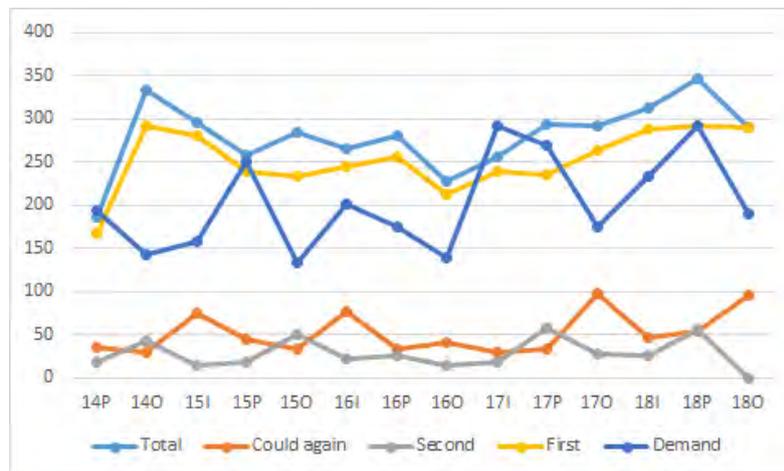
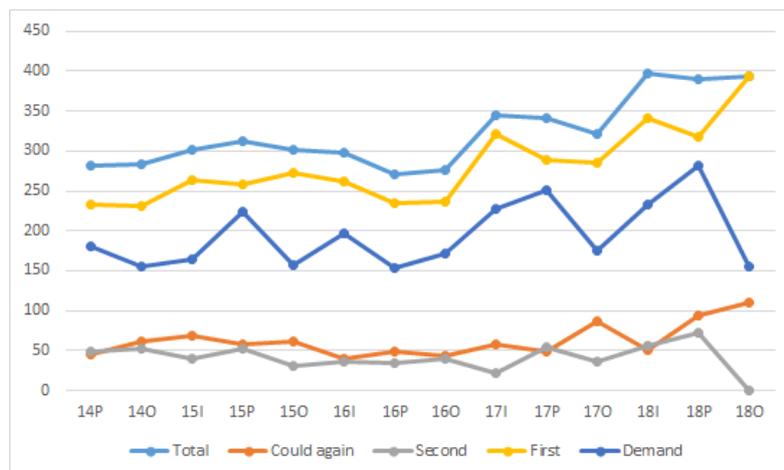


Figure 4. Demand and students that took Differential Calculus.



#### 4. Analysis

Considering the graphs presented in Figures 1 to 4, it is clear that the courses which have more problems are Compliments of Mathematics and Introduction to Calculus (Figure 1 and Figure 2). In these courses, the demand considering the students that approved the previous course is bigger than the total of students that took course. There are scholar periods in which the demand is very low, this is because the previous course, Introduction to Mathematics is offered to new coming students, and after a scholar period where there were not new students, the demand of places for the next course comes down drastically.

The other two courses do not have a several issue, the demand of places due to students that approved the previous course it is not considerable, and more students took these courses. This is because some of the previous courses (Compliments of Mathematics and Introduction to Calculus) are a bit more complicate and more students did not approve them, so the demand comes down. Also, more students did not approve the former courses in their second try and this makes it impossible to them to take the course again.

Analyzing the behavior of students that did not approve a course, the total of them that could take the course again is not considerable, but in general could be told that not all the students that did not approve and could take the course again take it in the next scholar period. This causes an extra delay in their studies.

## 5. Conclusions

Universities generate a lot of information related with many topics, presenting this information in a clear way allows its analysis for discovering if there are problems or situations that need the attention of authorities. Having the data just as raw versions with thousands of registers that are not analyzed is something that in the era of information and knowledge could not be allowed in any superior institution.

Goal of this work was determining if there is a problem related with offer and demand in four courses, which are considered as the most demanded in all the engineering programs. Results show that two of them have problems every certain scholar period where the demand is greater than the students that took the courses. This means that a certain number of students could not take them provoking a delay in their studies. This also occurs to those students that have failed once in the course, here, the delay is twice, one because of not approving and another due to they could not take the course again, this means that a course that should be approved in one scholar period, could be approved in at least 3 (a year considering the scholar calendar of UAM).

This information exists, but as raw data it is almost impossible to discover this kind of patterns or behavior, it is only when the data is presented in a visual way that the problem raises and measures could be taken to solve it. As an initial stage of a bigger project related with showing a lot of information at UAM, results from this work allows discovering the problems that exists in two courses. This study can be applied to all the courses at UAM, this could help improving the number of courses that are programmed every scholar period and also taking measurements for helping students during their studies so their advance could be as expected and desired for both, the institution and students themselves.

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## SELF-PRODUCED VIDEOS IN FLIPPED CLASSROOM FOR PRE-COURSE ENGINEERING STUDENTS, ENGINEERING STUDENTS AND NURSING STUDENTS

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### Abstract

Western Norway University of Applied Sciences at Campus Førde offers nursing education, engineering education in electrical engineering and a one-year preparatory course for engineering education. Teachers on the different programs cooperate in the production of video-based resources. The study investigates students' use of videos made by the teacher as part of flipped classroom in three different subjects. These subjects are Control Systems in engineering education, Communication and Norwegian in the preparatory course for engineering education and Anatomy/Physiology in the nursing education. Control Systems, taught in the fourth semester of the engineering education, has traditionally been classroom-based, with a lot of blackboard teaching. Learning sessions have been a combination of problem solving and review on the board. Communication and Norwegian has largely consisted of presentations and related exercises. Anatomy/physiology is part of the course Anatomy, Physiology, Biochemistry and Microbiology, taught in the first semester of the nursing education. Lectures in plenary have traditionally been the most widely used teaching form in this course, but the number of lectures has been reduced in favor of learning sessions in smaller groups. 21 engineering students, 17 nursing students and 17 students in the preparatory engineering course answered a questionnaire about the use of videos. The study shows that the nursing students use videos more before the learning sessions than the other two groups. Videos produced with simple tools are technically satisfactory, and make it easier for the students to understand the material, which contributes to increased learning outcomes. Students express that videos are more motivating, and that they learn more from watching a video than readings. Nursing students expressed a higher degree of agreement to replace the traditional lectures in other topics with videos.

**Keywords:** *Inverted classroom, teaching videos, motivation, learning outcomes.*

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### 1. Introduction

The concept of flipped classroom, also called inverted classroom, is used in different ways with varying content, and it is difficult to point to a common model (Bachnak & Maldonado, 2014). Flipped classroom means that what has traditionally been done in the classroom is done at home, and what has traditionally been done at home is done in the classroom, but flipped classroom means more than this (Sams & Bergmann, 2013). Bishop and Verleger, who in a review article have undergone a number of studies on flipped classroom, choose to describe the flipped classroom as a form of teaching that consists of individual computer-based learning outside the classroom and student-active group-based learning in the classroom. Not all concepts referred to as flipped classroom contain these elements (Bishop & Verleger, 2013). Common to the models referred to as flipped classroom, however, is that the learning that takes place outside the classroom is a preparation for the student-active learning in the classroom. For the model to work, it is a prerequisite that the students have worked with the subject matter beforehand. The guidance in the classroom is based on the knowledge that the students bring with them when they come to the learning sessions, because activating pre-understanding is important for constructing new meaningful knowledge (Pettersen, 2015). It means that the students prepare, preferably by watching one or more videos before the learning session in the classroom. The learning session includes task solving and group work, and the teacher goes from being a lecturer to becoming a supervisor (Sams & Bergmann, 2013).

Students supplied with videos come better prepared for the learning sessions than those who only get text material in advance (De Grazia, Falconer, Nicodemus, & Medlin, 2012). In a study among nursing students at Hawaii Pacific University, 85% of the students thought it was extremely or very useful to watch videos (Critz & Knight, 2013). Videos can be recordings of whole lectures, or short clips (Kay,

2012). Previous studies show that short videos are preferred (Guo, Kim, & Rubin, 2014; Zappe, Leicht, Messner, Litzinger, & Lee, 2009). Video clips are an important resource for teaching the Internet generation, in order to take advantage of different learning strategies so that each student get better results (Berk, 2009). There are many video lectures on the Internet. However, each lecturer has their own style and it may take a long time to find suitable videos. The time it takes to find a good video online can be as long as the time it takes to make one's own (Raths, 2014). You can start with simple tools, and gradually become more advanced (Sams & Bergmann, 2013). A large study from the United States shows that what engages most is informal, short video recordings with tablet teaching, as well as videos like those at Khan University. Students like these videos better than even pre-recorded high quality lecture videos (Guo et al., 2014).

A large review of research on flipped classroom concluded that the students are generally positive about this form of learning, but the opinions are somewhat mixed, and some are even negative (Bishop & Verleger, 2013). Many also prefer a mix of flipped classroom and traditional lectures (Zappe et al., 2009). A survey among engineering students at Texas A & M International University in a course in electronics, showed that 67% preferred to continue with the flipped model, while the rest would rather have traditional lectures (Bachnak & Maldonado, 2014). Another survey among engineering students showed that flipped classrooms meant that lecturer could go through more material, and that the students did just as well as students who had traditional lectures. Initially, the students struggled with the new program, but mastered it quite quickly (Mason, Shuman, & Cook, 2013).

## 2. Objective

The purpose was to investigate students' use of videos as part of flipped classroom in nursing education, pre-course engineering education and engineering education.

### 2.1. Method

The videos are six to eight minutes long, in central themes. In cases where longer videos have been needed, they have, as far as possible, been divided into shorter clips. The students use the videos as part of their preparation for the learning sessions.

In Control Systems, there are nine major themes, with two or three videos to each main theme, about 20 videos in total. The students were to watch the videos before teaching and learning sessions with a review of theory, followed by a solving of problems in the classroom with access to guidance.

In Communication and Norwegian, students received short videos that they would watch at home or at the start of the class. During class, the students worked on different assignments, oral and written, in both Norwegian and English. There are four main themes in the subject, and each part consisted of between three and five videos.

In Anatomy, Physiology, Biochemistry and Microbiology for the nursing students, "the senses" was selected as the theme, after which 18 short video clips replaced 4 hours of lecture. After watching the videos, the students met in groups for two hours of guidance in the same theme. The subject teacher who met the students for guidance was the same teacher who had recorded the videos.

Some of the videos are made using software that captures the contents of the PC screen while the lecturer talks. The tool used for this is Screencastomatic (Screencastomatic, 2019), which can record both audio and video, used in combination with PowerPoint. Screencastomatic in combination with a web camera was used to record the preparation of notes on paper.

Other videos in the project were recordings, most often of blackboard teaching, made using a rotating camera. Here we used a Swivl robot (Swivl, 2019), which is a tool that, in combination with for example an iPad, records videos. The Swivl robot is rotatable and programmed to follow a marker. The marker can be worn, making the robot follow and record the movements of the lecturer. A built-in microphone records what the lecturer says. The Swivl robot produces mp4 files, a format which most platforms, including smartphones, handle. All videos used in anatomy/physiology were made this way, with the exception of a video made using an animation program. The animation video was made by using a Bamboo drawing board with SmoothDraw, and recorded using a program that captures what is on the screen. This video was saved as a WMV file, and all the charts used were in versions that are available for free on the Internet.

### 2.2. Data collection

In order to evaluate the project, the students answered a questionnaire. The sample consists of 21 engineering students, 17 nursing students and 17 students in the preparatory engineering course. Of these, one engineering student and one student in the preparatory course only answered the first three questions, so that the sample size for these student groups is 20 and 16 students, respectively. Norwegian Center for Research Data (NSD) found that the project was not subject to notification. The students received information in writing and/or oral about the project. They did not provide names on the questionnaires.

### 3. Results

Table 1 shows the responses of the groups together in the questions where the answers are easy to put together. The "completely agree" and "partially agree" response options are merged to "agree", while the "completely disagree" and "partially disagree" options are merged into "disagree". Students who answered "indifferent" or "don't know" are not included.

Table 1. Student answers.

Questions.	Agree	Disagree
The videos were easy to understand		
The videos worked technically satisfactory		
The videos made it easier to understand the subject matter		
The videos made me well prepared for the learning sessions		
The model with videos and learning sessions is more motivating than lectures		
The model with videos and learning sessions gave me greater learning outcomes than lectures	)	
I learn more from regular lectures than from the model with videos and learning sessions		
The learning environment during the hours with learning sessions was good		

Table 2 shows the differences between the groups. A Kruskal-Wallis test has been performed by grouping the students' answers, e.g. for the variable "The videos were easy to understand" give "totally agree" the lowest weight and "totally disagree" the highest weight, and then the average weight for the different student groups is shown. Here, too, the students who answered "indifferent" or "don't know" are not included. There are significant differences in how much time students spend on their studies ( $p = 0,002$ ). A p-value less than 0,05 indicates a significant difference. The nursing students spend the most, the engineering students the least. There is also a significant difference in the use of the videos before learning sessions ( $p = 0,000$ ). Here the nursing students use the videos more than the two other groups. However, after the learning sessions, the engineering students use the videos more than the other groups, but this difference is not significant ( $p = 0,069$ ). The nursing students are most in agreement with the rest of the questions, with the exception of "I learn more from regular lectures than from the model with videos and guidance/practice". The differences between the student groups are significant ( $p < 0.05$ ) for all questions, with the exception of "Videos made it easier to understand the subject matter".

Table 2. Comparison of the different student groups' answers to the questions.

Questions.	Group, mean rank.			Kruskal-Wallis test.	
	Lower number values indicate a higher degree of agreement.			A p-value less than 0,05 is a significant difference.	
	Nursing	Engineer	Preparatory course	Chi-squared	p-value
Time spent			33,8	12,47	0,002
Use of video before learning sessions			32,3	23,69	0,000
Use of video after learning sessions			30,5	5,35	0,0069
The videos were easy to understand *			33.4	10,79	0,005
The videos worked technically satisfactory *					
The videos made it easier to understand the subject matter *					
The videos made me well prepared for the learning sessions*			30.6	14,53	0,001
The model with videos and learning sessions is more motivating than lectures *			26.7	7,92	0,019
The model with videos and learning sessions gave me greater learning outcomes than lectures *			25.7	7,11	0,029
I learn more from regular lectures than the model with videos and learning sessions**					
The learning environment during the hours with learning sessions was good **			33.2	6,69	0,035

\* n 17 (nursing), 20 (engineer), 15 (preparatory course)

\*\* n 17 (nursing), 20 (engineer), 13 (preparatory course)

26,7% of the engineering students, 94,9% of the nursing students and 71,4% of the pre-course students want to replace lectures with videos and learning sessions in other topics. *Fisher's exact test* shows that there is a significant difference between the groups in this question ( $p = 0.001$ ). In this test, "do not know" answers are ignored.

#### 4. Discussion

The students clearly stated that videos made with easily accessible tools that the individual teacher can produce without assistance from others, were technically satisfactory. This is in line with what previous experience has shown. You do not need expensive and advanced equipment to make videos that work well technically (Sams & Bergmann, 2013). Videos recorded with simple and inexpensive equipment, and where the teacher has good eye contact with the viewer, can be more engaging for the students than videos produced in a professional studio (Guo et al., 2014). Our opinion is that the videos must be of sufficient quality, but do not need to be perfect. A common teaching situation is not perfect either.

Although all student groups were generally positive to flipped classroom, there are significant differences. The nursing students used videos more than pre-course and engineering students did before the learning sessions. Compared to the other groups, more nursing students also expressed that they felt this was a good way to prepare for the upcoming sessions, which would explain why they spent more time watching videos. This is consistent with the Hawaii Pacific University survey, where 85% of nursing students thought it was extremely or very useful to watch videos (Critz & Knight, 2013). Video clips can make a difference when it comes to students' motivation and attitude to the subject (Berk, 2009), and a clear majority of nursing students in our study think videos are more motivating than lectures.

The nursing students are also generally the most satisfied with the videos, they agree more that the videos are easy to understand and that they were technically satisfactory, than the other two student groups. The nursing students also have higher degree of agreement that the video and learning session model provides greater learning outcomes than lectures, while only a minority of pre-course and engineering students agree. Unlike nursing students, only a minority of engineering students believe that the teaching model in our study is more motivating than lectures.

These differences between the student groups may have several possible explanations. An explanation can be the way they use the videos, where the nursing students have used the videos more to prepare for the learning sessions. Another explanation may be the content of the videos, which in turn has a certain connection with the specificities of the subjects (Kay, 2012). Anatomy is a visual subject with many illustrations that can be good on video. The videos used in anatomy and physiology for nursing students were short, and made using a camera to record tablet teaching. When the students in our study were satisfied with this video format, it corresponds to the major review of flipped teaching in the United States that shows that short, informal tablet recording videos are most engaging (Guo et al., 2014).

The engineering students are generally more inclined to have lectures than the other student groups, and there are different reasons why students prefer lectures rather than videos (Kay, 2012). One reason why many of the engineering students in our study prefer lectures may be that they are most accustomed to blackboard teaching, and that the videos do not reflect the usual teaching situation. Working with control systems includes many mathematical calculations, and most videos are recordings of calculations on paper without the video showing a picture of the lecturer. The students want to both see and hear lecturers, so that the videos become more similar to other teaching situations (Guo et al., 2014; Sams & Bergmann, 2013).

The most surprising finding is that the nursing students, more than the engineering students, want to replace more of the teaching with videos and learning sessions. The difference between the student groups is significant. We thought the engineering students, who are more technically oriented, were more accustomed to finding and using videos in their learning. There are plenty of videos on YouTube on most technical topics, and videos support multiple learning strategies (Berk, 2009). Based on this, we assumed that the engineering students would prefer their study material presented in videos. The result of our study, however, was different. If we see the students' answers to this question in connection with what they answered to other questions, it is not as surprising as it might be at first glance. Although all the student groups are satisfied with the technical level of the videos, the nursing students are significantly more satisfied than the engineering students are. An explanation can be the technical differences between the videos, but may also indicate that the engineering students, because of their technical competence, have higher technical demands than the nursing students do. Another possible explanation for the engineering students being less enthusiastic, is the format of the videos. As mentioned earlier, the students in engineering education are mostly accustomed to blackboard teaching, while most of the videos are recording of computer screens or notes. Videos should therefore look more like the usual teaching situation, and visualize the material in a good way. The previously mentioned study from the United States (Guo et al., 2014) shows that short videos with the recording of tablet teaching are the best.

## 5. Conclusion

In this study, we have tested out self-produced videos as part of flipped classroom for nursing students, engineering students and students on a preparatory engineering course. Overall, the students expressed that the videos were both easy to understand and helped them to understand the subject matter more easily. One factor that may have contributed to how well they were received, was that the videos were short and often dealt with one single theme. The students found the videos technically satisfactory, which is important for how they would be used. The study supports the fact that videos made with simple tools work well both technically and academically. However, there were some clear differences between the student groups. The nursing students were even more satisfied with the learning model than the engineering students and pre-course students. Compared to the other student groups, the nursing students expressed that this model provided greater learning outcomes and was more motivating.

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## SERVICE-LEARNING AT UNIVERSITY: ADDRESSING SOCIAL CHALLENGES FROM THE EDUCATION

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### Abstract

The work presented is part of the Teaching Innovation Project ‘Social responsibility in the University: APS in the Degrees of Education’. In the development of this project, a collaboration agreement was signed with the Spanish Committee of Acnur (UNHCR). Within the university volunteer program of this NGO “Let’s not leave anyone behind”, students of the Degree in Early Childhood Education of the University of Jaén have had the opportunity to deepen their knowledge of the living conditions of refugees.

The main aim of the collaboration with UNHCR has been to offer university students the opportunity to build the learning process acquired in the Degree by promoting social transformation, through the Service-Learning methodology, developing training activities, raising awareness of this issues and proposals of work to develop them with the students of Primary Education.

After a period of intense training, university students have subsequently designed and implemented their own awareness campaigns in different schools in Jaén.

Through real material used in the refugee camps and the material created by the students themselves, more than a hundred primary school students have been able to approach the reality of forced displacement and have better understood in the lives of more than 70 million people in the world who are suffering it.

In the implementation of the project, there has been the participation of an asylum seeker, which has provided the activities carried out with the precise contextualization of being able to share real experiences in a live voice.

Once the evaluation of this experience is achieved through discussion groups, the results show that the experience has been enriching for all those involved in the project and that Service-Learning fosters motivation, social responsibility, reflection and ethical commitment in the students.

**Keywords:** *Service-Learning, university, refugees, social commitment.*

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### 1. Introduction

Among the different commitments that the university must face nowadays, those related to society acquire special relevance, because the improvement and transformation of reality is a priority task. In order to achieve this responsibility, the institution as a whole and the training that it offers must change substantially, creating links with the community and giving to students the possibility of having a comprehensive education aligned with social demands (Esteban and Martínez, 2012). In this sense, methodological strategies are a fundamental element for making this change possible. Among them, we highlight the training model of Service-Learning (SL).

The SL is, according to national and international researches, one of the greatest benefits to all participants involved in the process (Eyler, Giles, Stenson, and Gray, 2001). The SL can be defined as an active methodology, which combines two key elements: the learning that students do while acquiring contents, skills and curricular competencies and, the service, which is provided to the community by implementing this knowledge into practice (Folgueiras, Gezuraga, Aramburuzabala, 2019).

Puig, Batlle, Bosch and Palos (2007) distinguish four dimensions to consider when working with SL:

- The essence refers to the most basic and essential elements such as responding to real needs of society, performing a useful service and linking learning to academic curriculum.
- The pedagogy based on the actual experience lived by students, encouraging their participation and awareness of lived experience, promoting cooperation and looking for the project success and its recognition.
- Networking with the community: It is necessary to collaborate with other social institutions and organizations, to provide students service possibilities.

- Purposes: to promote values education through practice, encourage civic engagement and use knowledge as a tool for improving the quality of life.

Therefore, SL has become in recent decades in one of the better methodologies to promote relations between University and community, in order to achieve an improvement for all. In this respect, Olson and Brennan (2017) state that when a commitment is established between the university and the community, a positive transformation of higher education can be achieved. When we practice SL at the University, we contribute to open it to society, creating links between different institutions in order to participate in the social reality that students will have to face in their professional future. These are systematized activities aimed at improving relations between different groups, participating in the social framework, and giving meaning to the theoretical knowledge acquired (Campo, 2010). Hence, SL creates learning contexts that offers the possibility to develop communicative skills, capable of regulating the participation in debates, in solidarity projects in which the participants are involved as part of and intervening in them.

Even more, SL provides the necessary elements at a conceptual, procedural and instrumental level for the design and develop of projects that link the received learning with the labour world, a fact that acquires great relevance at the present time since the educational model is based on the acquisition of skills (Fernández, Arco, Hughes and Torres, 2014).

## 2. Design

The present experience is framed within an Innovation Project called ‘Social responsibility at the University: SL at the Education Degrees’. Specifically, we focus this project on the subject Inclusive School, in which the 2nd year students of the Degree in Early Childhood Education of the University of Jaén develop different activities based on the Service-Learning methodology. In order to develop the practical part of the subject, the group-class was divided into smaller groups (6-8 participants) and each group was proposed to choose a social or educational institution for performing the type of service they have chosen (creation of educational resources, conscience and awareness-raising campaigns, workshops and others), taking into account the contents which they worked on the subject and how they connect them with practice. All these actions were developed under the supervision of the teacher. Two of these student groups chose the NGO SPAIN with UNHCR to work with and carry out a direct service in two schools. For this, the following work scheme was used:

- A training seminar on the APS methodology was carried out with the groups involved. The main aim of this seminar was to inform students about what this methodology consists of and how it should be carried out.
- We contacted with representatives of Spain with UNHCR (UNHCR-UNHCR), who visited the University and offered students the opportunity to collaborate in their “Let’s not leave anyone behind” program. For this, a collaboration agreement was signed between the University of Jaén and UNHCR and training activities were carried out with the students involved in the SL project. ([https://diariodigital.ujaen.es/sin-categoria/alumnado-de-la-uja-participa-en-un-proyecto-sobre-los-retos-de-los-refugiados-puesto](https://diariodigital.ujaen.es/sin-categoria/alumnado-de-la-uja-participa-en-un-proyecto-sobre-los-retos-de-los-refugiados-puesto;); <https://www.europapress.es/andalucia/noticia-alumnado-uja-participa-proyecto-retos-refugiados-20190514131659.html>).
- At the same time, the students began to inquire about the possible services that could be carried out around this theme, linking them to their curriculum and the needs of the environment. Two public schools in the city that were working on issues of equality, interculturality and social justice were contacted and proposed to participate in this experience.
- The groups defined and organized their respective projects. In this case, they opted for awareness campaigns for primary school students. With the campaigns we designed, it was intended to make the reality of refugees known and provide an opportunity for school children to empathize with the refugee living conditions. In order to develop the campaigns, we designed two sessions for each school. During the first, an asylum seeker gave a talk to show their situation and contextualize their problem. At the second session, a gymkhana was developed. In this gymkhana, and through real material used in the refugee camps and the material created by the students, more than a hundred Primary students were able to put themselves in the skin of many people who are suffering the forced displacement of their origin countries.
- Once the service was implemented, the process and the students' learning were evaluated. Each group delivered a final report with the following structure: introduction, project objectives, theoretical justification, process description, technical data sheet of the actions and materials designed, conclusions and bibliography.

## 2.1. Objectives

The main aim of this Innovation Project was to use SL methodology for the development of the different subjects involved within, and at the same time, to improve the specific competences of the college students.

The specific objectives developed with this experience were the following:

- . To identify the real needs of schools involved in the project.
- . To encourage social engagement between university students, schools and the program developed by UNHCR.
- . To train students for the implementation of the service.
- . To design intervention projects based on identified needs.
- . To transfer to the real context the projects designed by the college students.

## 2.2. Methods

In this paper, we present the qualitative dimension of the experience. The techniques for collecting information were:

- direct observation, which was carried out during each session
- Pre-training and post-training evaluation (PPE), developed by the representative of the UNHCR Spanish Committee (using evaluation sheets and open questions)
- Final reports (FR), delivered by the college students at the end of the project and evaluated by the subject's teacher;
- Discussion groups (DF) composed by teachers from schools involved and college students.

A content analysis of the data was carried out in order to obtain results and draw conclusions about the whole develop of the SL Methodology.

## 3. Results and discussion

The results show that the experience was enriching for all the participants. Even more, they suggested that student participation in SL was associated with positive outcomes in motivation, task engagement, social responsibility, reflexion and ethic commitment (Celio; Durlak and Dymnicki, 2011).

*"...the motivation after the gymkhana was very good, it was really successful, because the boys and girls give us really news ideas while we proposed the activities, even, some of the groups asked us to repeat some games, but it was impossible because we did not have enough time." (Group 1. FR)*

*"... the design of the gymkhana was a very motivating and creative task for the developed of the chosen topic. It gave us the possibility of implicate to the children and make them participant from the very first moment." (Group 2. FR)*

We agree with Folgueiras, Gezuraga & Aramburuzabala (2019) when they state that the previous training is essential before the develop of a SL Project. In our case, the college students applauded the different training sessions. They argued that the training sessions allowed them to better design of their projects. Even more, the mere fact of participating in SL Projects offered to the college students the possibility of learning about the relevance of their professional and civic commitment with some disadvantaged collectives at risk of social exclusion (Mayor y Rodríguez, 2016).

*"... for two months, we attended training talks given by ACNUR representatives, in which they made us know how lucky we are, and how few we value it. During the sessions, they have talk about disadvantaged places, about the day-a-day suffering of some people, about how they can be manipulated just because they want to put in safe to their families, or flee their country due to fear of persecution... ... most of the people who suffer from it are women and children. It has made us reflect and value more what we have today. " (G1. DG)*

In this sense, the participation of the college students in the SL projects contributed to enhance their self-knowledge and self-esteem, as well as to the development of social and reflection skills. All the above mentioned, as Mayor (2019) states, implies the possibility of creating environments that offer different situations for analysis, criticism and awareness of their own actions, while give a personal and social meaning to their own experience.

*"In one session, we worked the control of our lack of confidence and how we can solve it. While we were doing some activities, we realized that not only the people who suffer have uncertainty about the future or, even about the present time, but also people who apparently have no problems can be disbelief. And we realized that we ourselves can find the better solution." (G2. DG)*

An aspect that the college students stand out positively is that the participating institutions and agents are involved into the action. It becomes an extra source of motivation for students, since they experience the usefulness and recognition of their work and effort.

*“During these two months, while preparing the gymkhana, we were in contact with the schools to find out where the gymkhana was going to take place, to know what space we had, the number of children, the classes and the resources they could offer us.” (G1. DG).*

*“The good cooperation between the children of the schools,... the motivation and interest they put in the development of the activities that we proposed,... the good use of the materials that the school provided us and the good treatment received by both the teachers and the students from the school was the best.”(G2. FI)*

In addition, the knowledge acquired at the university subject by the students has improved the service provided. They demonstrated that they were able to apply this knowledge into the practice. Moreover, the service favoured the students’ acquisition of new knowledge that make possible the resolution of new detected needs (Tapia, Amar, Montes, Tapia and Yaber, 2013).

*“The school students worked cooperatively during the different gymkhana games. Also, in several groups there were students with some difficulties but, this was no inconvenience since, the tasks were designed for any student with or without difficulties. Always the classmates worked together.”(G1. DG)*

In relation to the problems and limitations detected, they are generally reduced to the unforeseen events that arise in practice, related to problem solving and decision making (Chiva-Bartoll, Pallarés-Piquer and Gil-Gómez, 2018).

*“The only problem to highlight is the lack of time we had to implement our work in the school because we were assigned more Primary groups to work with. However, everything went as planned.” (G2. DG.)*

*“The gymkhana was intended to be done outdoor in the playground but, due to weather problems, we had to do it in a covered playground. Even so, it did not cause any problems and we were able to carry it out as it was intended”(G1. FI.).*

#### **4. Conclusion**

Trough SL projects, the Education Degrees’ students from the University of Jaén develop multitude of activities in their training course that can reverse in benefits for the society that surrounds them.

The subjects of their university training are focused on developing in them capacities that they will later have to put into practice in their professional work. Many of the university subjects (especially in the practice activities) require that the students carry out resources, materials, programs, etc., that could be used by different institutions taking advantage of these results.

Thus, our college students develop a series of practical activities that can offer answers to the demands of schools and social institutions. It is a big benefit for the institutions we collaborate with.

Moreover, carrying out these activities contextualized into real situations means that students are involved and interested in teaching practices, with the design and development of teaching resources, thematic workshops, etc.

With this, our project offers Learning, while our students learn from their subjects in a more realistic and connected way, and Service, while their elaborations can serve as support to teachers, students, schools and social institutions.

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# FOSTERING CREATIVITY OF STUDENTS WITH INTELLECTUAL DISABILITIES THROUGH MUSIC LISTENING ACTIVITIES

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## Abstract

This study investigates special schools music teachers' reflections on their design of music listening activities that could foster musical creativity of students with intellectual disabilities. Nine cases of special school music teachers are documented. Qualitative data were collected by classroom observations and face-to-face video elicitation interviews. The findings indicate those special school music teachers designed active listening activities that integrated with other music learning activities for enhancing students' enjoyment of music learning as well as their development of creativity and imagination.

**Keywords:** *Music, creativity, listening activities, students with intellectual disabilities, Hong Kong.*

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## 1. Introduction

### 1.1. Special education for students with intellectual disabilities

In Hong Kong, students with intellectual disabilities [ID] are commonly placed in special schools according to the students' level of intellectual disabilities, i.e. mild, moderate or severe intellectual disability. All special schools in Hong Kong are funded by the government. Under the principle of "one curriculum for all", students with ID are expected to achieve the same learning targets as their counterparts in mainstream schools (Education Bureau [EDB], 2020a).

### 1.2. Music curriculum for students with intellectual disabilities

Music teachers in all special schools for children with ID are expected to implement school-based music curriculum as their counterparts in mainstream schools. Music is one of the subjects in the Arts Key Learning Area. The curriculum framework of music is laid out in the *Music Curriculum Guide (Primary 1 – Secondary 3)* (Curriculum Development Council [CDC], 2003). One of the overall aims of the *Music Curriculum Guide* (2003) is "to develop creativity, the ability to appreciate music and to effectively communicate through music" (p. 11); and one of the major learning targets is "developing creativity and imagination" (p. 12). These learning targets are expected to be achieved through listening, performing and creating activities (CDC, 2003). Music is offered as a subject to students with ID according to adapted learning objectives under the Basic Education Curriculum (Intellectual Disability) (EDB, 2020b).

### 1.3. Rationale for conducting this study

I am a music teacher educator with over 30 years of experience in teaching and supervising music teachers' practices in mainstream schools and special schools. According to my experience of working with music teachers of special schools and mainstream schools, I have the following observations: (1) Students with ID in special schools demonstrate that they are capable to learn music like their counterparts in mainstream schools; (2) Listening is an essential activity for students with ID to learn music; (2) Music teachers may have reservations in implementing creative music activities in music lessons. Thus, it is worthwhile to study how special school music teachers design listening activities to foster musical creativity of their students.

## 2. Literature

### 2.1. Musical creativity

Webster (2002) defines musical creativity as the "engagement of the mind in the process of actively structured thinking in sound for the purpose of producing some product that is new to the creator" (p. 138). When children listen to music, regardless of their intellectual ability, they may have

their own way of thinking in sound. When they react or interact with the music they hear, they are producing sounds that are new to themselves at that moment. The development of music creativity is not age or phase dependent, it depends on the music teachers to create appropriate contexts and environment for them to develop their musical creativity (Burnard, 2006). The opportunity and time to play with music is essential in the context because their creative music making often occur in their play (Elliot, 1995).

## **2.2. Teaching of musical creativity**

The practice of musical creativity in schools depends on “how teachers act, and how their students participate, how musical creativity is taught as part of school music” (Burnard, 2012, p. 9). When teachers design their curriculum for developing students’ creativity, they should consider students’ abilities and interests because the development of musical creativity is influenced by formal and informal instructions and prior musical experiences of the children (Burnard & Younker, 2002). Due to the limitations of students with special needs, the availability of digital technology is an effective aid that can enhance their creativity (Adkins et al., 2013). Hong Kong special schools implement school-based adapted music curriculum (Wong, 2015). It is worthwhile to study how music lessons in special schools for students with ID to develop their musical creativity.

## **2.3. Creativity in listening**

According to Peterson (2006), listener constructs mental objects and novel perception of music that correspond to music performance which differ from that of other listeners; through the creative process of attentive listening, every listening experience is new and personal, all musical sounds are new and contemporary. This perspective of recognizing music listening as a creative activity also fits Webster’s (2002) definition of musical creativity. Furthermore, Hwang (2011) found that music listening combined with play can improve musical creativity skills, including musical imagination and musical originality. Thus, music listening is indispensable in developing musical creativity.

## **3. Purpose of study**

Up-to-date, research about teachers’ reflections on their curriculum design of listening activities for developing the musical creativity of students with ID is not found. It is worthwhile to explore and contribute in this area. The purpose of this study is to investigate special schools music teachers’ reflections on the music listening activities that could foster musical creativity of students with intellectual disabilities.

## **4. Methodology**

This is a qualitative multiple-case study. Purposeful sampling was used to select nine cases of special schools music teachers, three from each category of special schools for mild, moderate or severe ID. Class observation was conducted in four music lessons in each case. The choice of music lessons and level of students were left to the choice of the music teachers. All observations were conducted by the researcher. All music lessons were video recorded for viewing at the post-observation face-to-face interviews. An identical semi-structured interview guide was repeated to all nine cases. At the interview, both the teacher and the researcher could initiate discussion based on a certain incident shown in the video recording. The face-to-face video elicitation interview technique allows the researcher to prompt questions for the participants to provide in-depth clarifications about a specific incident in the video. All interview data were transcribed and checked by the participants. All data were coded, categorized and analyzed.

## **5. Findings and discussion**

### **5.1. Teachers’ profiles and reflections**

The reflections of music teachers on their curriculum design of listening activities that could foster their students’ musical creativity are presented in the following nine cases that are grouped together according to the category of children’s levels of ID, i.e. mild, moderate and severe intellectual disabilities. Pseudonyms are used in reporting to ensure the anonymity of the participating teachers. Personal profiles of these nine cases are shown in Table 1.

Table 1. Profile of the music teachers.

Case	1	2	3	4	5	6	7	8	9
Pseudonym	Ada	Ben	Clara	Diana	Ella	Fanny	Grace	Helen	Ivan
Sex/Age	F/30+	M/30+	F/40+	F/30+	F/30+	F/50+	F/20+	F/50+	F/30+
Type of special school	Mild ID			Moderate ID			Severe ID		
Education	B. Ed	B. Mus	B. Mus	B. Ed Sp. Ed.	B. Ed Sp. Ed.	B. Ed Sp. Ed.	B. Ed.	B. Ed. Sp. Ed.	B.A. (Mus)
Music ed.	✓	✓	✓	✓	✓	✓	x	x	✓
Years of teaching	>10 years	>10 years	>15 years	>10 years	>15 years	>25 years	< 5 years	>25 years	>10 years

Summary information of the selected classes, observed learning activities and summary of teachers' reflections are illustrated in Table 2.

Table 2. Information of selected classes, observed learning activities and teachers' reflections.

Case	Age/ No. of students	Observed listening activities	Summary of reflections
Amy	Age 6-8/ 7 students	Listen to music with music movements	<ul style="list-style-type: none"> <li>➤ Facilitate students to create music-induced movements to express the loud and soft dynamic levels of the songs.</li> <li>➤ Show students' imagination of the relationship between the dynamic changes of music.</li> </ul>
Ben	Age 12-14/ 5 students	Explore & mixing melodic fragments & sound effects with IT apps	<ul style="list-style-type: none"> <li>➤ Listening to students' own works can develop their awareness of the sounds of their works.</li> <li>➤ Listening to classmates' work can stimulate students to create more.</li> <li>➤ My feedbacks guide them to analyze the musical features that made up those sound effects. ... help them to organize their imagination of sounds in their minds and decide on the sounds in their works.</li> </ul>
Cara	Age 12-14/ 14 students	Listen to music with music movements	<ul style="list-style-type: none"> <li>➤ Familiarize them with the music by repeated listening and watching the music video. ... they may imitate the movements of the dancers, musicians and conductor.</li> <li>➤ Watching music video can enrich their imagination for creative movement and musical expressions.</li> </ul>
Diana	Age 12-14/ 10 students	Explore & rearrange sounds with IT apps	<ul style="list-style-type: none"> <li>➤ Students worked in groups to explore and listen to the effects of single sound track and mixing sound tracks. They were so happy to hear the new sounds and enjoy their collaborative music arrangement.</li> <li>➤ The use of IT apps facilitates them to create sounds.</li> </ul>
Ella	Age 12-14/ 8 students	Listen to music with creative movements & paper models of instruments	<ul style="list-style-type: none"> <li>➤ The use of paper models of Chinese instruments facilitated my students to participate actively and creatively while listening to Chinese music.</li> <li>➤ They created music movements with the paper models. They showed their imaginations and their interactions with the music excerpts. Their movements responded to the music features, such as loud/soft and fast/slow of the music excerpts very well.</li> </ul>

Fanny	Age 9-11/ 9 students	Watch & listen to students' performance and create movements and percussion accompaniment	<ul style="list-style-type: none"> <li>➤ My students enjoyed watching their group singing performance. It motivated them to create movements and percussion accompaniment.</li> <li>➤ Listening activities are especially important for nonverbal and verbally weak students to stimulate their creativity through their movements and percussion accompaniment.</li> </ul>
Grace	Age 9-11/ 3 students	Listen to music with creative movements and accompany with percussion instruments	<ul style="list-style-type: none"> <li>➤ Listening to music can stimulate my students' creativity when they react with music. I adapted instruments to fit their physical ability and I adapted the music excerpts to include some blank moments between sections for them to create sounds.</li> <li>➤ They were excited and move more when listening to music with stronger beats and festival moods.</li> <li>➤ They enjoyed creating movements and sounds while listening to music. It's important to develop their creativity as well as autonomy through listening activity.</li> </ul>
Helen	Age 12-14/ 2 students	Listen to music with creative movements	<ul style="list-style-type: none"> <li>➤ Military march could motivate my students to react creatively.</li> <li>➤ Their hands were too weak to make any sound on a real drum. The use of mobile apps can help them to play electronic drums by touching the screen softly.</li> <li>➤ The use of recorder pen to play music near their ears can help students with hearing impairment to listen more clearly and attentively.</li> </ul>
Ivan	Age 9-11/ 8 students	Explore sound effects with instruments or IT apps	<ul style="list-style-type: none"> <li>➤ Different versions of remixing a piece of music may enrich their imagination and stimulate them to explore new sounds.</li> <li>➤ The use of iPads and Makey Makey could help them to overcome their disabilities when exploring and creating new sounds while listening to music.</li> <li>➤ Record the sounds they made and show it to the class can encourage their imagination. They enjoy listening to their own work as well as their classmates' work.</li> </ul>

## 5.2. Listening activities for fostering musical creativity

Drawing from the above summary of teachers' reflections, they regard their designs of listening activities as a way to foster musical creativity. Due to the physical and cognitive limitations of the students with ID, music teachers had to design active listening activities to engage students for students to demonstrate their music learning outcomes of music listening and creating. These active listening activities are often integrated with other activities so as to make it meaningful and interesting for students. These activities include (1) music-induced movements that allow students to exercise their musical creativity; (2) formative assessment activities such as self-assessment that allow students to review their own creative work and peer assessment that allow students to appreciate their peer's work. The choice of music repertoire and proper teaching aids (such as paper models, mobile apps and music technology) for listening activities are also crucial for helping students with ID to develop their imagination and awareness of sounds which are essential in musical creativity.

## 6. Conclusion

Special school music teachers' reflections demonstrate that they designed active listening activities that integrated with other music learning activities, such as music movements, music creating activities and formative assessment activities such as self-assessment and peer assessment. In addition, the choice of music repertoire and teaching aids to suit the abilities and interests of students is also important for students' enjoyment of music learning as well as their development of creativity and imagination.

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# DEVELOPING DOMESTIC STUDENTS' INTERCULTURAL COMPETENCE—A CASE STUDY: IMMERSION PROGRAM OF SICHUAN UNIVERSITY, CHINA

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## Abstract

Intercultural competence refers to the comprehensive ability required in multicultural interactions. Under the background of globalization, there is no doubt that developing students' intercultural competence is important for higher education institutions. As the number of Chinese students studying abroad has increased dramatically in recent years, most studies have focused on Chinese students' study abroad experiences and how these students adapt to different cultures, however, internationalization of education is equally important for non-mobile domestic students. In China, how to achieve internationalization at home and help domestic students to develop intercultural competence deserves more attention. University Immersion Program (UIP) in Sichuan University (SCU) is a short-term summer international program involving domestic and international students, aiming to cultivate globally competitive talents at home. By using participant observation method, the researcher participated in UIP in the role of a student and observed the interaction between domestic and international students. The observations have revealed: First, there are three main advantages of UIP—the discussion-based learning, the mixed accommodation pattern, and the cultural trips. Second, in order to better promote positive interactions between international and domestic students, proper intervention should be given to students' behavior in curricular and extracurricular activities. In conclusion, based on the method of participant observation, the study is a case analysis of UIP aiming to explore how to develop domestic undergraduate students' intercultural competence through promoting intercultural interactions in a short-term international program.

**Keywords:** *Intercultural competence, university immersion program, internationalization at home, higher education.*

## 1. Introduction

In the era of globalization, internationalization is an important topic for higher education institutions. Internationalization of higher education involves three types of students—incoming foreign students, outgoing domestic students and non-mobile students. As mobile students, the first two types have received a lot of attention from Chinese academic circles, but for the moment they are a minority in the Chinese student population. Therefore, more attention should be paid to non-mobile students.

Developing students' intercultural competence is an important way to achieve internationalization of higher education. And the cultivation of intercultural competence can be carried out through learning related courses, or exposing to multicultural contexts. Nevertheless, the latter is difficult for non-mobile students. It is because some students are unable to study abroad due to financial situation, family responsibilities, language level, etc. Besides, the interaction between domestic students and international students is very limited on campus (Harrison & Peacock, 2010; Wang, Dai, & Jiang, 2014). In Chinese universities, the international students' management system of accommodation and curriculum is often different from that of general domestic students, which is impeditive to their interaction on campus. And the convergence management of overseas students is hard to popularize in a short time. Therefore, it is a feasible way to promote the interaction between domestic students and international students through joint participation in short-term programs. Studies from Korea demonstrate that participation in campus programs or summer international programs can help domestic students foster interactions with international students and improve their intercultural competence (Jon, 2009, 2013). How to make increasingly popular short-term international programs play the most effective role in promoting intercultural interaction is an issue worthy of attention.

To understand the real situation of the interactions between domestic students and international students in UIP of Sichuan University, the researcher adopted the method of participant observation as it is difficult to embody the true interactive behavior and the depth of interactions by quantitative data. The observations indicate that although a short-term international program provide students with opportunities for intercultural interactions, proper intervention is necessary to get better results.

## **2. Methods**

University Immersion Program (UIP) in Sichuan University (SCU) aims to cultivate globally competitive talents at home by inviting foreign professors and experts to provide some of the best designed courses and initiating international student camps. It is a two-week short-term intercultural program and has been held for eight consecutive years since 2012. During 2019 UIP, 184 professors and more than 600 students from 144 world-class universities of 31 countries and regions were invited to experience curricular and extracurricular activities with domestic students in SCU. Joint participation in UIP is mutually beneficial for domestic and international students.

The case study of UIP was conducted by the method of participant observation. The observation method could be divided into non-participant observation and participant observation. One of the great advantages of adopting participant observation in this paper is to hide the identity of the researcher from observed objects. The researcher participated in the program and became a part of the group to observe the spontaneous behavior of the students and the depth of their interactions. The observation lasted for 10 days. The object of observation was a group of students in UIP, including four domestic students, four Russian students, one Japanese student and one Canadian student. Among them, there are six female students and four male students.

## **3. Findings**

In the aspect of curriculum, the discussion organized by the professor effectively boosted the interaction among students. For example, under the guidance of the professor, domestic students put forward the stereotypes of a certain country, and the overseas student from that country explained the real situation and broke the stereotypes. In addition, the discussion was carried out on the reading material and video material offered by the professor. In addition to the group of students being observed, there were some other non-mobile students from Sichuan University in the class. It's worth noting that at the beginning of the course, students tended to sit with students of the same nationality and their attitude towards cross-cultural interaction was relatively negative, but the professor noticed this problem and intervened in students' choosing of seats. After that, students from different countries began to talk freely during break time. On the whole, the discussion-based learning was good for students' intercultural interaction.

During cultural trips, most students passively listened to the commentary provided by tour guides but have little discussion about the culture. Only one domestic student actively communicates with international students. The researcher found that the other three domestic students were not confident in their English proficiency and they tended to talk to each other in Chinese. In the regard of accommodation, double or triple rooms were randomly assigned to students with the same gender in the group. Most students directly accepted the arrangement and built good relationship with roommates, but a Russian student exchanged his room with other student when he checked in, as he wanted roommates of the same nationality. On the last day of the program, the domestic student who actively communicated with international students asked everyone for their addresses and planned to send them postcards. She experienced positive intercultural interactions and established a certain degree of friendship with international students. It is concluded that in both curricular and extracurricular activities, there are phenomena of over-reliance on the first language and imbalanced participation in intercultural communication.

## **4. Discussion and implications**

First, the researcher has found due to the limited days of the program it is difficult to make students get familiar with each other and share opinions freely, which could influence their cross-cultural interactions to a certain extent. Therefore, it is necessary to intervene in their behavior. For example, teachers could rearrange students' seats and organize more discussion in class. In addition, small-group tasks can be set up in extracurricular activities, which are supposed to be performed cooperatively by a domestic student and an international student, to ensure effective cross-cultural interactions and reduce over-reliance on the first language.

Second, previous study has indicated that the mixed accommodation pattern of Chinese and foreign students has positive effects on Chinese students' intercultural knowledge (Wang, Qu, & Lu, 2019). However, as China is a developing country with great population, in order to enable more people to receive higher education, Chinese public universities provide inclusive, collective and cheap accommodation for all Chinese students, while overseas students have a different accommodation system. Therefore, it is difficult to popularize the mixed accommodation pattern of Chinese and foreign students in Chinese universities, but it can be applied in short-term international programs like UIP. The suggestion is to combine self-introduction activities with two-way selection of roommates between international students and domestic when implementing the mixed accommodation pattern in short-term international programs, instead of random assignment or totally free choice.

In conclusion, in order to develop non-mobile students' intercultural competence, it is not enough to put domestic and international students together through launching short-term campus programs. To avoid the tendency of students from the same country to split up spontaneously into subgroups in activities and promote positive intercultural interactions, it is of considerable necessity to give appropriate intervention to their behavior. In addition, due to the small size of observational samples and the influence of different students' characteristics, there are certain limitations in this case analysis.

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## DIGITALISATION OF HIGHER EDUCATION – TEACHERS AND STUDENTS EXPERIENCE

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### Abstract

In Norway, as in the rest of the world, the development is constantly moving towards more and more automatization and digitalization. Increasing the efficiency of tasks by leaving them to computers and implementing modern technology in the private and working sectors is becoming. Digitization is about using the technology to innovate, simplify and improve tasks and to offer new kind of services that are easy to use, efficient and reliable. Digitalisation in the higher education is about facilitating the use of digital tools and technological solutions to emphasize learning and to create new opportunities for learning and teaching processes.

Times are changing, and institutions in the higher education sector need to create a learning model that blends curriculum with changes in the society, receiving and adapting technology and varying expectations of the students. When studying, you want to get an education that is relevant, quality assured and provides the opportunity for a good job afterwards. One challenge for the higher education sector is to adapt new kind of learning design to modern students and technology. Lectures are undoubtedly an important part of the learning process for the students, which the school system is based on, but the lectures do not provide an automatic professional competence in an arena. To hear about something or to follow a recipe for a task is not the same as having knowledge, skills and being self-reliant. What is important that students take responsibility for their own learning, and that they are active, mentally active. To do so, students need to be motivated for learning.

We think that the solution for learning with or through digital tools have a potential for improving the efficiency and quality of teaching and research. In order to succeed in exploiting this potential, teachers should know more about how their use of digital tools affects students' learning patterns and motivation, something we would like to explore further.

This paper will be based on our previous experiences and research on what teachers and students think about using digital tools for learning. In this project we will compare teaching with or through digital tools at different institutions for higher education. We would like to find and analyse how students studying and university colleges, in different cities, with different subjects are affected by teaching with or through digital tools and how does it affect their study patterns and motivation for learning.

**Keywords:** *Students, digital tools, higher education.*

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### 1. Introduction

Today's society is filled with technology and different digital tools. According to PricewaterhouseCoopers (pwc): "Many universities are developing specific digital strategies in reaction to the massive shift towards using new technology, yet lack of vision, capability or commitment to implement them effectively" (pwc, 2018, p. 3). The digitalization or the digital revolution is affecting the entire education system, from using technology to maintain information or to communicate, to introduce students to digital resources, notes or films (Thoring, Rudolph and Vogl, 2017). In this study the authors would like to research how different groups of students think about using digital tools in higher education, and to compare students views with teachers experience on using digital tools in different courses. The research question is: *How can digitalisation of higher education through digital tools affect students and teachers in teaching and learning practice.*

## 2. Background

Digitalization has no standard definition in educational research, but it can be described as a process where digital tools and resources are exchanging or modifying previous options. This gives an opportunity to use different electronic solutions (e-solutions/e-learning solutions) to diverse teaching and learning (Coccoli, Guercio, Maresca and Stranganelli, 2014; Schuster, Gross, Vossen, Richert and Jeschke, 2016). This topic is relevant for today's society but many researches do not show any correlation between digital tools and greater learning outcomes (Bates, 2019, Smeets, 2005, Thoring et al, 2017). Some research comment that the digitalization in higher education is at an early stage, because despite the teachers will and use of digital tools to innovate and differentiate teaching, there are no significant changes in students learning“ (Thoring et al, 2017). While discussing what is a common learning and teaching design, and what kind of learning and teaching design education today needs Tony Bates states that: “for all other important learning activities, such as developing critical thinking, deep understanding, and application of knowledge – the kind of skills in a digital age – lectures are ineffective. Other forms of teaching and learning – such as opportunities for discussion and student activities – are necessary” (Bates, 2019, p. 87).

## 3. Methods

One of the digital tools that is used in higher education is watching lectures through video or streaming. Video can be prepared as an additional part or instead of classic lectures. There are many ways to use video in classrooms as short films, explanations, streaming, conference- or meeting systems. In this paper the authors chose to compare students and teachers experiences in using digitalisation in some ways. First: compare between one-way streaming and two-way conference systems. Secondly: compare the use of the identical technical devices in different ways – with or without teacher.

To answer the research question proposed in this study, the authors conducted a survey with 44 students from several different subjects on HVL (Western Norwegian University of Applied Sciences). 37% of the students are students of automation, 20% of computer science (IT) and 43% are postgraduate students of Technology for Health and Nursing (THO). Similar survey was conducted in HVO (Volda University College) with 18 postgraduate students in studying advanced mathematics in teacher's education.

The students responded to the anonymous questionnaire and the survey was previously reported to the Norwegian Data Research Centre (NSD) and assessed as non-submittable.

## 4. Results

There are different ways to evaluate the results of students learning outcomes. It is possible to check the achieved grades on exams or ask students about their opinion. This paper is based on students opinions and teachers previous experience.

### 4.1. Students reflections from survey

Our results show (Figure 1) that most of the students want modern teaching methods, with digital tools, but at the same time they expect the teacher to be there - to be able to ask questions, and to help students, for example by motivating or supervising them. In total, 78% of students wanted to use digital tools to support learning in combination with traditional teaching or on their own, but in the same time 60% of students would have a teacher physically present in the lecture, see Figure 2.

Figure 1. Lecture form according to students needs.

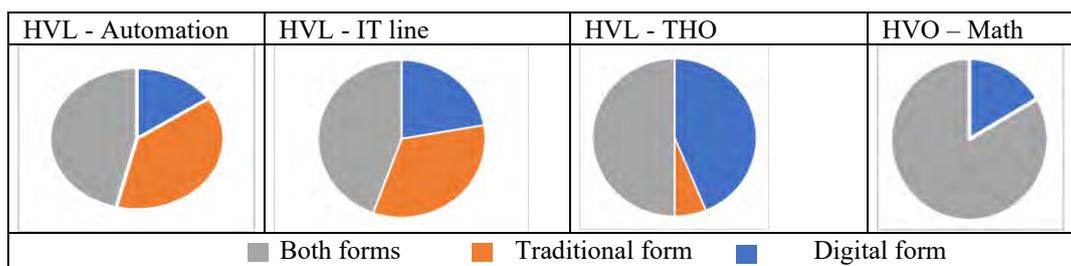


Figure 2. Access to the teacher according to the students.

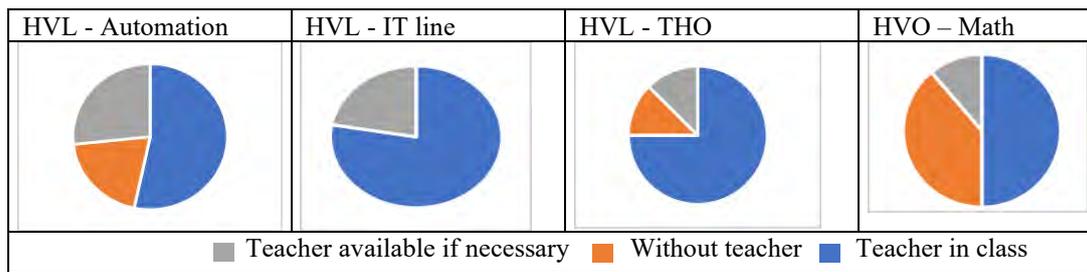


Table 1. Different types of needs that students like in lectures.

Course	Lectures adapted for the students [%]	Possibility to ask questions [%]	Engaging, varying lectures [%]
HVL - Automation	53	71	59
HVL - IT	89	67	67
HVL - THO	69	38	44
HVO - Math	89	28	67

This result show that students are generally satisfied when the teacher is present, the lectures are adapted for the students and the teacher is varying the methods of learning during lectures. In Figure 1, there is a similarity in the two postgraduate courses. Even though one course is about medicine and the other about mathematics, the students express a wish to combine both digital and traditional form of lectures. That meant they wish to both meet the teacher face to face, as well as using digital tools like computers, calculators and video. In figure 2, the similarity is between IT and Math. Both courses have a lot of streaming and are capable to learn much on their own. That may be a reason why the students from those courses want engaging and varying lectures, like showed in table 1. Another result in the table 1 is that the two postgraduate courses does not express the desire to ask questions during lectures. It looks like they are satisfied with what they hear through streaming, or that they have enough experience in studying that they know how to learn on their own.

#### 4.2. Teachers reflections

The authors experience shows that not always the student’s opinions and expectations are matching the teacher’s opinions. In THO subject there are at least 6 teachers (2 in each campus) on all lectures. They are available on the lectures, breaks and during exercises. There is a possibility (that is often used by students) to ask detailed question or get feedback. As results of all this effort, some students from THO think that the teacher is not necessary to be present for their learning, while students that does not have local teacher present during streaming or video lessons are more appreciate if the teacher is present, figure 1. On other courses students expressed the need to have a teacher available in best case scenario in classroom, if not on campus, at least to have the possibility to contact the teacher online or on the phone. The authors have observed many times than learning process is much more effective when teacher is a part of process and can supervise and support the students.

In the authors experience there are some students with attitudes like: “we want to show that we are able to do whole project alone – without teachers help or supervising”, and often their results are acceptable, but with supervising and help from an experienced teacher, the same students might have achieved better grades. A similar situation was observed in Volda in a fully online course that is not taking directly part in this study, but it has given the authors many experienced. It is a digital course where all lectures are published through an online learning platform, through video and digital tools – without present teacher. There is a possibility to contact the teacher online, but it was not obligatory, and the students are choosing themselves if they want or need help or they can figure things out on their own. In this course there were few of the students which commented after a semester that they did not perform as well as they could, because the topic for final project were too difficult, and they had a hard time doing it without any help, yet they did not ask for any.

Another interesting experience of the authors is a case where to courses had identical equipment, but the situation and the experience of students were very different. One course had a local teacher while streaming from another campus, and the other had only a teacher through streaming. In this study the participants from the course Technology in Medicine and Nursing THO had mostly positive response on the quality of the lectures. The course was about using different aspect of technology in medical/nursing practice. Both teacher from nursing and technology were present in every classroom on three campuses as

a control and help through additional skype connection (invisible for students). The teachers cooperate both before, during and after the lectures to control the entire process of streaming. There were no negative remarks from students about teaching process, and there were a group of students that commented that local teacher was not necessary.

After the study finished, the authors contacted another course on HVL for postgraduates in nursing that was using the same equipment. Clinical Nursing is also a course possible on three campuses, but it only has one teacher. So, the teacher has lecture on one campus and streams the same lecture to the remaining two campuses. There was no local teacher, only one a chosen student to help with control all the devices. Generally, the students were satisfied. However, there were many technical and organizational challenges like: control and quality of microphones, identification of questions (who ask, who should take control over camera and microphone), synchronisation. The students did not want to interrupt the lecture for the other campuses, so there was not easy to stop the lecture to ask the teacher some questions or confirm that the other campuses have possibility to see and hear the teacher and read the teachers notes on the board. The students briefly commented that there were some misunderstandings, leap in incoming sound and/or video, or a camera that did not show teachers notes, but it was difficult to contact the other campuses, and some students found it a little frustrating. This experience shows that the same classroom and the same tools can be used the same way but work totally different.

## 5. Discussion and conclusion

Most of the students from selected subjects taught in the HVL and HVO participated in the survey, but both schools are rather small, so the survey is not fully representative in quantitative terms. The results can only show the trend in both places.

Students who have been streaming since the beginning of their studies are used this way of having a lecture. They do not know that it is possible otherwise. Students who start in the "classical/traditional" way are not used to working completely independently, and sometimes have a hard time trying. Students evaluation of the system depends on the form of lectures they have now or previously had. In order to achieve greater accuracy, it would be necessary to have a control group with the same technical means. This has been discussed for two subjects, Clinical Nursing and Technology in Medicine and Nursing THO. The students without a teacher were generally satisfied but had a lot of comments about the equipment and the possibility of active participation: asking questions was quite complicated and embarrassing for some students. It was not possible to ask questions during a break or to consult the teacher personally. This may be because the students selected to coordinate did not have organizational or pedagogical experience and did not meet the challenge. According to Schuster et al, (2016) the digitalization of education should give the students an opportunity to be more active, and when some of the teaching and learning is based in a digital environment, the communication skills are very important to avoid misconceptions and problems.

Students with the same equipment, but in the course with many teachers did not make any comments about the technical or pedagogical problems. Almost always there was a local discussion between students and teachers after lectures or during practice and breaks. It turned out that everything was so well prepared that quarter of the students in this course were the only ones in the survey who wrote that the teacher was not needed. Is that good?

Perhaps it could be more effective not to replace the teacher with a video or streaming, but to create a full system of two-way contact. Such a system, apart from video, would have the possibility for students to write questions - so as not to interfere with an ongoing lecture for several campuses. The teacher could answer at the earliest opportunity so as not to interrupt the presentation. In addition, the (optional) system would automatically show the student asking the question so that everyone could hear/see what is happening. Situations where the teacher in the classroom is the only one who sees the question and then answers it are a disruption to the students on site. Unfortunately, so far none of the conference systems have such possibilities and using several different systems at the same time requires much more skills and practice.

The situation is similar for all types of students. Regardless of the form of teaching (classical, video, streaming, on or off campus) not all of the students use their abilities in lectures. This can be seen in presentations of final projects, tests or exams. Students are not always able to use the help of a teacher (for example in the HVL for projects, or for technical reasons in the HVO - lack of a system to facilitate contact). This assistance manifests itself in for example: explaining, repeating, advising, correcting, and much more. Without it, students have much more pressure on themselves not only to understand the subject, but also to understand the assignment, field of work, experience and practice of the subjects. In the authors experience such students are writing not exactly on the subject core or not answering questions but modifying them according to their needs and point of view. This applies to HVL and HVO.

For remote students the only (optional) way to contact them is by email, skype or phone. There are no mandatory contact options and some students chooses not to contact the teachers at all, even when they find the subject material hard to understand. This, in some cases, makes the learning process difficult.

In Norway there are big discussions on how teacher's professional digital competence is affecting students (Engen, Giæver and Mifsud, 2015; Johannesen, Øgrim and Givær, 2014), but this study pointed more of the technological aspects of digitalization. This would be interesting to research in further studies.

To sum up, digital systems largely cover the constellation but there is no full system available now. None of them have all the necessary features both according to this study, the authors experience and literature (Coccoli et al, 2014; Thoring et al, 2017).

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## INNOVATIVE USE OF ICT IN EARLY YEARS CURRICULUM BASED ON 5E INSTRUCTIONAL MODEL

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### Abstract

Active learning constitutes an essential part of the early years curriculum. A well-known instructional model which is based on active participation and inquiry learning is the 5E model which includes the following five stages a) Engage, b) Explore, c) Explain, d) Elaborate, and e) Evaluate. Moreover, over the last decades ICT has been widely used to engage students in learning and enhance both the learning and teaching process. However, a paradox is noted regarding ICT; although practitioners have commonly accepted the beneficial aspect of ICT, they demonstrate limited use of new technologies within the teaching process. Therefore, the present work proposes a methodological approach aiming to investigate, whether the incorporation of the 5E model into ICT activities could benefit the use of new technologies in the early years curriculum. A pilot study was performed on early years practitioners in kindergartens. For the purposes of the current experiment, an ICT-based activity was designed using the 5E model. The activity's layout, including the objectives and the learning outcomes, is outlined. The main benefits, according to practitioners, are that the 5E model not only provides multiple opportunities for students to build new knowledge through inquiry and active engagement, but also enhances practitioners' confidence in terms of using and integrating ICT into the teaching process. This result, despite being preliminary, indicates that the integration of ICT activities through the 5E model can be an effective approach. Lastly, since this is an on-going study, more results will be published in the near future.

**Keywords:** *ICT, early years curriculum, 5E instructional model, inquiry learning, engagement.*

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## 1. Introduction

Nowadays Information and Communications Technologies (ICT) has become an important medium for learning across the early years curriculum. However, there seem to be certain limitations regarding the incorporation of ICT tools into the teaching process (Brooker, 2003) and, therefore, a clear need of a developed pedagogy for the use of technology has been reported (Aubrey & Dahl, 2013). The present research proposes the methodology of the implementation of an ICT activity integrating the 5E instructional model. The objective of the pilot study is to explore whether the 5E model affects the students' active participation and engagement into the learning process of ICT.

## 2. Literature review

### 2.1. Early years practitioners' attitude towards the integration of ICT within the teaching process

Brooker and Siraj-Blatchford (2002), in their large scale study of effective pedagogy across the curriculum for the early years, showed that technology appears to stimulate children of differing abilities, levels of maturity as well as ethnic and social class backgrounds. Results indicated that children were found to engage in lively and supportive collaborative activities around the computer, with particular linguistic and cognitive gains and social development for bilinguals. Despite the uncontested benefits of ICT, the study showed that computers were being used in a limited way and that practitioners rarely engaged in the type of interactions with children. This draws the attention to the fact that the rapid growth in curriculum requirements, and in hardware, has not always been matched by a growth in practitioners' understanding of appropriate ways to use the new technologies.

Although Brooker (2003) pointed out that practitioners working with young children were willing to match new technologies with traditional early childhood goals and principles, aiming at a child-initiated and child-centered, exploratory and open-ended, learning, that would be supportive of

social interactions and of equal opportunities there were certain limitations, such as a) a reliance on desktop computers as the sole tool for technology, when a range of other applications (i.e. projectors) may be more appropriate, b) a preference for didactic software that teaches curricular materials (i.e. literacy, numeracy) through closed questions, rather than exploratory software that allows children to pose their own questions and discover their own answers, c) a trend towards situating computers in suites or laboratories, segregating them from all other aspects of the curriculum. Moreover, a small-scale investigation of the confidence, competence and views regarding use of ICT by a maximum variation sample of practitioners, showed that although all practitioners identified technologies available in their center (most commonly mentioned were computers, educational software, Internet, electronic and programmable toys and the interactive whiteboard), they said that they knew very little about ICT and indicated a fear of technology (Aubrey, 2013).

Plowman and Stephen (2003) conclude that while practitioners believe in the benefits of computers, these are more likely to come about when staff feel able to use resources discriminately to match children's learning needs and styles as well as their own theories of learning. Aubrey and Dahl (2013) provided evidence in support of that assumption further adding that there is a need to identify different models for providing effective support and pooling of existing skills and resources. These observations point to the need not only for a more developed pedagogy for the use of computers in the classroom but also for practitioners to have opportunities to become more familiar with the software available. Furthermore, practitioners need to be encouraged to be more critical about whether or not the learning model inherent in the software used, matches both their own models of learning and the needs of the children for whom they are responsible.

## **2.2. The 5E Instructional Model: Engaging students in new concepts learning**

Bybee et al. (2006) translated decades of research into a brief and memorable set of five words that educators could actually use, the 5E Model which is an inquiry-based approach grounded in active learning. The 5E model is based on a conceptual change model of learning, where learners become receptive to new ideas and then integrate new information into their existing conceptual framework (Posner, Strike, Hewson & Gertzog, 1982). The 5E approach is grounded in a constructivist view of learning, where the students have to do the work of identifying and changing their conceptions (Vygotsky, 1978). More specifically, the five components of the 5E model are the following: (1) The ENGAGEMENT, where the students' prior knowledge is identified in order to become engaged in a new concept. (2) The EXPLORATION, where they use prior knowledge to generate new ideas, to explore questions and possibilities. (3) The EXPLANATION, where they focus attention on a particular aspect of their engagement and exploration experiences and demonstrate their conceptual understanding, process skills, or behaviors. (4) The ELABORATION, where they develop and extend their skills and apply their understanding of the concept. (5) The EVALUATION, where they are encouraged to assess their understanding and abilities, and where their progress is evaluated towards achieving the learning objectives.

The fact that the 5E model is structured in five distinctive components, following a linear sequence, each one building on the knowledge of the other, might be considered as an established methodology enabling the educator not only to design, organize and implement ICT activities, but also to identify and assess the children's learning.

## **2.3. The objective of the current research**

Although there is plenty of research showing the use of the 5E model into the science domain, very limited research is found regarding its incorporation into the ICT field (Utari et al., 2013). Taking this into consideration the present work explores whether the proposed methodological approach of the 5E model affects the implementation of ICT into the early years curriculum. The aforementioned general hypothesis is followed by two sub questions:

*RQ1.1. Does the 5E model offer opportunities for students to build new knowledge through inquiry and active engagement?*

*RQ1.2. Does the 5E model affect the use and integration of ICT into the teaching process on behalf of the practitioners?*

## **3. Methodology**

### **3.1. Framework**

An intervention was designed especially for the purposes of the present research that was based on the objectives of the Greek New Curriculum (Institute of Educational Policy, 2014), concerning the learning area of Information and Communications Technologies. The activity layout includes five phases,

each covering a separate component of the 5E model while integrating the others at the same time. Since, the early years curriculum implementation relies on the principles of constructivism, which is also applied to the instructional 5E model, the activity's layout attributes a fundamental role to variations of constructivism, such as inquiry-based learning, active learning and knowledge building (DeVries, Zan, Hildebrandt, Edmiaston & Sales, 2002). In Table 1, the design of the ICT activity is presented while integrating the 5E instructional model.

Table 1. The ICT activity layout integrating the 5E instructional model.

ACTIVITY LAYOUT	
TITLE	<b>Live Wishing Cards</b>
GENERAL PURPOSE	<ul style="list-style-type: none"> <li>• Development and expression of ideas with digital media and the production of multimodal works</li> <li>• Reinforcement of learning experiences with the use of ICT (<i>Institute of Educational Policy, 2014</i>)</li> </ul>
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> <li>• To become familiar with the basic forms of digital information (text, image, sound)</li> <li>• To develop and express ideas using digital media</li> <li>• To [allow children to] express themselves in a creative way with the use of designing software, and the use of audio/image/video editing and recording (<i>Institute of Educational Policy, 2014</i>)</li> </ul>
LEARNING AREAS	<ul style="list-style-type: none"> <li>• Information and Communications Technologies</li> <li>• Language</li> <li>• Art (<i>Institute of Educational Policy, 2014</i>)</li> </ul>
DURATION	5 days (one phase per day)
AGE GROUP	5-6 years (kindergarten)
NUMBER OF STUDENTS	18-20 (average class)
DESCRIPTION	<ul style="list-style-type: none"> <li>• <u>Phase 1- ENGAGE with the wishing cards</u> In the first phase of the learning cycle, the practitioner, based on students' prior knowledge and in order to identify any knowledge gaps, introduces a variety of printed and electronic wishing cards to the students. The students observe the designing (size), the text (letters/fonts/wording), and the images (paintings/drawings/colors) of the different cards. Students are asked opening questions for the purpose of a wishing card (knowledge already gained from previous familiar circumstances). Finally, students categorize the cards based on their preference of style and the type of the wish.</li> <li>• <u>Phase 2 - EXPLORE the Tux Paint drawing software</u> During the exploration phase, students actively explore the Tux Paint software through experimentation with its functionalities. They explore the design themes, typewriting, adding of pictures, etc. They observe the operation of the variety of functionalities with the help of the practitioner. They also try themselves to use the functionalities since at this phase students are urged to learn in a hands-on way.</li> <li>• <u>Phase 3 - EXPLAIN how to design using the Tux Paint software</u> This is the practitioner-led phase that helps students synthesize the new knowledge of using Tux Paint software and ask questions if they need further clarification. For the EXPLAIN phase to be effective, students should be asked to work in pairs in order to share what they learned during the EXPLORE phase. In order to boost understanding, in line with the zone of proximal development theory, preschoolers from the reception class should be placed alongside younger children to work together. The older child will take over the responsible role of instructing the younger one regarding the functionalities of the tool.</li> <li>• <u>Phase 4 – ELABORATE on making live wishing cards</u> The elaboration phase focuses on giving students space to apply what they've learned and reinforce their new skills. This helps them develop a deeper understanding. Practitioners ask their students to create wishing cards using the Tux Paint software. Students are free either to typewrite a wish or to videotape themselves using the PC's camera while they narrate a wish. They are also free to use either ready - made images/photos from the "My Pictures" folder, their own drawings, or internet pictures as a background for the card. They can also decide whether to use sound effects or record themselves using the PC's microphone. For the design of the card, students can choose one of the tool's themes they already explored in the previous phase. Finally they can print or display their wishing cards on the screen.</li> <li>• <u>Phase 5 – EVALUATE on how the use of Tux Paint software leads to a live wishing card</u> This phase allows students to cement their knowledge by evaluating themselves what they have learnt. Students are asked to present to the group the procedure of the design of their own live wishing card and comment on their effort. Students should give rationale on why the Tux Paint software is appropriate for making live wishing cards. Practitioners should also observe whether the students will turn to the software on a future similar case.</li> </ul>
LEARNING OUTCOMES	<p>Students are expected to:</p> <ul style="list-style-type: none"> <li>• operate design software through the use of different options from the tools available</li> <li>• incorporate the gradual use of various software in their practices</li> <li>• express themselves in a creative way while acquiring new ICT skills</li> </ul>

Practitioners were asked to perform the ICT activity of “Live Wishing Cards” based on their existing professional experience without the use of the 5E model and its phases (pre intervention). Following that, they implemented the particular ICT activity -designed by the authors-, following the five phases which incorporate the 5E model and report on the results (post intervention). After the implementation of each of the two interventions, a questionnaire was distributed to the practitioners in order for them to describe the impact of the 5E model integration to the ICT activity, its effects on students’ participation and their engagement with the process.

### 3.2. Research design

The questionnaire was developed by the authors for the purposes of this research and some questions were based on Lund’s (2001) questionnaire for measuring ICT usefulness and satisfaction. It included twenty four (n=24) 5-point Likert scale questions, ranging from 1 = Strongly Disagree to 5 = Strongly Agree and the questions were grouped into two thematic areas: 1) students’ active participation and engagement, which contains the following groups: a) engage, b) explore, c) explain, d) elaborate and e) evaluate; and 2) ICT use and integration into the teaching process on behalf of the practitioners. The instrument’s reliability is reasonably high (Cronbach’s alpha = 0.95). Finally, a small scale study was conducted and seven (n=7) early years practitioners (range, 18-21 years) participated by fully completing the questionnaire.

## 4. Results and discussion

The purpose of the present study was to examine whether the incorporation of the 5E model into ICT activities could affect the use of new technologies in the early years curriculum. Firstly a descriptive statistical analysis was performed, presenting means and standard deviations for the question groups of the pre and post intervention (Table 2).

Table 2. Means (M), Standard Deviations (SD) and P-values for the question groups of the pre and post intervention.

	Early years practitioners (n = 7)		
	Pre intervention M (SD)	Post intervention M (SD)	P-value
<b>1. Students’ active participation and engagement</b>			
ENGAGE	3.00 (1.26)	4.48 (0.51)	< 0.001
EXPLORE	1.76 (0.62)	4.24 (0.62)	< 0.001
EXPLAIN	2.00 (0.89)	4.33 (0.65)	< 0.001
ELABORATE	1.86 (0.65)	4.24 (0.70)	< 0.001
EVALUATE	1.57 (0.50)	4.14 (0.73)	< 0.001
<b>2. ICT use and integration into the teaching process</b>			
PRACTITIONERS	2.29 (1.03)	3.92 (0.86)	< 0.001

In general, Table 2 indicates that the level of scores in post intervention were higher than in pre intervention in all question groups. Therefore to further examine the changes in pre and post intervention, a series of Wilcoxon signed rank tests were performed, where the p-values of question groups are presented in Table 2. Wilcoxon signed rank test was selected since the sample size was small (n=7) and the difference between the scores were not normally distributed. More precisely:

*RQ1.1. Does the 5E model offer opportunities for students to build new knowledge through inquiry and active engagement?*

The Wilcoxon S-R test showed a statistically significant change between the pre and post intervention in the first part of questionnaire, which includes the following five question groups: engagement, exploration, explanation, elaboration and evaluation. Analytically, the proposed ICT activity, integrated with the 5E model, engaged and further stimulated the students to actively participate in the activity ( $Z = -3.601$ ,  $p < 0.001$ ) when compared to the situation before the integration of the 5E model. Additionally, students explored the ICT tool in greater depth ( $Z = -4.165$ ,  $p < 0.001$ ) and explained their experience and knowledge thoroughly by connecting what they already knew with the current activity ( $Z = -3.964$ ,  $p < 0.001$ ). Finally, they applied their acquired knowledge effectively ( $Z = -4.104$ ,  $p < 0.001$ ) and evaluated it adequately ( $Z = -4.136$ ,  $p < 0.001$ ). From the aforementioned findings, it is confirmed that the scores are higher in post intervention than in pre intervention, eliciting statistical significance in all question groups. The incorporation of the 5E model into the ICT activity shows that a child-initiated and child-centered lesson plan stimulates each student’s active participation and inquiry-based learning providing a peer interaction in every phase. The explanatory, open-ended and collaborative nature of the 5E model enhances the achievement of early childhood goals and principles,

since it is built on pre-existing knowledge and leads to acquiring new cognitive skills (Brooker, 2003; Brooker & Siraj-Blatchford, 2002; Posner et al., 1982; Vygotsky, 1978).

*RQ1.2. Does the 5E model affect the use and integration of ICT into the teaching process on behalf of the practitioners?*

With respect to this question, on behalf of the practitioners, the implementation of the 5E model into the ICT activity helped them to be more effective and productive as well as to have more control over the implementation of the ICT activity ( $Z = -6.058$ ,  $p < 0.001$ ). The aforementioned findings reinforce that the 5E model, as a developed methodology of five coherent and consecutive phases, could enable the early years practitioners to meet the children's learning needs through a developed pedagogy, which according to the previous research (Aubrey & Dahl, 2013; Plowman & Stephen, 2003), has arisen as an instant need. The phases of the 5E model enable not only students to explore the ICT concept, but also the practitioners to become familiar with new technology tools. In the end of the procedure practitioners also have the opportunity to be critical and reflective of the learning outcomes.

## 5. Conclusions

In conclusion, the purpose of this particular research was to explore whether the incorporation of the 5E model could affect the use of ICT tools in the early years curriculum. A small scale pilot study was conducted on early years practitioners and a pre and post intervention was performed. Leveraging the statistical analysis, the first indicative results show that the integration of the 5E model into the ICT activities enable practitioners to follow a developed methodology which lead to specific learning outcomes and students to engage in inquiry learning simultaneously. The aforementioned study is preliminary and along with the small scale intervention study, further investigation and research should be undertaken in the near future. The forthcoming work aims, using a larger number of participants, to measure thoroughly the effect of the 5E model into a wide range of ICT activities. The larger sample and the long term intervention should give safer and broader results and attempt to answer further questions regarding how the innovative use of ICT in early years curriculum can be affected by the 5E instructional model.

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## **AUGMENTED REALITY IN INTERVENTION WITH PEOPLE WITH AUTISM SPECTRUM DISORDER: PROTOCOL ACTIVITIES**

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### **Abstract**

Over the last few years, Augmented Reality (AR) has become one of the newest trends in technology due to its characteristics: ease of access to information on the world's reality and superimposition to the society of digital data in real time. Since the smartphone revolution, virtually everyone uses them continuously in their daily lives. These devices have a processor, GPS, screen, camera, microphone, etc., indispensable tools for AR experiences. Because of this, among other things, AR technology is constantly growing and captures the attention of many users around the world. Various studies show some relevant results in the intervention of Augmented Reality with students presenting with Autism Spectrum Disorder (ASD) in the acquisition of social skills that worked with parents, teachers and peers. Although ASD is highly heterogeneous, both in etiological issues and in the manifestations and evolution of symptoms at different stages of development, expression and presentation according to sex, age or co-morbidities presented; some of the impairments in the social skills of people with ASD have been described in various researches such as, for example, the presence of difficulties in intuitive comprehension in the social situation. Due to this, the objective of the work is to create a protocol of activities using Augmented Reality as a teaching methodology, to learn a specific routine that allows people with ASD, with verbal communicative behaviors and non-verbal communicative behaviors, to improve in the acquisition of communication and response to tasks and routines. The results obtained indicate that this protocol of activities that has been created allows people with ASD to obtain information from the world around them and respond safely to the demands of the environment. In addition, this protocol is characterized by following a favorable learning style for this disorder, as it studies how people with ASD obtain information about their environment.

**Keywords:** *Augmented reality, ASD, social communication, social interaction, routines.*

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### **1. Introduction**

To begin this study, it is necessary to first go back to the definition of Autism Spectrum Disorder, hereinafter ASD. In the first studies, Hobson (1995) stated that ASD is a rare and profound disorder, and it is really difficult to explain how autistic subjects are. Specifically, ASD encompasses a heterogeneous set of neurodevelopmental syndromes associated with deficits in social interaction, communication skills, mental flexibility, and sensory processing, as described by the American Psychiatric Association (2013).

Autism Spectrum Disorder is known in the early stages of development where the areas of communication, socialization and behavior are affected, causing a deficit in cognitive and emotional development (Cruz and Villanueva, 2020). Likewise, Villanueva and Brun (2008) specify that the environment of these people is also affected in a substantial way, generating suffering in the people who surround the social context, whether they are family members or professionals who take care of them.

Specifically, over the years, the care of people with Autism Spectrum Disorder has been related from a psychoanalytic, behavioral and therapeutic point of view, forgetting pedagogy and cognition from the field of Special Education (Badillo and Iguarán, 2020). The educational opportunities and the possibilities of success in life are marked by the pedagogical system of the 21st century where the importance of educational transformation is evident: it is necessary to adopt measures that favor the learning of all students. As Miranda, Laz and Campuzano (2020) call it, it is found inclusive education, a modality that promotes better teaching opportunities. Along these lines, Booth and Ainscow (2002) stated that such education involves a set of processes aimed at eliminating or minimizing the barriers that stand

in the way of student learning and participation in order to obtain the pedagogical achievement of all learners.

Therefore, it is the task of schools and pedagogy to understand and improve the teaching-learning processes of people with autism, adding technologies in the classroom that facilitate the inclusion of this population in the school. In this sense, teachers must be able to create work plans for their incorporation into the classes and, in this way, create a constructive use of new technologies. As indicates Villalustre (2020), the use of new technologies in the classroom requires a change in educational practices, becoming an important element of any educational and innovative process (Cabero, 2015).

Within the field of new technologies, it is found the so-called Augmented Reality (AR), which has reached a great boom in most sectors of society, including education. AR is understood by various authors as a technology that allows us to enjoy experiences in which virtual content is added to or superimposed on our environment, in real time (Estebanell, Ferrés, Cornellá and Codina, 2012; Reinoso, 2012). As it is quoted by López and Maquilón (2020) in a study by the company GARTNER on emerging technologies, it reflects that this is one of the technologies with the greatest expectations for the future and that in a range of five to ten years, it will be when it reaches its optimum level of adoption to reach the general public.

On this point, it has now been corroborated that the AR is a tool for the development of inclusive education (Marín-Díaz, 2018). However, as it is pointed out by Marín-Díaz and Sampedro-Requena (2020), it should be specified that this technology cannot be used in its entirety by those people who present visual, motor or psychological difficulties or who present high abilities, unlike the great viability of this tool with subjects who present ASD. Following Gilabert, Pérez, Lorenzo A., Lledó and Lorenzo G. (2019), numerous studies (El-Seoud, Halabi and Geroimenko, 2019; Vértiz, Pérez, Faustino, Vértiz, and Alain, 2019) show that the use of Augmented Reality is a fundamental tool to improve the understanding of academic interaction with ASD students and provides a new opportunity to address situations of Special Educational Needs that favor learning conditions.

## 2. Objectives

The main objective of this project is to promote the inclusion of Augmented Reality as an intervention tool in teaching-learning with people with Autism Spectrum Disorder. Therefore, a series of more specific objectives have been extracted to be reached: to carry out a search of articles that relate the participants with different styles of learning, with the Information and Communication Technologies (ICT) and, more specifically, with the AR; as well as, to design a protocol of activities in accordance with the characteristics of the ASD through the Augmented Reality.

## 3. Method

This project has been carried out thanks to the collaboration of all the members of the IncluTIC research group. Specifically, the method of this work is a qualitative study within an exploratory-descriptive level.

### 3.1. Description of the context and participants

Exploratory study has been carried out in a Centre for the Attention of Mentally Disabled People located in the city of Alicante. In particular, the participants are part of the residence unit.

Two people were involved in this study. Both subjects have a diagnosis of Autism Spectrum Disorder. Specifically, following their pedagogical reports based on the Diagnostic Statistical Manual of Mental Disorders (DSM-5) both present a level 2 ASD. In terms of age, one of them is 18 years old and the other participant is 21 years old. It should be noted that both cases 1 and 2 make use of verbal communication, although sometimes case 2 shows a negative behavior, refusing to communicate orally. More particularly, the two individuals have a moderate intellectual disability as well as a recognized overall disability of 70% in subject 1 and 75% in subject 2. As far as the curricular field is concerned, the current level of competence of the cases is 0-3 years of preschool education.

### 3.2. Design and process

The following steps have been taken to carry out the process of finding information to complete the Augmented Reality-based activity protocol for people with ASD:

1<sup>st</sup>. Search for articles dealing with activities related to the learning style of people with ASD. In these documents it has found that some of the characteristics such as the general treatment objectives of ASD proposed by Riviere (1998): to foster emotional well-being, to increase freedom, to promote

personal autonomy, to increase communication possibilities, to develop cognitive skills, to improve the capacity of understanding human interactions and to expand learning skills.

2<sup>nd</sup>. Search for articles on the use of new technologies as a tool for teaching-learning in students with ASD in which the benefits are provided as those cited by the authors Martínez, Pagan, García S. and Máiquez (2014) who report that ICTs provide benefits for both teaching and learning of students with ASD, since they are characterized among other things by their versatility, flexibility and adaptability. Moreover, they are specifically adapted to the ASD student because they favor different learning rates and a greater individualization.

3<sup>rd</sup>. Search for articles that expose the use of Augmented Reality in ASD intervention. To do this, it has been consulted the bibliometric analysis "Augmented Reality in the intervention of students with Autism Spectrum Disorder through scientific production" where researchers Gilabert, Perez, Lorenzo A., Lledó and Lorenzo G. (2019) show that in the educational field, there is an upward trend in the number of citations related to this topic as years go by and, therefore, it is evident that the use of Augmented Reality is a fundamental tool to improve the education of this group.

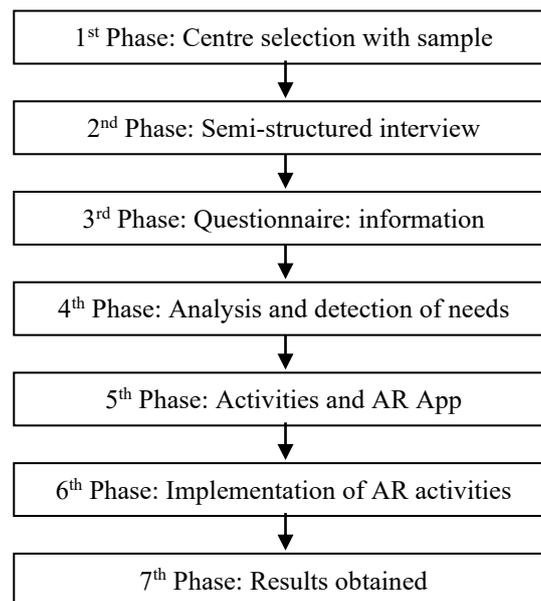
4<sup>th</sup>. Analysis of the searches and data extraction for the realization of the activity protocol.

As it is observed, these steps include from the initial and wider step as it is the search of articles related to the learning style of the ASD people to the final and more concrete step as they are the documents that treat on the tool of AR for the students with this disorder and, the later analysis of all of them with the purpose of creating the protocol of activities to follow.

#### 4. Result

The results of the investigation are described in detail below. Initially, the different phases to be followed to carry out the process of creating the AR-based activities that make up the activity protocol can be seen in Figure 1.

*Figure 1. Phases of the activity protocol.*



Below, each of the phases developed that make up the protocol of activities based on Augmented Reality for people with ASD are presented.

1<sup>st</sup> Phase. Firstly, we have selected a center in the city where there is a variety of population to be studied, in this case we have selected a center where there are numerous cases of people with Autism Spectrum Disorder, which is our field of application.

2<sup>nd</sup> Phase. Then, an appointment has been arranged with the management team of the center, in which the research team is authorized to hold a semi-structured interview with the team of professionals involved in the treatment of people with ASD (psychologists, therapists and sociologists). This is an extensive and open interview, in which pre-established questions are included, and a conversation is held regarding the cases of ASD found in the center, for the purpose of selecting those persons who are desired to form part of the exploratory research project.

3<sup>rd</sup> Phase. Later, by means of a 10-item questionnaire, information was collected on the cases (age, ASD level, type of communication, level of curricular competence and degree of disability, among others). In addition, other types of questions were asked to the psychologists and therapists of the center in which they were asked about which habit or routine they considered essential to work on (hygiene, clothing, food, behavior, attention...) with the aim of proposing some activities that would affect the most important aspects to be dealt with.

4<sup>th</sup> Phase. Once the necessary information has been collected, the data obtained must be analyzed and the need in this population must be seen, on the basis of which the activities will be created using Augmented Reality as an intervention tool.

5<sup>th</sup> Phase. Next, the creation of the activities has to be started by choosing a specific topic and creating a series of sessions, in this case individual sessions so that the person can concentrate and fix his attention for as long as possible. The periods of concentration of the ASDs in which the attention is full are very short so the sessions should not exceed 30 minutes. Also, an Augmented Reality application should be selected to create the experiences for the intervention with ASD persons according to the different objectives to be worked on.

6<sup>th</sup> Phase. Subsequently, the implementation of the Augmented Reality activities has to be carried out. To do this, it is important to set the different sessions over time and prepare a space in which to carry out the exercises. It should be noted that the person responsible is the researcher although there should always be a person accompanying the participants due to their characteristics, at least in the first sessions.

7<sup>th</sup> Phase. In the last place, the results obtained after all the sessions must be evaluated in order to quantify the improvement produced in the subjects and to perfect the aspects that may have failed in the development of the application through the use of Augmented Reality.

## 5. Conclusion

The results of the research allow the following conclusions to be drawn. In general, it can be observed that ASD persons need to follow a routine with very ordered patterns in their teaching-learning process. Therefore, it is essential to create a protocol of activities to follow with these students in order to enhance, in an optimal way, their learning using, in addition, a tool that is adapted to their style of learning and capturing information such as Augmented Reality.

The type of session, timing and motivation are key to achieving adequate performance, but it is also necessary to follow a daily routine in the activities, that is, if you start with a dance at the beginning of the session you should do the same dance every day. People with this disorder like to anticipate what is going to be done and do not conceive a vision of the world in which the steps to be followed are not always the same.

It should also be noted that these activities should contain a center of interest in which the subject is motivated to learn through a playful way. In many occasions, ASDs feel some rejection when sitting in a new space with an unknown person who is interacting with them, so it is important to take into account that the first two sessions must have as an objective that participants feel motivated to perform the activity, feel safe towards the researcher and feel comfortable using the tablet, since it is the main tool that will be used to visualize the AR content.

Finally, referring to the objectives of the study, it can be indicated that the general objective which is to promote the inclusion of Augmented Reality as an intervention tool in the teaching-learning with people with Autism Spectrum Disorder is demonstrated throughout the work. This is due to the fact that after carrying out the search procedure of the articles about the learning style of the ASD participants, as well as the potentiality of the ICT tools in the development of the teaching processes and more specifically, of the Augmented Reality in these people, it is proved that it can be very useful as a teaching methodology. In later studies, after applying the specific objective of this work which is to create a protocol of activities, it will be possible to calculate in a quantitative way the achievement of learning.

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## THE CONTEMPORARY EDUCATIONAL AGENDA \_ EDUCATION AND REALITY

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### Abstract

One of the most forgotten topics in the various educational agendas is the anthropological reflection for the teachers themselves, as well as for the students. Essential questions of a fundamental educational character arise without any doubt: who do we educate? and where do we educate from? Having in our hands, as teachers, the cognitive destiny of our students, being able to influence their freedom of thought, and forge an ethical framework, are very important aspects, especially when the constructivist educational philosophy, which most reforms have assumed, implies anthropological concepts that influence educational approaches under an eminently humanistic profile, and integrate basic assumptions such as: a) the person is a biological, rational, and social being; b) his cognitive ability is essential; and, c) he has a psychic dimension. The following paper discusses our beliefs and truths towards our students as future generations, and tries to outline the anthropological vision that we have regarding the educational aspects, because without pretending it, we will always be configuring and contrasting the student with models, whose foundations can be determinants for their future.

What does a true transformation imply and the philosophical and epistemological absence in contemporary educational currents? Readers interested in this field of education will find also in this article considerable ideas that would help them to understand the transcendence of the mission and the vision in the education of the future as a utopia; the paradigm of pedagogical "Complexity" in postmodern society when it comes to gender from the perspective of beliefs and axiology, and the challenges of the school as an educational institution. They will complement their didactic training and thus make practical decisions that allow them to reach the established objectives.

**Keywords:** *Anthropology, dimensions, education, gender, reflection.*

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### 1. Introduction

Having in our hands, as educators, the cognitive destiny of students, being able to influence their freedom of thought, forging the ethical framework, are very important aspects; so, let's review our beliefs and truths about the person, and try to sketch the anthropological vision that we have regarding education, since without intending it, we are always configuring and contrasting the students with models, whose foundations can be decisive for their future.

Being a teacher – more than a profession – is a challenge especially for those countries that are facing critical situations of social and economic stagnation. In spite of the multiple efforts to the reforms and regular transformations, the educational status continues to be considered as a profession of less priority, that does not harbor much hope of progress; teacher salaries denote a true relevance, and are symptoms of the low dignity of the teaching profession.

Contemporary trends invite us to reflect on a new teaching model and we are increasingly talking about a scholar with research field focused on Education and Learning processes, a teaching task expert in specific technical actions, whose abilities must be eminently professional in regards to content, methodologies, technologies, assessments, etc.

### 2. Teacher's training as development and culture

Training requires a prominent place on the educational agenda under new tactics and strategies. A first aspect to consider is the reformulation of the teacher's training under a paradigm of "professional development", which, obviously, is marked by a system that stimulates or rewards the efforts of this development. A second aspect is the creation of a "permanent culture"; in other words, there should be no specific moments at long intervals, but rather, a professional development and/or updating that should be a permanent task.

On the other hand, the training must be designed and executed by teachers who know the reality, and who have had real experience and ethical authority to be counselor. It is also important to mention

that the creation of a culture or personal discipline of professional self-development must emerge in teacher's training institutions – or earlier -; if university students are not required or are not introduced to the path of autonomous professional responsibilities, if they are not helped to build a habit of reading or being updated, they will hardly be able to self-train in the workplace.

We are facing a serious issue associated to the motivation and self-esteem, which in turn articulates with several factors: first, the teaching status and its possibilities for development; what can motivate the teacher to excel professionally or to invest in a postgraduate degree? Or, what are the conditions to reach higher levels? Second, the quality of the system: which institution guarantees quality standards in the educational field at graduate and postgraduate level?; third, the relationship between the profile of the candidate for teaching and the conditions of the professional training process: do students and teachers aspire to enhance their skills through personal convictions or does it have to be through an economic incentive?

Finally, the issue of professional development and a culture of self-training has to do with a vision toward the future and with a self-understanding of teaching professionalism. While teaching is only perceived as a way for surviving or meanwhile it's disfigured or saturated, there will be no space for even thinking about the importance of professional development; beyond vocational concerns, the system will also have to open the initial spaces to punctuate or stimulate this professional concern.

### **3. Educational reforms and transformation in critical environments**

The fundamental question of true educational transformation implies overcoming the reformist vision of institutions and resources, and inevitably leads us to a nerve center: the teaching profession; So: does reforming the laws, the curriculum, the textbooks and the administration guarantee a true transformation? Apparently, the answer is no; In that case, what does a true transformation imply? It involves more than consulting and training the teachers or co-authoring the process. It supposes a very forgotten anthropological starting point in the agendas of the reformers: knowing the identity of the teachers. Who and how are they? Which in turn facilitates the analysis of the possibilities to concretize – or not – certain changes in the educational setting. In other words, knowing the assimilation capacities, assessing their conditions for change and auscultating how far they can count on their management in the real reform that is, in the classroom, a substantial place for major reforms and / or transformations.

In critical environments, we must observe this wide world scenario with carefulness because we are part of it, and beyond the achievements and obstacles, we must ask ourselves what are our contributions and solutions; But this question has to involve all sectors, either at the public or the private level; which takes us to the need of a necessary and urgent agreement where everyone's commitment must be presented, otherwise we will be predestined to the traditional underdevelopment where we all lose.

There are five fundamental questions that are defined and essential in the field study of "educational quality": What do students learn? What is the level at which this learning occurs? What skills have students enhance within their learning process? How did the learning occur? And, under what conditions did it take place?

### **4. The philosophical and epistemological absence in contemporary educational trends**

Philosophy as a science, facilitates a theoretical instrument that allows to be critical and purposeful, tries to overcome the appearances of reality. It also contributes with a logical ordering to the discourse, points out ethical paths, rationally inquires reality, supposes an intellectual maturity; it is an existential and vital discipline, a form of human existence at the service of something that humanizes the dehumanized society.

But, why philosophy? For what purpose? It is for not being subtle and cynical professionals, corrupt experts, brilliant exploiters, wise despots, fraudsters, enlightened hedonists, excellent materialists, venerable consumerists, and ignorant people. It is for teaching critical thinking, close reading, clear writing, and logical analysis to understand better the world we live in.

The educational and scientific means, and therefore knowledge, are the key to development; however, knowledge – by itself – has also been the basis of inhuman becoming, from which different study fields have emerged such as genetic manipulation, dehumanization...etc. The 21<sup>st</sup> century is a symbol of artificial intelligence, but it must be especially of human intelligence; the greatest expression of adequate, coherent and ethical knowledge is based on freedom, equity and humanism; and, the human being has the responsibility to begin by knowing himself, then his environment and finally knowing everything else.

It is important to emphasize that – as human being – we are losing the capacity of "amazement", which hinders the real knowledge that implies: to be astonished, to problematize, to conceptualize and to solve. This is also the basis of science; so, did the pre-Socratic philosophers, and from that moment, every great thinker has outlined an analogous scheme.

Finally, it is consequential to highlight the significance of having a culture of intellectual production that would include policies encouraging and rewarding research seen as investment and not as expense for the well-being of the science and therefore the nation.

## 5. The Mission in education and vision of the future as utopia

A mission is the great title of any collective project, it is the path that allows any institution to avoid being lost when navigating to the future. The etymology concedes a swift epistemic action. The mission is an achievable historical commission, it is a “towards” and a “doing”, its contents implies a direction and an action. The mission of an educational institution is an achievable, realistic, complete, and useful programmatic and historical plan that sets the horizons and spaces of its intellectual and operational capacity; it is the genesis of any institutional becoming.

When we think about carrying out the mission, we have to overcome several obstacles that intervene in our clear profile, avoiding tacit contents; for example, if we talk about the University, it is supposed to be an institution of higher education, an educational institution, an institution dedicated to education, etc.; Overcoming these redundancies and others like that, the mission must contain a defined purpose “to the point”; it must obviate the idealistic aspects that will not be realized, those are left for the vision as already pointed out; thus the elaboration must think of a “creative tension”, that is, dialectic; we should also avoid using “elegant and ethereal” terms, achieving a rather clear and concrete definition that goes beyond good and legitimate intentions.

As for “Utopia”. (that is to say, a place that does not exist), it is a concept that became universal within the socialist context, to designate the pre-scientific stage in the formation of the theory about society based on the community of goods, in compulsory labor and in distributive equality. However, the term was previously used in the Greek context, and was later retaken to describe the ideal society. A synonym of Utopia is vision, understood in the structural context of the mission, goals and objectives of an educational institution; within the realistic, dogmatic and rigid excesses that the definition of a mission requires, understood this as a programmable and realistic mandate achievable, as well as the aims and objectives. It is necessary to cede spaces to the human profiles that have dedicated themselves to defining what achievable, so that the unrealizable, that is, utopias and dreams, the ideal pretensions of what one would like to be and not, sprout.

## 6. The paradigm of pedagogical “Complexity” in postmodern society

There are four foundations / principles that make up the complexity paradigm: uncertainty, globality, transdisciplinarity and humility.

Uncertainty is somewhat analogous to instability and indeterminacy; it is a vision that starts from quantum physics transferred to a more complex scenario: the social sciences; in fact, we are facing an unlimited and ethereal horizon of possibilities: today’s society.

Globality is another foundation of the new rationality; here the whole is inexplicable if referring to the parts, equally the one that are incomprehensible without relating them to the whole; but that whole is a sum with versatile identities, something different from the parts but possible because of them; the global is sweeping and is acquiring a presence of its own; But without falling into extremisms, global consciousness challenges local existence, both on a single scaffolding.

Interdisciplinarity supposes the complementarity and the conjunction of disciplinary knowledge; quoting Edgar Morin (2000a :18), who explains that: *complexity thinking is animated by a permanent tension between the pursuit of “a knowledge that is neither fragmented nor compartmentalized, and the recognition of the incompleteness and incompleteness of any knowledge”*

Finally, the principle of humility and cooperation demands a solid ethical support based on dialogue and cooperation; which in turn rejects dogmatism, authoritarian superiority and self-centeredness; as Claude Bernard, father of experimental medicine, affirms: “it is better to know nothing than to have fixed ideas supported by theories in which confirmation is always sought, neglecting what is not related to them. This is one of the worst dispositions of the mind and is eminently opposed to the invention. Indeed, a discovery is generally an unforeseen relationship that is not understood in theory. “Humility goes hand in hand with synergy, cooperation, networks, team works, cluster, which supposes a coherent response to the own uncertainty, globality and transdisciplinarity, something not easy for the isolated subject.

## 7. Women at the crossroads: for an education with a gender perspective

Since ancient times, society has excluded women outside of any organization, community or right. Making this has been nothing more than a proactive entity for all those who observed it then. It has taken centuries for rights, and women themselves to be recognized as “equal” in a society of rights.

A vision of how women have been treated since the play is highlighted: The Assembly of Women (also known as *eclesiazusas*, Latinized form of the ancient Greek title, *Ἐκκλησιάζουσαι*:

Ekklesiazousai) is a play by Aristophanes written in the 392 B.C. and similar to *Lysistrata* in the sense that much of the comedy comes from the participation of women in politics, although it is much more infused by problems of gender. This work also shows a change in the style of classical Greek comedy, after the short period of oligarchy after the Peloponnesian War, or at least an attempt of this. It seems to be a mixture of the two styles that works in the beginning but fails at the end.

The play is about a group of women led by Protagoras, who has decided that women must convince men to relinquish control of Athens to them, as they will be able to govern it better than they have. Women then institute a proto-communist government in which the state gives food, home, and general care to all Athenians. After the ruling oligarchy that followed the end of the war, the Athenians asserted their democracy and equality with great force, to the point that, although it was an evident exaggeration, the master piece surely made clear enough their opinion on excessive democracy.

Since the beginning of the 20th century, the world history of women has been changing rapidly from the roles of participation within a state, through the expansion of ideas of equality to the formation of feminist thought. In addition to this, the mentality of world citizenship has been constantly growing in terms of the inclusion of women in social and political matters, the latter being one of the most important. The philosophical and historical perspective of the role of women and the variation of this throughout history remains among questions in countries with low to medium level of human development.

## **8. Axiology and education: beliefs or values?**

The term axiology from the Greek *Aixia* = value and *logos* = study or treatise: In fact we can affirm that since the time of the Republic of Plato considered as one of the first educational projects that recognized the history of education, it was already intended to form certain characteristics or traits in students such as good, beauty, etc. as ends or purposes to achieve in education. However, in almost all the Middle Ages, the fight for the establishment of values was almost prosecuted by the church as the most important educational institution and in particular by religion as the dominant form of social consciousness always under the divine design.

Educational policies and programs in Ethics began to emerge in response to social decline and lack of the mystical teacher; in effect, the teaching sector and its training centers entered the superhighway of deterioration, and with the requiem of the normal ones, the teachers became technical facilitators of learning, leaving behind the mystical support of a dedicated profession, in other times, to be an artisan of the citizen conscience.

Beyond the diverse orthodox and heterodox conceptions of values, and the discussion about the need for a more or less secular or religious morality or ethic, there is a fundamental, historical and cultural antecedent: beliefs, which standardize conduct by means of a contrasting and axiological scale of values. It should be noted that beliefs, values, and attitudes shape behavior. Having said that, in order to have a better nation, with new beliefs and value, with new attitudes and behaviors, it's necessary to start thinking about a new generation that is forging and embracing a solid and coherent system of citizen beliefs that not only preach, but live historically with conviction.

## **9. Education and poverty: The challenge of the school**

“Freedom is a conquest and not a donation, which requires a permanent search” (Freire, 1993); without any doubt, this definition leads us to a deep interpretation of the subject that continues to worry about education and poverty. It has been said that education is the determining factor to alleviate poverty; However, scientifically it continues to be verified that despite large investments in the education sector, the gap between rich and poor continues to expand in many countries.

One of the reasons for this failure is the downward verticality of educational policies and strategies still in force, that is: national organizations have dedicated themselves, metaphorically speaking, to “donating” packages of pedagogical and administrative actions to schools with the aggravating factor. They are not assimilated for various reasons: they are complex, inadequate, out of reality; they do not respond to needs, problems and expectations, just as other adjectives could be continued.

What a school does demand is true autonomy or freedom, but the various legal and administrative gags, although decentralization continues to be spoken of, are lurking, cutting off all initiatives. It is worth mentioning that a true school cannot subsist on strategic donations and needs to conquer its own institutional freedom. The key question would be: how is it conquered? When the school has an educational project with a defined mission and a vision of the future, but this project demands an innovative, proactive, synergistic leadership direction that pushes and guides this projects, it is necessary that each school discover its own within the privacy of that educational community.

Following the pedagogue Joao Picardo, an educational project must have two coordinates: within its consolidation of educational quality and efficiency; and outside, its social role of being a reflective space for solving problems and proposing solutions, as in this case poverty.....A school under this organizational architecture becomes a substantial means to mitigate it. Because the school is not only

dedicated to taking care of its enrollment, but it is also beginning to be a new stage of dialogue to analyze the local circumstances of its environment. Therefore, the school would have to be the first point of reference to achieve the literacy task, identify the most pressing problems in that community, propose the conclusions, summon the pertinent governmental instances to solve them together, articulate community-municipality developing programs and extracurricular training for the community with the support of other instances, among other possible functions. Schools that make schools, schools that learn, innovative schools, schools at the service of their community: these are the challenges that educators face today; but, sometimes, we are faced with another reality, faint-hearted directors, perverse laws, outdated administrative processes, salary problems, few incentives, thus building a wall of obstacles. To avoid today having to face the alarming dropout rates that many environments are going through, it is necessary to turn the gaze towards those who have achieved through a firm educational policy that includes considering the variables of poverty, exclusion, marginality, underemployment, thus reaching a leading economic position in the region, by achieving through education to eradicate the historical ills that affects us as a country in the educational area.

## 10. Pedagogical ideas from challenged educational environment

In recent years, the educational systems have demonstrated, in some countries more than others, the importance of: a) making large and continuous investments in the field of education; b) reform the curricula, especially at the elementary level, to give more room to the key subject that lay the foundations for learning; c) extend the coverage of the school system; d) introduce new forms of schools management, in support of decentralization and strengthening of local capacities; and 2) questioning the operation-cost of higher education institutions, generally exempt from public supervision due to the tradition of university autonomy. Due to the previous initiatives, are now the international cooperation and credit institutions, whose interest and commitment in the field of education represents a notable change in relation to their previous priorities. Despite initiatives that seek to improve the coverage and efficiency of educational services, deficits are still greater that attempts to overcome them. Children and young people come to schools in many challenged environments in conditions of great inequality, especially due to the great differences of social and economic origin that still prevail in many countries. School systems do not contribute to overcoming these differences because resources and investments in education are distributed very unequally and end up favoring urban and middle- and high-income populations.

For education to become a true instrument of economic and social development that allows the full use of human potential, it will be necessary to make greater efforts and investments in schools, a place where mostly the learning and training process occurs. To achieve these objectives, three specific measures are proposed: a) investing the maximum in the classroom in terms of 3 learning resources and infrastructure; b) make the training of teachers more rigorous and intensify and systematize the continuous training; and c) offer better conditions and supports to students who come from low-income homes, communities and regions.

Beyond these specific measures, it will be necessary to rethink and redesign the educational systems as a whole to respond appropriately to the changes in the structure of the student population that will surely occur when the quality and retention levels in schools are improved.

Finally, efforts in the educational field will have to be substantially increased. Much of this effort will be monetary (expenses, investments), but it must be complemented by measures that take advantage of the good experiences that have been achieved. It is also essential that stakeholders in a good education – parents, employers, officials, and teachers themselves – are more concerned with improving the quality of education. Only when this occurs, a substantial improvement can be anticipated and thus, respond to the demands and opportunities of globalization.

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## DIFFERENCES BETWEEN TRADITIONAL AND AUGMENTED REALITY TEACHING

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### Abstract

Nowadays, we are faced with the constant development of a technological revolution. As a result, new paradigms are emerging in education that pose new challenges for schools that need to move in the same direction as society does. In this sense, the so-called traditional method is being replaced by new teaching methodologies that are characterized by the use of technological tools with the aim of achieving a more complete knowledge and personalized to the specific needs of students. Educational institutions include these changes, since they expect an improvement in student motivation and, as a consequence, an increase in academic performance. After studying the results of different studies, there is no doubt that the inclusion of new technologies is responding to the demands in education. One of the technologies used in education that has acquired a great boom in recent years is Augmented Reality (AR). This tool is being progressively incorporated as one of the emerging technologies with the most future projection. In this line, the real change is located in the school that defines the AR with characteristics such as efficiency, innovation and creativity. The aim of this study is to explain the differences between the traditional method used in school and teaching through the Augmented Reality of 21st century education. The results obtained show improvements in the teaching-learning process in the students according to the adaptability to the different learning difficulties of the students, changes in the organization and methodology of the classroom and, finally, the need to train teachers in all stages of education in information and communication technologies, specifically in the AR.

**Keywords:** *Augmented reality, technologies, didactics, teaching, learning.*

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### 1. Introduction

To begin to contextualize the theoretical development of this study, it is essential to emphasize that, as Rodríguez Cavazos (2013) points out, through the emergence of the school as an institution in the eighteenth century and thanks to the classification of pedagogy as a science in the nineteenth century, it germinated traditional pedagogy. Its teaching method is essentially expository, its learning is evaluated by means of reproduction, the result is the main axis of the qualification, the teacher and the student are linked through an authoritarian relationship and it also conceives the student body as a mere recipient of knowledge. Likewise, the traditional method is characterized by understanding knowledge as unique, certain and objective, which can be transmitted without taking into account the context and the participation of the students (Sarmiento Santana, 2007).

On the other hand, as Pedró (2009) states, nowadays technology is a fundamental part of the life of the learners because their lifestyles are linked to the use of devices in different areas such as, among others, leisure time, interpersonal communications and social interaction. Within this framework, it is known that in recent years the advance of technologies has been of such magnitude that it has caused a general change in social behavior, increasingly associating people with technological devices. The world as it is known today would not be possible without the use of technology in most areas of life.

For this reason, in recent years, the need has been observed to replace the traditional method used in the classroom with other forms of work that help to promote the integration of students in the educational process, varying the forms of evaluation and qualification, giving knowledge the category of variable with the ability to adapt to a specific context. In this regard, in the new scenario of society, technology is exposed as a new style to approach learning and the organization of teaching, being viable to synthesize and face the problems obtaining new solutions, facilitating the teaching-learning processes and, at the same time, helping to vary the routine and the gap of the teacher training programs (Sarmiento Santana, 2007).

In this sense, it is also important to consider that the integration of technologies in centers and classrooms has been possible because they help the school system to adapt to the particularities of the information society, preparing students to face the new digital cultural forms, improving and increasing the quality of the development of teaching and, equally, promoting the innovation of teaching materials and methods (Moreira, 2002). However, it is also necessary to set out Amar's (2006) vision, which explains that the purpose of the use of technological tools in the educational field should be to seek an application in this field with the aim of training citizens with the ability to integrate into today's society with autonomy and critical capacity, avoiding the use of new technologies as substitutes for traditional resources.

Following this line, as it is indicated by Gilabert, Pérez, Lorenzo A., Lledó and Lorenzo G. (2019), one of the methodologies that is best responding to the contemporary needs of education is the introduction of Information and Communication Technologies and, specifically, in recent decades, Augmented Reality (AR) is one of the newest trends, since it is conceived as an interactive system that superimposes artificial images generated by a processor on the real world and whose purpose is to access information by making digitally processed data available to people in real time (Cubillo, Martín, Castro and Colmenar, 2014).

Finally, Augmented Reality is one of the technologies that will endure over time because new ideas and applications appear almost daily, and, similarly, although it can already be considered a sufficiently mature tool to be used in the educational field, innovative developments in AR will promote a new generation of applications that will extend the possibilities of this technological tool (Prendes Espinosa, 2015).

## 2. Objectives

The main objective of this study is to analyze the differences between the use of the traditional method and the use of a methodology based on Augmented Reality. Starting from the main objective, several specific objectives have been developed to be achieved with the development of this work:

- To specify the characteristics of the traditional methodology and that of Augmented Reality
- To detail the benefits and limitations of these two methodologies
- To promote the advantages of using Augmented Reality as a tool in the teaching-learning process
- To enhance the use of Augmented Reality as a learning method

## 3. Methods

The present research has been based on a qualitative design within an exploratory-descriptive level. This design makes it possible to identify and describe the characteristics or phenomena with the aim of generating or inducing knowledge (Bisquerra, 2009). Specifically, this project identifies the characteristics, benefits and limitations of the traditional method, as well as of Augmented Reality. Likewise, and after the presentation of the results obtained, an analysis of the discrepancies observed between traditional teaching and the use of Augmented Reality as a methodological tool in educational centers has been carried out.

This study has been developed thanks to the collaboration of all the members of the research group of the University of Alicante IncluTic (VIRGROB-321).

### 3.1. Participants

The sample is made up of a variety of articles related to the traditional method and Augmented Reality obtained after a search and selection of articles during the month of September 2019. The Web of Science and Scopus databases have been used to search for documents.

### 3.2. Design and process

The phases of the search process have been the following:

- Phase 1. Firstly, with the aim of selecting the articles related to the traditional method and to Augmented Reality, a search was carried out in the Web of Sciences and Scopus databases.
- Phase 2. Subsequently, a compilation has been made, in a summary table, of the characteristic data, benefits and limitations of both the traditional method and Augmented Reality included in the articles selected after the search carried out.
- Phase 3. In this final phase, an analysis of the data used to complete the table of the previous phase has been carried out, in order to be able to elucidate the dissimilarities existing between the use of the traditional method and the use of a methodology based on Augmented Reality.

#### 4. Results

The search carried out has given rise to a series of articles related to the use of the traditional method in the classroom and the use of Augmented Reality as an innovative methodology in the development of the teaching-learning process, from which the qualities, advantages and disadvantages of each have been extracted. As can be seen in table 1, the data obtained have been collected and organized in different columns to facilitate subsequent data analysis.

Table 1. Characteristics, benefits and limitations of the traditional method and Augmented Reality.

Traditional method	Augmented Reality
<b>Characteristics</b>	
<ul style="list-style-type: none"> <li>- The teacher acts as a mere speaker of knowledge.</li> <li>- The students are conceived as a passive element and receptor of the information.</li> <li>- The relationship between teacher and student is authoritarian, the teacher is the central figure.</li> <li>- They evaluate by reproducing the curricular contents that are memorized by the students in a mechanical way.</li> <li>- It understands knowledge as unique, true and objective.</li> <li>- The main type of reasoning that this educational method represents is deduction.</li> <li>- It disaggregates the practice of theory into the teaching-learning process.</li> <li>- Theory always takes priority over action or experience in this teaching method.</li> <li>- It understands that knowledge can be transmitted independently of the context in which learners find themselves.</li> <li>- Reason is given more importance than emotion, postponing emotional development.</li> <li>- It is developed from the book as the main educational resource.</li> </ul>	<ul style="list-style-type: none"> <li>- The teacher acts as a guide in the students' learning.</li> <li>- The students are conceived as participants and actives in the teaching-learning process.</li> <li>- The relationship between the teacher and the student is egalitarian, the teachers and the students are similar.</li> <li>- It evaluates through the application of the knowledge acquired and internalized by the students through its use and experimentation.</li> <li>- It understands knowledge as plural and subject to be complemented and expanded.</li> <li>- The type of reasoning mainly used with this methodological tool is induction.</li> <li>- It associates practice and theory as a common methodological set.</li> <li>- Action, experience and theory are conceived as egalitarian pillars of knowledge.</li> <li>- It understands that knowledge must be transmitted taking into account the context of the students.</li> <li>- More importance is given to reason than to emotion, postponing affective development.</li> <li>- The resources used are made up of fictitious images, 3D models, texts or other types of digital information superimposed on real images.</li> </ul>
<b>Benefits</b>	
<ul style="list-style-type: none"> <li>- It encourages the development of students' will, personal effort and self-discipline.</li> <li>- It contributes to the improvement of memory processes among students.</li> <li>- It makes possible the joint formation of several students at the same time, saving in the amount of educational resources.</li> <li>- The sequence of the knowledge worked on is simple.</li> </ul>	<ul style="list-style-type: none"> <li>- Students are not only exposed to the content, but can create it, thus expanding the real educational world.</li> <li>- It expands the opportunities for learning in different contexts.</li> <li>- It adapts to the learning difficulties presented by learners.</li> <li>- It promotes structures of solidarity, collaborative or cooperative work.</li> <li>- It enables dynamism, creativity and interaction of the resources used.</li> <li>- It promotes the intrinsic motivation of the students.</li> <li>- It helps the development of social skills such as collaboration, interpersonal relations and negotiation.</li> <li>- It contributes to the acquisition of lasting learning.</li> <li>- It allows the combination of the real world and with elements of the virtual world, thus forming a more complete image.</li> <li>- The information that it is processed visually is directly related to the content worked on.</li> <li>- As it is interactive in real time, it allows any response, change or action made by the user to have an immediate impact on the scenario composed by Augmented Reality.</li> <li>- It provides a more realistic experience since the information obtains the physical capacity of its environment and it is possible to interact with it.</li> <li>- It enables students to have more complete experiences that would not be possible without the use of Augmented Reality.</li> <li>- It encourages spatial reasoning and the acquisition of physical skills.</li> <li>- It promotes an education open to knowledge.</li> </ul>

<b>Limitations</b>	
<ul style="list-style-type: none"> <li>- It promotes lack of motivation and disinterest on the part of the student body which generates distraction and boredom in students.</li> <li>- It can help to slow down social development.</li> <li>- It does not use the structure of solidarity, collaborative or cooperative work and, likewise, it stimulates competition and comparison among students.</li> <li>- It does not encourage curiosity, participation, initiative and creativity.</li> <li>- The presence of the teacher can impose on the students in front of the group.</li> <li>- It may lead to an inadequate adoption of information or to momentary learning, since much of the knowledge acquired through memorization and repetition is often forgotten over time.</li> <li>- Neither the affectivity of the students nor their emotional development is taken into account.</li> <li>- The teachers may not be well prepared to control a group or to transmit the teaching correctly.</li> <li>- It contributes to a lack of critical attitude and to the passivity of the students.</li> </ul>	<ul style="list-style-type: none"> <li>- Teachers have a lack of preparation and knowledge about the tool of Augmented Reality, so it is necessary to train teachers in this area.</li> <li>- Internet accessibility and the availability of mobile devices or tablets are required.</li> <li>- It requires extra planning on the part of the teaching staff.</li> <li>- It needs a state investment to fight the digital gap between students.</li> </ul>

## 5. Conclusions

After the analysis of the results obtained, it is observed that the properties that characterize traditional teaching are very different from the characteristics noticed in a methodology that uses Augmented Reality as the main tool in the teaching-learning process.

Specifically in relation to the benefits provided by each of the two methods analyzed, it can be stated that the number of advantages provided by a methodology based on the use of AR is much greater than the amount obtained in the traditional method. Likewise, the benefits of AR are better suited to the needs of today's students who are developing in a technological society and who use all types of devices in their daily lives.

Similarly, with respect to the limitations, it should be noted that the disadvantages found in the methodology based on Augmented Reality are fewer than those observed in the traditional method, because the latter method, for example, puts barriers to social and communicative development of students and delimits knowledge.

For all the above reasons, it can be concluded that a methodology based on Augmented Reality provides more benefits and fewer limitations than the traditional method. In this sense, it is possible to determine that if more economic and temporary resources were invested in the development of methodologies based on AR, it would be possible to achieve the acquisition by students of a more lasting knowledge, promote social relations of students, stimulate creativity and involvement of students in the teaching-learning process and, thus, increase their motivation, and expand knowledge capabilities, among other benefits provided by this methodological tool.

Finally, it is important to specify that, throughout this study, it has been demonstrated that the proposed objectives have been met, as the differences between the use of the traditional method and the use of a methodology based on Augmented Reality have been analyzed by exposing the characteristics and presenting the benefits and limitations of the two types of teaching methods. Likewise, through the development of this study it has been possible to promote the advantages of the use of AR as a tool in the teaching-learning process and to enhance the use of AR as a learning methodology.

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## MOOCS FOR BRIDGING THE SCHOOL - UNIVERSITY GAP

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### Abstract

This paper presents an update of the MOOC orientation strategy implemented by Federica Weblearning, the Centre for Innovation, Experimentation and Diffusion of Multimedia learning at the University of Naples, Federico II since January 2019 and already published in the same year. The adoption of a solid orientation strategy continues to be driven by the need to support students in their university choice and prepare them for the intellectual demands of university life and study. According to OECD, the number of graduates in Italy has increased in 2019 from 20% to 28% in the 25-34 age range, and Italy has high numbers of post-graduate degree holders. However, as in the rest of the world, dropout rates in Italy continue to be high, currently standing at approximately 25% of registered students. The MOOC-based orientation strategy addresses possible ways of bridging the gap between school and university. The initial Federica meta-MOOC strategy provides a tool for helping students choose the right degree. Meta-MOOCs offer experiential chunks of real university courses, thus demonstrating content type, learning approach and expected levels of attainment. In 2020, the Federica Weblearning orientation offer has been extended via a new partnership with the CISIA inter-university consortium. This initiative focuses on MOOCs that fill in the knowledge gaps, providing preparatory courses in key areas where weaknesses have been identified to support students through first-year university exams, or indeed, university entrance tests. A further prong is currently being added to the overall Federica orientation strategy: MOOC activities to foster student awareness to deal with change positively, and adopt the path towards self-fulfilment.

**Keywords:** *MOOCs, freshman orientation.*

### 1. Introduction - Degrees to plug the skills gap?

Orientation is a crucial phase for school-leavers as they face major decisions about their future, and whether to aim for a university degree or not and, if so, in what subject. The global jobs market is a fast-changing and unpredictable place, and it is getting harder for students to choose a degree that will make them career-ready in a world where “8 - 9 percent of 2030 labour demand will be in new types of occupations that have not existed before” [McKinsey] and OECD statistics predict that “15.2% of Italian workers may see their job being automated and another 35.5% may see it significantly overhauled in the next ten years” [OECD]. EU and OECD data confirm that demands from the jobs market are shifting towards more complex, non-routine tasks and non-cognitive skills as a result of digitalisation and globalisation. On average, shortages are the strongest in the “*knowledge of Computers and Electronics* followed closely by substantial demand for *Judgment and Decision Making Skills* and *Verbal Abilities* (written expression and comprehension and oral expression)” [OECD Skills for Jobs Database].

A recent World Economic Forum report stated that although Italy has good culture and civic literacy, critical thinking and problem-solving skills, its citizens have poor foundation skills, including literacy, numeracy, scientific and financial literacy. [World Economic Forum] And despite the need for increased digital skills in Italy, women continue to be under-represented in ICT education, with only 13% of ICT students being female in Italy in 2016. [Eurostat]

School-leavers, both male and female, may well be tempted to try and choose a degree subject that aims, in some way, to plug one of these skills gaps. In Italy and elsewhere. On the other hand, the value of humanities degrees is also being re-recognised, as was recently evidenced by Microsoft executives amongst others: “as computers behave more like humans, the social sciences and humanities will become even more important... (as they) can teach critical, philosophical and ethics-based skills that will be instrumental in the development and management of AI solutions”. [Business Insider]

## 2. Value of tertiary education

Whichever department or subject area students choose, however, one thing still holds true. University degrees continue to be the main currency for the jobs market and, in general, increase a student's chances of employability. In America, for example, employment rates are 89% for students with a bachelors or higher degree compared to 59% for those without [NCES]. Italy is following this trend with educational attainment continuing to grow. More Italian students have MAs than in many other European countries and even though Italy still has a higher than EU average number of NEETs, people with degrees are less likely to be unemployed long-term. [OECD Education at a Glance]

Although many school-leavers are thus encouraged to think that a university degree is the best next step, statistics regarding drop-out rates and change of subject amongst university students would seem to indicate that a significant percentage of students continues to leave university without a degree. [Eurostat] This has a “scarring effect in the form of greater marginalisation and negative labor market outcomes” [Sosu, E.M., Pheunpha, P. 2019] and thus significant consequences for individuals, institutions and society. Although the reasons for university dropout are many and varied, “students' intellectual capability to cope with the academic demands of university study is one of the most significant risk antecedents consistently identified across the literature” [Sosu, E.M., Pheunpha, P. 2019]. And in Italy ANVUR reports that, for example, in Industrial Engineering, 19% of students have abandoned their studies at 3 years from registration and 27% at 6 years, and overall, on a National level, dropout rates are at 12.2 % for 3yr bachelors, at 5.9 % for 2yr MAs and 7.5% for 5 or 6yr Combined degree programs, meaning an overall dropout rate of approx. 25%. [Anvur]

## 3. Effectiveness of MOOC-based orientation strategy

We would like to argue that learning technologies can provide structured learning pathways with clearly mapped stages, engaging and relevant content that allows for flexible access and personalisation of learning, while predictive analytics can flag issues that help identify at-risk students. And that, therefore, a MOOC-based orientation strategy could be, as reported in our previous paper, an effective tool for:

a) raising awareness of degree content in different subject areas to enable school-leavers to make an informed choice, especially in popular degree subjects that are not necessarily included in school syllabuses, like psychology, law, engineering, communication sciences etc.). MOOC lessons also give a taste of the university classroom, with clear indications of expected performance and attainment levels via the accompanying assessment activities;

b) providing preparatory or remedial study content in specific areas to boost learning and fill the knowledge-gaps, thus reducing the possibility of students finding themselves unable to cope with the level of intellectual difficulty posed by university study.

The main areas for a MOOC strategy then are twofold: the first is to provide useful tools and links to help students choose the right degree for them. The second is to provide preparation for university study in the sense of “filling in the knowledge gaps” using specific subject MOOCs. A third prong of the strategy that is currently being proposed at Federica Weblearning is to use MOOCs to:

c) improve students' levels of self-knowledge and awareness, to render them more resilient in the face of the major changes that university and its associated study, as well as the future workplace, pose for them.

In all cases it would seem that orientation strategies require the support of the teacher for successful implementation. Already in 2014, the Italian Ministry for Education published national guidelines for lifelong orientation which recognised the important role that schools had in “helping people develop their own identity and make the right decisions regarding their personal and professional life, as well as facilitating the match between demand and supply in the jobs market”. [Orizzonte Scuola] Many schools already had a Head of Orientation who is responsible for orientation initiatives and approaches, nominated as a result of a former Ministerial decree in 2004. The commitment of the teachers as disseminators and multipliers is central to the uptake of online learning initiatives like MOOCs, which might otherwise remain hidden on the Web.

## 4. Institutional interest in MOOCs for schools

There are signs that institutional interest in MOOCs for schools has continued since our last paper. The new European Commission President, Ursula von der Leyen, aims to update the Digital Education Action Plan and increase the use of MOOCs in the area of digital skills to “get Europe up to speed [Techcrunch] and the H2020 project UP2U aims to bridge the gap between secondary schools and higher education & research by better integrating formal and informal learning scenarios and adapting both the

technology and the methodology that students will most likely be facing in universities [UP2U] In the same period, the French national MOOC initiative, FUN, has significantly increased its Orientation offer. The FUN platform is now offering 31 orientation MOOCs of which 20 are new, fruit of the MOOCFOLIO project financed by the French Government [MOOCFOLIO] The aim is to enable students to “1) choose the right degree 2) reinforce their knowledge and bridge the gap between school and university”. The Italian EduOpen University Consortium has also now inserted a section on its homepage entitled Orientation, and offers 30 introductory courses in aspects of maths, physics, statistics, law and other popular university subject areas. On the other hand, the leading European and American OPMs that offered the university preparation initiatives we reported in our previous paper [Merciai I., Kerr R., 2019] (Futurelearn and edX) have made no further investment or effort in this area.

As reported in our previous paper [Merciai I., Kerr R., 2019], the Federica Web Learning Centre has been experimenting with the use of meta-MOOCs for bridging the gap between school and Higher education since 2019. These place the emphasis on the first of the main MOOC strategies identified above, that is, they offer chunks of the major degree courses offered at national level, and thus enable students to experience the university classroom and content and standards first-hand. The role of the teacher as multiplier was fundamental to the success of this project, as the initial point of contact was with individual class teachers who chose to adopt this series of orientation mini-MOOCs as a classroom activity and involved the class in the creation of their own digital artefacts as a project outcome. 8452 local students in the Naples area followed the meta-MOOC project in 2019.

## 5. MOOCs as preparation for university entrance

In a new extension to the Federica MOOC Orientation activity, and in line with the second of the main MOOC strategies identified above, the Federica Web Learning Centre has recently started a collaboration with CISIA (Consortium Interuniversity for Integrated Access Systems). The Cisia is a non-profit consortium, comprising 50 Italian Public universities, whose role is primarily to aid university access and orientation, by creating, administering and marking university admissions tests. Their role also includes the development of tools on the part of their consortium members, to plug freshmen knowledge gaps in a bid to reduce repeated failure in all-important modules of the course and thus reduce potential dropout rates. The MOOC initiative is a valuable addition to their toolbox.

The CISIA Federica Weblearning collaboration consists in offering specific online courses - on the Federica platform - to help students prepare for university entrance exams to those faculties where stringent selection procedures are in place. These MOOCs can also serve as remedial learning content for struggling first year students. The Italian Ministry for Universities and Research, first with the PLS and then with the POT projects (Plan for Science Degrees and Plan for Orientation and Tutoring) [MIUR] published open Calls to Universities to design and produce learning content for final year school students in the 6 disciplinary areas where gaps had been identified: Basic Maths; Physics; Chemistry; Biology; Logic; Text Analysis and Comprehension and Italian Language Skills. The design and development of MOOCs to improve baseline knowledge in these key areas is specifically mentioned in the Ministerial Decree. The aim is to boost interaction between schools and universities to improve levels of college readiness on the part of school-leavers and with the overall objective to:

- increase university enrolment rates;
- promote awareness in choice of degree;
- reduce dropout rates;
- support students in completing degrees within the recommended time-frame.

Within this Ministerial initiative, the CISIA consortium is committed to designing effective self-learning and self-assessment tools, and MOOCs will make a valuable contribution to this orientation and tutoring activity on their part. The Federica Weblearning/CISIA collaboration, which focuses on the production of new introductory MOOCs to improve baseline knowledge for better university access and performance, is already under way. It includes establishing guidelines for effective MOOC design and creation with a national committee of stakeholders. The first phase of the joint initiative saw the creation of a set of courses in Basic Mathematics for the following subject areas: Engineering and Science, Agricultural science, Economics and Pharmacy. Maths was identified by the universities and teachers involved in the project as being one of the most significant hurdles for students on these degree courses, and according to OECD statistics, Pisa performance for mathematics and science shows poor performance for Italy compared to its European counterparts. [PISA]

The design of the courses was aimed at a school-leaver audience and enables them to explore and clarify basic concepts in 10 lessons. Numerous videos, texts and formative assessments accompany the student through the theory and practice of functions, equations, logarithms, geometry and other fundamental aspects of maths for further science studies.

Once the courses were ready, a two-pronged dissemination plan launched the initiative. Major stakeholders from both partner networks were invited to a Study Day on Technology Enhanced Learning where the courses were presented. This coincided with the launch of a dedicated page on the Federica platform [www.federica.eu/cisia](http://www.federica.eu/cisia) (April 2019) and on the CISIA platform that publicized the initiative and also provided access to the four Mathematics courses.

## 6. Initial CISIA / Federica project results

The initiative has met with success in terms of student numbers in the first 6 months of its lifespan. We report some of the more significant user data, updated to January 2020, in the table below. The data shows the success of a collaborative university network and results show a greater need for mathematics for Science and Engineering so far. The collaboration will continue in the forthcoming months.

Table 1.

<b>CISIA users registered on the FEDERICA platform</b>	19,919 users registered on Federica.EU via Single Sign On
<b>Numbers of students registered</b>	14,000 total registered users
<b>Number of times a visitor accessed the Federica platform via the project Landing Page</b>	45,683
<b>Bounce rate</b>	14,56%

The Federica / CISIA collaboration will be extended in the forthcoming months.

## 7. Future extension of MOOC strategy to vocational orientation

In addition to the two routes towards orientation that Federica has already explored, and that we have presented here above, future work at the Centre will also focus on the third way; that of vocational orientation for students. The objective is to equip students with life skills that develop an awareness of self, and the changes that their lives will undergo as they enrol at university, and how this new level of understanding will enable them to achieve personal goals and fulfilment. This is one of the overall objectives of one of the most significant and wide-reaching POTS under way - that of Engineering, which involves 41 Universities. The University of Naples Federico II is heading this group, due to its research and teaching excellence in this area, and Federica Weblearning, as a consequence, will incorporate experimentation of this approach to orientation in future MOOC initiatives. A National Day of Study devoted to tools and ideas for vocational orientation, was already organised by Federico II in November 2019, touching on subjects like *New directions for an inclusive and sustainable future; Policies, practices and pathways towards more active student orientation*.<sup>1</sup>

## 8. Conclusion

A two-pronged MOOC strategy for Orientation has been implemented effectively by Federica Weblearning in the last twelve months: preparation for university choice via the Meta-MOOC initiative, and knowledge enhancement via the CISIA initiative. A forthcoming change of platform interface will give greater space and visibility to these orientation initiatives, that respond to the needs and expectations of the digital generation by speaking and using their language. These existing orientation activities will be reinforced and extended. New experimentation will move in tandem with the University Engineering POT, adding a possible third prong to the orientation strategy, that of vocational orientation and life skills.

<sup>1</sup> “Giornata di studio sul tema: Strumenti dell'orientamento vocazionale per l'accesso agli studi universitari” organized in Nov. 2019, by the Polytechnic School of Federico II (Scuola Politecnica e delle Scienze di Base) <http://www.scuolapsb.unina.it/index.php/9-in-evidenza-highlights/743-giornata-di-studio-sugli-strumenti-di-orientamento-vocazionale>

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## PHYSIOTHERAPIST STUDENTS' PERCEPTIONS IN A GAMIFICATION PROJECT

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### Abstract

Motivation is a crucial aspect in the students' learning. Thus, active learning methods encourage students to become active protagonists of their own learning processes. Gamification is the use of game elements in a non-game context. The use of gamification as an innovative teaching-learning strategy rises from the need for change in teaching methodology. By applying gamification to the classroom, students could be motivated to learn in new ways or enjoy otherwise tedious tasks. For that reason, a gamification project entitled 'Jeopardy', based on a cooperative methodology, has been developed in the first semester of the academic course 2019-2020. The participants have been students of 2<sup>o</sup> course of Physiotherapy degree from San Jorge University, enrolled in the subject 'General Procedures in Physiotherapy 1'. Jeopardy project consisted in the implementation of educational games that gave students, divided into small groups, tasks to earn points and feature a leaderboard to track progress and increase students' engagement. Our main objective was to analyze the perception of learners about their participation, the impact of the project and, the integration of content from this subject. In order to assess students' perceptions and satisfaction with the gamification project, an online survey was designed to collect quantitative and qualitative data. Results show that students value this project positively in terms of the way in which it facilitates the integration of content in a collaborative way. To conclude, this study provides that the use of a gamification project is a valid active learning strategy.

**Keywords:** *Gamification, cooperative learning, active learning, physiotherapy.*

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## 1. Introduction

### 1.1. Analysis of the initial situation

Learning is the incorporation of new data and the ability to put it into practice when necessary and in a real environment (Lopea, 2000).

In addition, recent publications emphasize the need for creative work to acquire and apply new learning (Elisondo et al, 2011). In this model, teachers are decisive in designing, proposing and directing innovative projects that pose a creative and knowledge challenge for students. Therefore, the teacher becomes the coordinator, organizer, trainer and follower of the cooperative work of the students (Meroño & Acuña, 2012).

Cooperative projects require a work team that must organize, participate and contribute to achieve a creative solution to a problem raised. Furthermore, Johnson and Johnson state that working through collaborative projects in small groups manages to develop interpersonal skills thanks to positive interdependence and the evaluation of group performance (Baker et al, 2018).

Nowadays, one strategy used in the classroom is gamification, defined as the use of the principles of the game in non-common contexts (Attali & Arieli-Attali, 2015). It is a methodology where students can purchase new knowledge, reinforce them, experience simulations and/or solve real world problems in a playful way. In addition, it allows students to be introduced to collaborative environments, very close to real professional contexts where there are challenges. Furthermore, the fact that there is a return in the form of a qualification as a "reward or prize", favours the motivation of the students.

Although play and fun are not always associated with learning, many aspects of play and own games are very conducive to learning. Thus, educators have seen an increase in engagement and knowledge retention when using games (Bruder, 2015).

## 1.2. Innovation highlights and their justification

Higher education is increasingly based on the development of competencies and interdisciplinarity facilitating both transversal skills and self-learning (Baños & Perez, 2005). This model of higher education displaces the traditional figure of the teacher and student since the teachers, who are an interactive part of these new methodologies, will have to develop new pedagogical strategies to achieve the implementation of both specific and transversal objectives and the student will have an active role in their learning (Alvarez, 2004).

The gamma activities increase interactivity and motivation. Moreover, much more so if there is a reward for their participation, involvement and collaboration (Sera & Wheeler, 2017). Therefore, carrying out gamification activities in a collaborative manner will facilitate both the learning process and the development of skills inherent to the degree.

## 2. Context of the intervention and objectives of the proposal

The general objective of this project is to evaluate the impact of the implementation of a gamification project to favour the assimilation of the content of the General Procedures in Physiotherapy 1 (GPP-1) subject.

As specific objectives:

- To apply and extend specific knowledge of the content developed in the GPP-1 subject.
- To acquire and develop professional competences through the collaboration between the members of the groups.
- To work within a team participating in a collaborative way contributing knowledge and ideas for the resolution of the proposed gamification activities.
- To evaluate by means of appropriate tools, the influence of the Jeopardy project on the integration of the subject content.
- To evaluate, by means of appropriate tools, aspects related to the collaborative work during the development of the activity.

## 3. Methods

### 3.1. Participants

Students in the second year of the Physiotherapy degree of the Universidad San Jorge, enrolled in the 1 GPP-1 subject, participated in the project.

### 3.2. Preparation and development of the gamification project

At the beginning of the teaching period, lecturers instructed students on the project's operation and the scoring system. At the same time, students were divided into small groups of 14-16 students to encourage them to work as a team.

Jeopardy project was a set of evaluated tasks worth 10% of the final mark in GPP-1. These tasks included interactive games using different platforms, micro-classes, and activities based on problem solving as clinical cases. During each class the students worked on a specific topic carrying out the different activities. Each task was marked with a specific score.

The activity took place during the first semester of the academic course 2019-2020.

### 3.3. Assessment

In order to evaluate the student's perceptions about the learning process through Jeopardy project, the students were surveyed in the last class using the Intrinsic Motivation Inventory (IMI) scale.

The IMI includes 45 items measured on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree) and assesses issues such as participant's interest/enjoyment, perceived competence, effort/importance, pressure/tension, perceived choice, relatedness and value/usefulness while performing a given activity.

## 4. Results and discussion

122 students (53 males, 69 females) with a mean age of  $20,97 \pm 3,56$  years participated in this project.

Table 1 below shows students' perceptions and considerations about their motivation of the Jeopardy project.

Table 1. Intrinsic Motivation Inventory (IMI).

SUBSCALE	ANSWER						
	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
<b>Interest/Enjoyment</b>							
I enjoyed doing this activity very much	3,28%	4,10%	3,28%	18,85%	32,79%	26,23%	11,48%
This activity was fun to do.	1,64%	4,92%	6,56%	9,02%	27,05%	36,89%	13,93%
I thought this was a boring activity. (R)	4,10%	13,93%	16,39%	17,21%	16,39%	24,59%	7,38%
This activity did not hold my attention at all. (R)	4,92%	9,84%	10,66%	17,21%	12,30%	27,87%	17,21%
I would describe this activity as very interesting.	2,46%	3,28%	9,02%	21,31%	28,69%	25,41%	9,84%
I thought this activity was quite enjoyable.	1,64%	5,74%	7,38%	25,41%	27,87%	23,77%	8,20%
While I was doing this activity, I was thinking about how much I enjoyed it.	7,38%	5,74%	11,48%	20,49%	29,51%	18,85%	6,56%
<b>Perceived Competence</b>	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Agree	Strongly Agree
I think I am pretty good at this activity.	0,82%	6,56%	18,03%	36,07%	18,03%	14,75%	5,74%
I think I did pretty well at this activity, compared to other students.	0,00%	13,93%	16,39%	29,51%	22,95%	11,48%	5,74%
After working at this activity for a while, I felt pretty competent.	0,82%	9,02%	20,49%	30,33%	26,23%	7,38%	5,74%
I am satisfied with my performance at this task.	0,82%	8,20%	13,93%	26,23%	22,95%	17,21%	10,66%
I was pretty skilled at this activity.	1,64%	9,84%	15,57%	37,70%	20,49%	7,38%	7,38%
<b>Effort/Importance</b>	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Agree	Strongly Agree
I put a lot of effort into this.	1,64%	9,84%	17,21%	27,87%	18,03%	18,03%	7,38%
I did not try very hard to do well at this activity. (R)	3,28%	6,56%	16,39%	31,15%	13,11%	20,49%	9,02%
I tried very hard on this activity.	0,00%	10,66%	17,21%	27,87%	20,49%	16,39%	7,38%
It was important to me to do well at this task.	0,00%	4,10%	2,46%	13,93%	27,87%	31,97%	19,67%
I did not put much energy into this. (R)	4,10%	8,20%	13,11%	30,33%	13,11%	18,03%	13,11%
<b>Pressure/Tension</b>	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I did not feel nervous at all while doing this. (R)	17,21%	26,23%	13,93%	18,03%	13,93%	6,56%	4,10%
I felt very tense while doing this activity.	16,39%	27,87%	11,48%	24,59%	10,66%	4,10%	4,92%
I was very relaxed in doing these. (R)	14,75%	20,49%	22,13%	17,21%	14,75%	8,20%	2,46%
I was anxious while working on this task.	18,03%	23,77%	9,02%	30,33%	10,66%	4,10%	4,10%
I felt pressured while doing these	18,85%	26,23%	12,30%	26,23%	9,02%	2,46%	4,92%

Perceived Choice	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I believe I had some choice about doing this activity.	11,48%	12,30%	6,56%	31,97%	11,48%	18,85%	7,38%
I felt like it was not my own choice to do this task. (R)	15,57%	15,57%	13,93%	25,41%	7,38%	14,75%	7,38%
I did not really have a choice about doing this task. (R)	16,39%	13,93%	9,02%	31,15%	6,56%	13,93%	9,02%
I felt like I had to do this. (R)	15,57%	25,41%	23,77%	26,23%	4,92%	2,46%	1,64%
I did this activity because I had no choice. (R)	13,93%	22,95%	21,31%	22,13%	4,10%	9,84%	5,74%
I did this activity because I wanted to.	6,56%	4,92%	11,48%	29,51%	18,85%	22,13%	6,56%
I did this activity because I had to. (R)	23,77%	22,95%	25,41%	18,85%	2,46%	3,28%	3,28%
Relatedness	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I felt really distant to this person. (R)	6,56%	5,74%	13,11%	16,39%	6,56%	27,05%	24,59%
I really doubt that this person and I would ever be friends. (R)	6,56%	5,74%	13,11%	22,95%	7,38%	23,77%	20,49%
I felt like I could really trust this person.	3,28%	8,20%	10,66%	27,05%	22,13%	13,93%	14,75%
I'd like a chance to interact with this person more often.	1,64%	4,10%	3,28%	29,51%	27,87%	22,13%	11,48%
I'd really prefer not to interact with this person in the future. (R)	3,28%	4,10%	4,10%	24,59%	5,74%	21,31%	36,89%
I don't feel like I could really trust this person. (R)	3,28%	3,28%	9,84%	22,13%	10,66%	24,59%	26,23%
It is likely that this person and I could become friends if we interacted a lot.	0,82%	3,28%	7,38%	23,77%	22,95%	22,13%	19,67%
I feel close to this person.	3,28%	9,84%	9,02%	33,61%	23,77%	10,66%	9,84%
Value/Usefulness	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I believe this activity could be of some value to me.	3,28%	5,74%	5,74%	18,03%	25,41%	31,97%	9,84%
I would be willing to do this again because it has some value to me.	5,74%	5,74%	9,02%	19,67%	27,05%	22,13%	10,66%
I think this is an important activity.	2,46%	7,38%	5,74%	17,21%	27,05%	28,69%	11,48%

All these findings align with literature on the difficulty of finding student motivation and engagement (Hanus & Fox, 2015). Despite this, the entertainment value of the games in education makes them more enjoyable than other learning activities. Moreover, the contemporary students need interest, engagement, stimulation, and entertainment to support their learning (Day-Black et al., 2015).

Regarding the perceived competence subscale, it is theorized to be a positive predictor of behavioural measure of intrinsic motivation. In view of our results, there was generally a high level of satisfaction about their individual performance. However, Zichermann (2011) argued that intrinsic motivation is unreliable, and it is necessary using extrinsic motivation as incentives as we have applied in our study.

Some of the advantages of this type of gamified activity is that learners must review contents prior to each activity and therefore, this involves considerable effort and dedication (Hanus & Fox, 2015), as reflected in the effort/importance subscale.

Pressure/Tension is theorized to be a negative predictor of intrinsic motivation and evaluates if participants feel pressure to succeed in an activity (Monteiro, Mata & Peixoto, 2015). This subscale was not scored with higher scores, so there was no evidence of an important pressure.

Other factor such as perceived choice was assessed. In this regard, it should be noted that despite the project was an obligatory activity, it was perceived neither as a forced activity. On the other hand, another aspect that is interesting to highlight is the complex interaction of students within-groups since groups were not organized by own students (relatedness subscale).

About the usefulness of the gamification, this project was positively valued by a large majority of the students. This approach must be integrated in a way that reinforces students' perception of the importance of education for the professional future (Urh et al., 2015).

To conclude, findings from this study revealed that the application of a gamification project has been recognised as an interesting learning methodology although students found some disadvantages such as an important effort and some difficulties in relationship to their peers.

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## IS KNOWLEDGE PRICELESS? A CASE STUDY ON THE CHANGING FACE OF EDUCATION

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### Abstract

Current developments in the Western economies have turned some universities into corporate institutions driven by practices of production and commodity. Academia is increasingly becoming integrated into national economies as a result of students paying fees and is consequently using business practices in student retention and engagement. With these changes, pedagogy status as a priority within the institution has been changing in light of these new demands. New strategies have blurred the boundaries that separate a student from a client. We believe that this has led to a change of the dynamic, disrupting the traditional idea of the knowledge market and emphasising the corporate aspect of universities. In some cases, where students are seen primarily as a customer, the purpose of academia is no longer to educate but to sell a commodity and retain fee-paying students. By analysing a case study of the Student Success Festival, an event that involved academic and marketing teams, we consider the differences between the respective visions of the pedagogic arm of the university and the corporate. We argue that the initial concept of the event, which was based on the principles of gamification, independent learning, and cognitive criticality, was more clearly linked to a grounded pedagogic approach; however, when liaising with the marketing team, is a crucial step in creative process, it became apparent that these principles were not considered a priority in terms of their remit. This paper will consider these two opposing viewpoints, reflecting on the reality of maintaining a pedagogic grounding in an increasingly commercialised sector.

**Keywords:** *Economic pressure, commodification, pedagogy, gamification, higher education marketization.*

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### 1. Introduction

Within capitalist economies, education has been driven into the sphere of economic activity. Governments that exist within a capitalist state are increasingly serving the interests of the market and responding to the demands of capitalist players (Shumar, 1997). This shift from public funding to private funding can be seen across Europe but has been particularly evident in the UK (Williams, 2016), with a 60% cut in public funding for Higher Education (HE) over the last 12 years, which has been replaced by a system of fees and loans developed through a collaboration between universities and the government (Privot et al., 2018). Furthermore, over the last five years, the income of UK HE institutions (HEIs) has seen an increase in tandem with increasing fees (HESA, 2019). This has led to heated discussions within both the academy and HEIs regarding the practical and conceptual impact of such financial commodification on student expectation and how this may affect recruitment, retention, and engagement.

As Williams (2016, pg. 135) states, from 2010 onwards, it is undeniable that HEIs within the UK have become primary “commercial institutions serving almost entirely private interests”. This is particularly apparent in the Conservative-Liberal Democrat coalition government’s (2010-2015) decision to decrease public funding for HEIs by £3billion a year and increase student fees to £9,000 per year, a three-fold increase (Hillman, 2016). In addition to this, the coalition government also capped student loans for part-time study at £6,750, resulting in a significant decline in part-time students and, consequentially, a drive from HEIs to attract and retain full-time home and international students in order for them to remain financially viable (Hillman 2016). Thus, the situation now exists in which HEIs must both *attract* and *retain* increasing numbers of fee-paying students in order to remain operational.

Governing bodies, therefore, consider the need for universities to be managed and marketed, and implement policies that seem beneficial for the commodification of the institutions, but detrimental for the pedagogical nature of universities. As part of the strategy to attract students and increase visibility in the HE market, universities have orientated knowledge towards the demands of capitalist tendencies, such as adopting a market orientation (see Asaad & Melewar, 2013) in order to maintain functionality. This results in universities having to consider how to ‘sell’ and ‘export’ their services, despite education being primarily an intangible ‘commodity’—thus a situation occurs in which HEIs are forced to market their ‘product’ (access to knowledge) alongside more tangible benefits: employability, reputation, student support; even the town, city, or country in which the university is located.

At Middlesex University, the Student Engagement and Advocacy team helps boost the university's visibility and directs students towards career choices that are responsive to the needs of the market. This team, although related to student engagement and progression, is located within the marketing department, which is being primarily driven by market-related demands. It focuses its actions on generating profit, usually by supplementing the appeal of the degrees offered with Middlesex University's London campus, its multicultural student body, its support services, its library, and free printing and e-textbooks for all students. However, this clashes with the pedagogical nature of the institution and draws educational activities towards market-related trends. One such activity that has been affected by the actions of the marketing department is the Student Success Festival (SSF). The SSF's primary aim is to highlight the range of available support services for students and improve engagement and attainment. However, as a result of differing aims and objectives between the pedagogical remit of the festival and the marketizing of the same, a number of ideological and institutional challenges arose which affected the planning, coordination and ethos of the festival.

While the SSF may appear to be a largely uncontroversial project, we encountered numerous challenges regarding not only our approach (which was based on pedagogies of Task-Based Learning and Gamification) but also on how we communicate with the student body. This paper, therefore, aims to explore these challenges and analyse our responses to them, as well as offering a discussion on ways in which these two competing factions (pedagogy vs marketisation) interact with each other.

## 2. Institutional context

Middlesex University (henceforth MU) is a post-92 university, meaning that, along with other former polytechnic colleges, it was awarded university status as a result of the Further and Higher Education Act (1992). These new universities had the opportunity to attract students from previously untapped markets; specifically, for this paper, lower tariff home and international students. However, the introduction of new HEIs in the early to mid-1990s, along with the introduction of universities fees towards the end of the same decade, has resulted in a competitive field. For post-92 universities, strategic marketing, both nationally and internationally, has become paramount in the continued drive to attract students and maintain financial stability (Assad & Melewar, 2013), and, as Bates and Kaye (2014) have underlined, fee-paying students report an increased focus on employment potential. There are a number of avenues to employability: communication skills, problem-solving skills, team-working abilities, critical and creative thinking are all important for students to demonstrate *in addition* to their final degree qualification. Unsurprisingly, MU focuses on these areas when marketing itself to future students. The current (2020) online prospectus begins with the following, written in bold on a bright red background: "Real World Learning [line] Our undergraduate courses give you hands-on experience to get you ready for the future". Further down the same splash page, the next prominent piece of text states:

### 2.1. Personal study support

Get support to succeed, wherever you're coming from. You'll have a Personal Tutor, support from graduates and students in years above plus academic writing and numeracy support.

As this shows, MU is keen to not only promote itself as an HEI which provides its students with good career opportunities but will also offer them 'personal study support' in the form of academic writing and numeracy support, personal tutors, and peer support. Nevertheless, despite the variety of services offered, we have found that many students often do not take advantage of them. Student engagement is vital to retention and success, and yet students are often unaware of the range of support available to them (Karp, 2011; Trowler, 2010; Kuh, 2009). Moreover, it has been reported that students find the variety of services confusing (see, for example, the 2018 HEA report). As a result of this, the SSF was created to help students access the support that they are not only entitled to but which has been (and continues to be) marketed to them as a direct benefit of choosing MU. However, as will be detailed in the next sections, we encountered frequent conceptual and ideological clashes when trying to balance the pedagogic aims of the festival with the University's marketing arm, despite our goals being so similarly tied together: to better support our students, increase their skills base, promote engagement and retention, and ultimately provide students with better employability prospects.

## 3. Case study: The student success festival

The SSF was created to highlight the range of Middlesex support services available for students. The event was co-created by the authors, lecturers working in the Learning Enhancement Team, one of such support services. Our aim was to develop a series of engaging events which foreground how student engagement and attainment can be increased through a better awareness of support services and, crucially, the people who run them. The initial concept of the event was to incorporate the principles of gamification, independent learning, task-based learning, and cognitive criticality to engage students in 'putting a face' to the service, thus hopefully overcoming any reticence in contacting them or confusion as to their purpose.

This approach is clearly linked to grounded pedagogy theories, as this is our background in educational training. The SSF focuses on holistic success, incorporating academic success, career success and mental health and wellbeing, and facilitates over 20 support teams to promote their help and accessibility to students. In 2016/17, a decision was made to thematise the event, as it has been evidenced that theme-based learning boosts creativity and facilitates the acquisition of new material (Tessier and Tessier, 2015). Thus, the inaugural SSF was designed within the overall theme of an Adventure Island, which allowed us to work with a theme of ‘exploration’ and ‘adventure’, and align our games and tasks to this visual metaphor (see Peksa, Lawson and Dillon-Lee, 2017).

In the planning phase of the next (2017/18) festival, we were advised by the Deputy Head of our service, who had initially granted us the budget to run the 2016/2017 festival, to discuss the thematisation of future events with the marketing team, based on the feedback from Executive regarding Adventure Island. We discovered that the Marketing Manager and the Chief Commercial Officer had not understood why the SSF had utilised the Adventure Island theme and had been confused by the gamified and task-based learning elements. In an email dated October 2017, we were informed that “[Marketing Manager] and [Chief Commercial Officer] were concerned about the lagoon and the volcano in terms of looking ‘professional’ and representing the university. They also thought that “it was not immediately clear how the theme linked to student success”. The email concluded by saying, “we need the Exec to be totally supportive, so working with Student Engagement Marketing will ensure we are on message”.

What followed was a series of meetings with the Student Engagement and Advocacy team (we could not meet with the Executives who had voiced their concerns) in which we sought to justify the approach of the SSF. Initially, we had planned to redesign the event under the theme of ‘outer space’ as, based on the interviews with the Student Learning Assistants (SLAs) and the Student Union, it conveyed the motivational message of ‘reaching for the stars’ and extending boundaries, which we believed aligned with the university strategy and the festival’s ethos, as well as addressing the principles of theme-based and gamified learning in HE (Reardon, 2000). However, when we prosed this idea to our marketing liaison, we were informed that the Executive members still did not fully understand the link between gamification, task-based learning and information transfer, something which, we suggest, was encapsulated in their negative response to the outer space theme. Finally, the Executive decided that the Student Engagement and Advocacy team (henceforth the marketing department) should assume more conceptual control over the event.

This new coalition created a number of challenges. It transpired that in many ways, the SSF had become a victim of its own success: more students and support services were interested in the event, which meant it became the focus of the non-pedagogical marketing arm of the University. This resulted in a series of fraught meetings with our new stakeholders. We argued for and were able to retain the principles of gamification, task-based learnings and independent learning, but we conceded the Space theme, instead accepting the marketing department’s suggestion of a Music Festival theme. We quickly encountered issues from an organisational stand-point. While a Music Festival theme was certainly less conceptually difficult to grasp, it allowed very little room within which to insert our pedagogic metaphors (reach for the stars/travel to new places/explore the universe, etc.). We were also hindered by the limitations of our campus—the SSF takes place in the Quad, a covered space in the centre of one of the University’s main buildings, around which class are held. Due to the SSF occurring during term time, there are strict limitations regarding any possible disturbances to teaching. This meant that we could not include any music-related activities at the SSF. This new theme also presented issues for our participating stakeholders, who were unsure what exactly was meant by a Music Festival, many of whom made the connection with dancing, casual sex and recreational drug and alcohol use.

While some of these issues were easily resolved (for example, by stating that we were aiming for a calming, ‘in-touch-with-nature’ approach to the theme, rather than a large-scale Music Festival, such as Glastonbury or Coachella), others were trickier. One such example was the design of our promotional materials. MU follows a red, black and white colour scheme and all internal and external marketing materials are required to adopt this for branding purposes. Thus, we found ourselves bound by a colour scheme that, rather than promoting the ethos of the SSF as a fun and rewarding event to participate in, where dark and foreboding. After three rejected attempts, we were left with a final design which ourselves and our stakeholders felt was reminiscent of a battlefield—the torn flags combined with the wildflowers invoking the image of a poppy, the flower associated with both World Wars and the Armistice Charity (The Poppy Appeal) [see Figure 1].

Figure 1. 2017/18 'Music Festival' SSF marketing design journey.



We also encountered difficulties regarding how to ‘decorate’ the event. For Adventure Island, each area had been clearly delineated, allowing us to go to the Theatre and Arts Departments and commission students to design and create props for our event. However, the Quad is too small to host a ‘festival-style’ tent, and a stage seemed unnecessary given the fact we would have no performances. The marketing team suggested booking external sellers to run a vintage stall in order to ‘liven’ the space up, which we felt negated the purpose of the festival to promote student services and encourage student ownership of the event. Unfortunately, we were ultimately unable to utilise student products and instead hired decorations.

Following this, we again made a case to work creatively within a theme, explaining how the theme allowed us to ‘market’ the festival in such a way that we could include student productions (settings, technology, costumes etc.) and also place our services within a fun and memorable context, thus setting the event aside from the more traditional University offerings. Happily, we now have garnered some understanding between ourselves and the marketing department, and in 2019 we settled on the permanent theme of Carnival/Circus. Within this theme, we have been able to again use student made products. The theme also helped our stakeholders by giving them clear boundaries within which to create and present that games and tasks to students—guidance which also helped the creative team within the marketing department to design digital posters, web banners and social media shots for the SSF, all of which incorporated a circus tent and bunting in Middlesex colours. We were also successful in arguing for a slight adjustment to Middlesex’s red, black and white branding, with the inclusion of a salmon pink shade.

In the next section, we will present and discuss some of our suggestions for why these conceptual and theoretical clashes occurred, and offer possible ways to avoid them.

#### 4. Discussion

The organisation of the festival was impacted by the factors that are closely related to ‘education wars’, a concept coined by Olssen and Peters (2005). We were brought into conflict with proponents of marketisation over the value of pedagogy and production of knowledge. As Michel Foucault (1991b, p. 165) argues:

We live in a social universe in which the formation, circulation and utilization of knowledge presents a fundamental problem. If the accumulation of capital has been an essential feature of our society, the accumulation of knowledge has not been any less so. Now, the exercise, production and accumulation of this knowledge cannot be dissociated from the mechanisms of power; complex relations exist which must be analyzed.

Although key players in the commodification of HE have developed strategies to govern core pedagogical activities, a conflict exists between the factions that are guided by principles of pedagogy and marketisation (Taylor et al., 2007). In the current climate, the factions representing the power (in our case, Executive and the Student Engagement and Advocacy team) have dominance over other stakeholders. Should educators act outside their remit to help engage students, as we did with the SSF, their authority is curbed and thus their expertise and understanding is significantly reduced. In this project, the strained relationship between the knowledge market and the financial market was evidenced through the response from the university’s Executive and non-academic players, who, as it transpired, became a decisive factor in pedagogical initiatives and staff-student communication. This was first seen in the feedback from the Executive, where the pedagogic foundations of the festival were not understood and were instead seen to be deviating from the University’s branding and image strategies. This resulted in both the above practical issues, but also, most fundamentally, in a lack of trust between us and the Executive and marketing teams, a result that has been seen in the response to commodification by other academic staff across the UK HE sector (see Molesworth et al., 2011; Brien and Guiney, 2018).

We have come to believe that our freedom of academic thought was curbed, which did not allow us to embed pedagogical values into an event designed to promote student development. According to the Education Reform Act 1988, Section 202 (2), academics should be able to “test received wisdom and put

forward new ideas”. In the case of the SSF, this guarantee was denied as a result of our pedagogic foundation not being understood and instead replaced by generic publicity that did not clearly communicate the nature of the festival and its uniqueness, the suggestion of inviting unrelated outside business to the event, and the misunderstanding of the principle of theme, gamification and task-based learning. Nevertheless, the marketing team did give us more room for the creativity and agreed to support the festival with their budget. In some sense, then, it could be argued that the differences in understanding between the marketing department and ourselves have not been, overall, negative. However, we are still feeling the effects of the mismanaged Music Festival in 2020, most notably in the memory of the conflicts we faced, which have the potential to fester and create further difficulties down the line. Ultimately, it is neither healthy nor productive to have two such essential factions—pedagogy and marketing—working against each other.

## 5. Conclusion

Although advocates of marketisation believe that this has enabled HEIs to respond to new financial challenges, the impact of this shift towards commodification has been far reaching. Not only has the affected how HEIs view themselves, but also the approach taken to extra-curricular support, such as our experiences with the SSF. We believe that the marketing department attempted to dictate a range of solutions that were directed by policies that aim to align with branding and market goals, rather than educational ones. While it is impossible to ignore HE’s need to survive within a marketised economy, it is also deeply problematic to prioritise this over the educational and pastoral needs of the student body; more so when such a focus on support is a significant marketing strategy. To that end, we believe that in order for pedagogy to play a valuable part in student achievement, academics and non-academic departments should reach a consensus that aims to preserve the value of education. While we believe in the power of pedagogy, we also think that a pact of concord is necessary between different stakeholders in order for students to benefit fully from their learning experience. Nevertheless, while issues of power prevail and whenever power is unevenly distributed, reaching a consensus becomes increasingly challenging.

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## CATCHING TWO BIRDS WITH ONE STONE - THE CASE OF MUSIC AND PROGRAMMING FUNDAMENTALS

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### Abstract

This study describes a unique learning experience of elementary school students that learn programming fundamentals via engagement in music programming of known melodies using the Scratch 3.0 environment. Eleven six-grade students participated in weekly activities each lasting 90 minutes along one semester. The learning units were planned in a way that the engagement with the programming of well-known melodies stimulates the curiosity to get mastery over the above programming concepts and structures. The research aim is to explore the effects of teaching fundamental programming structures and concepts via music. Since it is a pilot study, the research method used is of action research in which each lesson is redesigned according to conclusions and insights gained from previous lessons. The research data include transcripts of the class discussions, the students' feedback after each lesson and the researcher's reflective journal. From the data analyzed so far, four categories emerged: enjoyment, interest, gaining of programming knowledge and experiencing feelings of success. Instead of the teacher's initiation of teaching new programming concepts, the need for these concepts emerged from the students during their engagement in music programming. The students were enthusiastic during the learning lessons, and they were curious to learn and were eager to get mastery over advanced concepts right from the first lesson. The music programming provided them with practical meaning for the learned programming structures and concepts.

**Keywords:** *Music, programming fundamentals, Scratch 3.0, spiral learning, constructivism.*

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### 1. Introduction

Accelerated technological development creates opportunities to revolutionize the pedagogy world. Incorporating technology into education is a complex and costly challenge. Technological trends identified are available and inexpensive computing infrastructures, cloud computing, the Internet of Things, and so forth (OECD, 2019). In "Mindstorms: Children, Computers, and Powerful Ideas", Seymour Papert (1980) paved the way to the idea to teach programming to young students. Papert believed that the learning of programming should be done through playful exploration in which young students take control of their own learning.

In the field of education, various teaching methods have evolved over the years. Among the effective ways to learn the spiral method. Bruner (1960) proposed the spiral curriculum, a teaching approach in which each topic or skill area is revisited at intervals, at a more complex level each time. This teaching method enables the establishment and solidification of the learning topic in a profound manner. Spiral learning provides a gradual learning process from simplistic ideas to complicated ones (Johnston, 2012). Considering what is written above, I found the spiral learning method suitable for teaching programming principles to young students. To enable the students to find the practical meaning of programming principles I chose to teach programming via music using a simple programming language (Scratch). To avoid unnecessary syntax mistakes, Scratch commands are designed as blocks that can be dragged and executed. The Scratch environment is taught in some elementary schools in Israel using the Hebrew language. Despite the difficulty of programming in a language that is not one's native language, I believe it is important to teach programming in English because it is the language of all the programming languages and students have to get used to it right from the beginning. To overcome the language barrier, I added the translation of the new English words in each of the learning units.

Via the composing of familiar melodies, the learner will be acquainted with programming concepts such as variables, repetitive structures, conditional commands, functions and more. Moreover, the teaching/learning process will follow the constructivist theory in a way that the students will be engaged in personal exploration tasks. In the last fifteen minutes of each session, a class discussion will take place in which the new concepts will be discussed, and the students will share the insights they gained during their individual explorations.

## **2. Brief theoretical background**

### **2.1. Music and programming**

Music adds joy, color and pleasure to our lives, and those who are blessed with musical talent even create it for us. Due to the significant role of music in our lives, there are those who even attribute therapeutic capabilities to it (Clair & Bernstein, 1990). Recognizing its merits, music has become an integral part of many multimedia environments developed over the years such as MicroWorlds Project Builder, Scratch, ScratchJr, Alice, etc. These multimedia environments were developed to make programming learning accessible while also developing reading, writing, and analytical skills for young learners. The ScratchJr environment provides a platform for developing problem-solving skills in a playful and tailored manner to the development of the skills mentioned above in early childhood education (Papadakis et al., 2016). The Scratch software, used in this study, is a blockchain visual programming language that is most suitable for young learners. One of the common attributes the above-mentioned environments share is music which provides an added value to the projects students can develop.

In the present study, music is used as a tool for learning. That is, through the programming of simple and familiar melodies, students become familiar with basic programming concepts and principles such as variables, parameters, functions, repetitive and control commands, parallel programming and more.

### **2.2. The spiral learning method**

The term 'spiral curriculum' was coined by Bruner (1960). This term encompasses the following ideas: (a) complex topics, concepts/ideas are revisited several times during school studies; (b) The level of complexity of these topics concepts/ideas increases with each repetition; and (c) Repetition of these topics, concepts/ideas is always associated with their prior learning. Spiral learning enables, among other things, to assimilate the new concepts/ideas and their understanding in each revisit. Spiral learning also provides a process of gradual learning from simple ideas to complex (Harden, 1999; Johnston, 2012).

Schneiderman (1977) used the spiral learning approach to teach beginner programmers, arguing that this approach makes programming education more natural for students, reduces the anxiety associated with learning of a new language and promotes the development of computer literacy. He also argued that the spiral approach enables the parallel acquisition of syntactic and semantic knowledge continuously, which increases student motivation by using meaningful examples, building on prior knowledge, and all in tune with the student's cognitive skills. Also, learning in this approach enables the assimilation of new material, and develops confidence in performing increasingly difficult tasks.

## **3. The study**

### **3.1. Population**

This study is a preliminary study conducted in an action research format (Stringer, 2013). Eleven (eight male and three female) students in grade six (one from grade five) from an elementary regional school in the north of the country participated in the study. Three students (two males and one female) have basic music knowledge. They attend the one-week meeting of 1.5 hours during school hours.

### **3.2. Research aim and questions**

The aim of the study is to explore the effect of learning programming via music on the students' attitudes and perceptions as regards programming studies. The research questions derived from this aim are:

1. Does learning through music affect: (a) Students' desire to learn to program, (b) their motivation to invest in learning, (c) their understanding and internalization of the concepts learned and in what ways.
2. Is there any added value to learning programming through music and if so, what is that value?

3. Has learning via music influenced students' self-concept regarding their ability to handle programming learning? If so, in what way?

Due to space limitations, in this paper, I will refer only to the first research question.

### 3.3. Research tools

Students were provided with study units developed by the researcher. The idea behind these units is that during the process of music programming, the need for relevant programming structures will emerge. The units were developed in the spirit of the constructivist approach to learning (Cooperstein & Kocevar-Weidinger, 2004). The learning activities were built according to following principles: (a) the learning is in English and not in the students' home language; (b) the learning method is designed to match the spiral learning approach, and (c) to raise the learning effectivity, the learning units were built in the spirit of the constructivism. Although the Scratch environment was translated into many languages, it is important to educate students to program in English right from the beginning since all programming languages are in English. The study units were designed according to the spiral learning method, in which the learning concepts are revisited several times while their level of complexity rises. The learning units are also planned for self-learning and include activities through which the students become acquainted with basic concepts of programming such as methods, variables, repetition and control commands, parallel processes and so forth. By the end of each session, a class discussion is initiated in which emerging ideas and insights are discussed and summarized.

The present research is action research (Stringer, 2013), which in this case its purpose is to learn from the feedback given by the students and from the researcher's insights in order to improve successive learning units (Denscombe, 2014). Action research includes the following stages: (1) identify a change; (2) observe the present situation; (3) plan different possible interventions; (4) carry out the intervention; (5) observe the effects of the intervention; (6) evaluate against original goals; and (7) share findings.

In the current study, the understanding that traditional methods used to teach programming deter students from choosing programming studies has led to the development of a learning method that integrates enjoyable activity (music) with programming (addressing stages 1–3). Within the weekly lessons, the developed units were taught to the study participants (stage 4). During the lessons, the researcher wrote a reflective journal in which she documented her insights as regards the students' expressions, their behavior and the kind of questions asked. The writing in the reflective journal was also influenced by the students' feedback given at the end of each lesson (stages 5 and 6). The insights gained from the evaluation process were implemented in the successive learning unit (stage 7).

After each meeting, the data that include the students' outcomes of the inquiry tasks, the reflective notes taken by the researcher and the feedback given by the students at the end of each lesson were analyzed using content analysis method (Neuendorf, 2002), which revealed four main categories: experiencing pleasure during learning, interest stemming from needs, acquisition of programming knowledge, and Acquire experiences of success.

## 4. Results and discussion

In what follows, the first research question is addressed.

### 4.1. Experiencing pleasure during learning

Jenkins (2002) argued that learning programming can be very boring. Lectures focusing on syntax details will never be inspiring. Exercises that include simple mathematical manipulations on data such as student scores, different business inventory management, or bank account information will never increase learners' interest. However, looking at many programming lessons shows examples of the above. In referring to the enjoyment and interest in learning, he emphasized that programming at its best can be a fun and creative activity, and many students can take great pleasure in being exposed to inspiring tasks and regret learning. This is still rare, learning music programming is an example of fun and creative learning.

During the lessons, the students were very curious and enthusiastic and expressed a feeling of joy. These feelings were highlighted in verbal phrases like: "Wow! [Proudly] Look what my animation looks like!" Or "I like the combination of music and programming. It revives the 'dry' commands"; "listen to the music I created; I have no mistakes at all! Imagine that [proudly] I have just learned how to read music notes". These phrases and more were repeated in every lesson. Students' enjoyment was noticeable also by their body language. Happy voices were heard during lessons and there was a relaxed atmosphere in class. They arrived at the lessons before the start time and stayed even after the lessons ended.

In the second lesson, I decided to teach them basic music knowledge, so that they will be able to read music notes. At the end of the lesson, all of them could write notes of a song independently. Later, when I offered them readily done notes of a song, they refused to utter they wanted to write the notes by

themselves. During class discussions, most of them said in similar words that the music made a difference. They also mentioned that if they had to study the programming commands in the traditional way, they probably would have stopped attending these classes.

#### **4.2. Interest stemming from needs**

From the first class, the students showed great interest. Their interest was reflected in asking questions that had to be addressed in successive lessons. Questions regarding the use of advanced programming commands that have not been learned, how to play the music in higher/lower octaves, how to play the music with two hands in concert and more.

Although each student worked independently on the inquiry tasks, there was a lot of activity in the classroom. During the lessons, many questions were asked by the students, some of whom were referred to the researcher and some to other classmates. Students made sure to check on the progress and achievements of their classmates, and once they encountered unknown feature or programming structure that their peers used, they were eager to gain control of them as well. They were constantly asked questions about advanced functionalities that were not included in the current learning unit. As a result, an atmosphere of the positive competition was induced which resulted in a creative and amazing project. The fact that there was an immediate result of the programming commands they used (they could hear the melody written up to that point) motivated them to continue and finish successfully the music they programmed. Moreover, when one of the students discovered a feature or capability in the software, she/she shared it with other classmates at once.

The significant insight from lessons was that the need to learn a certain functionality stemmed from the students rather than the teacher's decision to teach it. For example, after encoding notes of a well-known tune ('Little Jonathan'), the students noticed that the octave in which the music was playing was quite low. The researcher asked them what could be done to play it at a higher octave. They said it didn't make sense to rewrite all notes by changing the characters' values and there must exist a programming functionality that will provide a more elegant solution. They said that this functionality will enable us to change the values in a way that the same melody could be played in different octaves without making too many changes. At that point, they were ready to learn the concept of a variable, which in fact the need for it came from their behalf. After demonstrating how to define a variable and its associated commands (initializing a variable, changing its value), they developed their idea by saying that we should use two variables, one for the value of the played character and one for the time the character should be played. Then they went over all the tunes previously programmed and changed the commands to include variables without being asked to do so.

In another case, they observed that for some melodies, there are two lines of notes, one for the melody (the right hand) and one for the accompaniment (left hand). They asked how we could translate this situation into programming. One of them replied that we had to write two different programs, one for right-hand characters and one for left-hand characters, and both programs had to be played simultaneously. Then another question was raised: How to play two programs at the same time. Although this was an initial phase of the course, they were given a basic explanation of parallel processes, stating that we will return to discuss this topic in more detail later.

To get students to internalize the meaning of nesting loops, students were asked to compose accompaniment of various types of drums for their programmed melodies. After a simple demonstration, the students were so enthusiastic and offered to build a drum accompaniment for each of the melodies they had programmed so far and competed as regards the level of accompaniment complexity.

#### **4.3. Acquisition of programming knowledge**

During the students' engagement in the inquiry tasks, they became acquainted with basic programming structures and concepts. To facilitate the understanding of some of the concepts, the learning units have been designed according to the spiral learning method (Bruner,1960). That is, complex programming structures and concepts, were revisited several times in a raised level of complexity. For example, dealing with repetition structures first referred to definite loops, then presented with indefinite loops and finally with nested loops. The need to use loops, as well as other learned concepts, stemmed during music programming. That is, when a group of notes had to be repeated, they used a definite loop and when they had to write an accompaniment of drums to music, they used nesting of loops. Variables have been associated with playing melodies at various octaves. These associations have a dual role. First, they enabled the connection of programming concepts to concrete needs, and second, they may develop students' understanding and appreciation of these programming structures, hoping that when they meet these structures and concepts in the future, they can easily assimilate them.

When the students were asked to animate their melodies, a competition atmosphere was created in relation to the sophistication of the animations they provided. Some of the students created

sophisticated games, using advanced features of the Scratch environment which resulted in expanding their programming knowledge. the acquisition of programming knowledge was done in an enjoyable manner. The engagement in music and the aim to reach correct and rich music motivated them to get mastery over the programming structures and concepts that will help them reach their goal.

#### 4.4. Acquire experiences of success

The students' behavior during lessons reflected on their self-perception as regards to their ability to cope with the inquiry tasks. Practicing programming using music brought humor and color to the lessons. Curiosity and eagerness to learn advanced functions to improve the students' products were observed. The review of student products revealed that a great deal of thought was invested in them. The students were motivated to create relevant animation to the melody they programmed, to accompany drum accompaniment to fit the correct rhythm of the melody using advanced programming commands that included control structures. During the time between two successive lessons, they sent via email to the researcher improved versions of their programmed animations, which can imply on their level of satisfaction from their achievements. These results are consistent with Bandura (1986), who stated that a person with a high sense of self-aptitude tends to respond to challenges and persist in efforts to achieve his/her goals.

After the sixth meeting, one of the students said: "I have to say I had doubts at the beginning of the course if I could learn to program. What broke the ice was the music practice; it raised my motivation to create a sophisticated animation program that would fit into the melody." Another student said: "Music has made programming something concrete and efficient, which increased my desire to learn it. Not just a theoretical study of commands, but learning for concrete purposes, such as creating drums accompaniment or playing in various octaves." The student said: "I don't believe I am saying it, but despite all my fears at first, I understand the programming commands thanks to music. I learn because I wanted to and not because I had to."

From the above, it can be concluded that music played an important role in influencing their self-perception in relation to their ability to handle programming tasks. This way of learning increased their motivation to succeed in providing solutions to concrete problems. During the activities, students experienced feelings of success both instantaneously (accurately of music) and over time (projects that were appreciated by peers and the researcher). These feelings helped the improvement of their self-perception in their ability to cope with programming learning. Furthermore, during the learning of programming structures and concepts, they also enriched their musical knowledge.

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# TEACHING DISCOURSE ANALYSIS OF THE CATEGORY OF SUBJECT

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## Abstract

The paper focuses on the DA of the category of semantic subject and aims to introduce a step-by-step algorithm that can be applied for the analysis of Russian and English academic texts. Despite its status of being a well-established and viable research method, DA's framework to be introduced in the classroom and its teaching effect are still relatively under-researched.

**Keywords:** *Discourse analysis, semantic subject, academic discourse, dialogue with the reader, academic writing skills.*

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## 1. Introduction

Recent years have witnessed a vivid interest in various applications of discourse analysis (DA) in the classroom environment (e.g. see (Cots, 1996), (Martínez, 2011), (Alsoraihi, 2019)). DA as a research method for studying language use in context is viewed as “a broad and fast-developing interdisciplinary field”, an approach to “promote the application of critical thought to social situations” and to unveil the strategies employed within socially dominant discourses (Martínez, 2011). Researchers claim that DA can enhance the quality of teaching / learning techniques, serve as a powerful tool to develop professional and linguistic competencies. Despite its status of being a well-established and viable research method, DA's framework to be introduced in the classroom and its teaching effect are still relatively under-researched.

## 2. Methodology

Students are taught DA in their theoretical disciplines such as theory of grammar, lexicology, introduction to linguistics, general linguistics. At the beginning of the term students are offered research projects for teams of 3-5 students (see (Suleimanova, Yaremenko, & Vodyanitskaya, 2018) for examples of actual research projects completed within PBL (project-based learning) format combined with role play in synergetic teaching). The projects help students develop relevant research skills and master a variety of research methods and techniques. Some of the projects rely on such a research tool as DA.

The paper focuses on the DA of the category of semantic subject and aims to introduce a step-by-step algorithm that can be applied for the analysis of Russian and English academic texts.

The analysis starts with collecting the empirical data for the research. The common strategies employed in academic discourse reveal themselves through textbooks, dissertations, lectures, monographs, etc. The research article (RA) “remains the pre-eminent genre of the academy” (Hyland, 2009) and is regarded as a most significant and common research tool to present the author's research and findings in the academic circle. RA abides by – as any other academic or literary genre – a set of rules and requirements, and has its own peculiarities. When submitting a paper, authors are to follow certain standards and guidelines, in terms of both the content and layout. Thus, the empirical base of the study can rest on a number of recent scientific articles on linguistics published in academic journals. Another genre students may set their sight on for the analysis is dissertation. Being significant and common research tools to present the author's research and findings in the academic circle, dissertations and research papers reproduce the academic's multistep cognitive activity: Purpose of Study / Problem Statement → Research Hypothesis → Proving the Hypothesis → Summary of Findings.

Then students turn to semantic and structural analyses accompanied by content analysis and an interpretation of their results. They focus on the linguistic means the speaker opts for to establish a dialogue with the reader and adopt an appropriate identity in academic texts – “stance and engagement” expressions (Hyland, 2005), with the focus on hedging and boosting devices as linguistic representations of the category of subject. While “stance” includes features which “refer to the ways writers present

themselves and convey their judgments, opinions, and commitments”, “engagement” is managed by writers in the ways they “relate to their readers with respect to the positions advanced in the text” (Hyland, 2005). These two functions are realized by the following “key resources of academic interaction”: “stance” expressions – *hedges, boosters, attitude markers, self-mentions*; “engagement” expressions – *reader pronouns (you, your and inclusive we); directives* (that “instruct the reader to perform an action or to see things in a way determined by the writer”); *appeals to shared knowledge* (“the presence of explicit markers where readers are asked to recognize something as familiar or accepted”); *personal asides* (that “allow writers to address readers directly by briefly interrupting the argument to offer a comment on what has been said”); *questions* (the strategy to involve the reader by “inviting engagement and bringing the interlocutor into an arena where they can be led to the writer’s viewpoint” (Hyland, 2005).

To collect the data (stance and engagement expressions in our case) within content analysis “manually” (search options in Microsoft Word for .rtf or .doc(x) formats or Adobe Reader / PDF-Xchange Viewer for pdf files might be of some help still do not provide for the scenario – a frame of the text analysis) turns out to be a multi-hour monotonous and tedious task. What can significantly facilitate the research procedure and reshape research methodology is digital tools. Consider a free desktop search engine and semantic analysis software from Acetic / Semantic-Knowledge – Tropes Zoom. Uses of Tropes software (now available in English, French, Spanish, Portuguese, Romanian) cover a wide spectrum ranging from content-analysis and defining stylistic register, chronology, communicators, parts of speech (frequency), key episodes, logical steps, modality, etc. to analysis of free-response questionnaires, studies of the effectiveness of advertising, monitoring changes to brand image, analysis of clinical interviews, behavioral studies, or analysis of literary works (<http://www.semantic-knowledge.com/>). After being introduced to the basic features of the system, students are encouraged to support the research procedure with the software – e.g. all the statements with reader pronouns (*you, your* and inclusive *we*) as well as absolute and relative frequency of these “engagement” expressions can be easily extracted from the analysed text in no time.

### 3. Results

Now consider the DA’s framework, the empirical data collected as well as the results of content, semantic and structural analyses of the data.

#### 3.1. Empirical data

The empirical data for the research can be collected from Russian and English academic texts. Some of the research projects initiated by the Chair of Linguistics and Translation Studies (Moscow City University) and completed in 2018-2019 academic year relied on recent PhD dissertations in linguistics, while other teams analysed dissertation summaries, or scientific articles on linguistics published in Russian- and English-language academic journals.

In the paper, let us consider some of the results obtained within a research project on Russian parenthetical words / clauses (e.g. *Думается, ... – lit. Think-refl.; Как можно заключить, ... – lit. As may conclude-inf.; Как представляется, ... – lit. As appear-refl.*) to illustrate professional competencies and skills mastered by students through working on the project. The data of the study have been collected from ten PhD dissertations in linguistics defended for the period 2014-2018. To illustrate the methods and techniques employed as well as some of the research results, consider two PhD dissertations (Evtseva, 2014; Tivyaeva, 2018).

#### 3.2. Semantic and structural analysis of Russian boosters and hedges

Research findings show that the extent to which authors can reveal their identity and make their voices pronounced varies and appears to be culture- and language-specific. Whereas authors of English academic texts opt for stronger identity (e.g. by means of author pronouns *I, me, my*), Russian academic texts demonstrate the avoidance of specific reference to the author by eliminating the use of first person pronouns. Instead, they use impersonal structures allegedly designed to disguise the author and to focus on factual information; first person plural pronoun *мы* (*‘we’*) to indicate solidarity with the academic world; parenthetical words and clauses (that feature definite-personal or impersonal structures) and some other linguistic means.

In the paper, let us consider some of the results obtained within a research project on Russian parenthetical words / clauses (e.g. *Думается, ... – lit. Think-refl.; Как можно заключить, ... – lit. As may conclude-inf.; Как представляется, ... – lit. As appear-refl.*) to illustrate professional competencies and skills mastered by students through working on the project.

Russian parenthetical words / clauses such as *по-видимому* ('apparently'), *по всей видимости* ('apparently / to all appearance'), *Как представляется, ...* (lit. *As appear-refl.* – 'It appears (that) / It seems (that) ...'), *кажется* (lit. *seem-refl.* – 'it seems (that)'), *по некоторым признакам* ('from certain indications / characteristics / by certain signs / symptoms'), *Как можно заключить, ...* (lit. *As may conclude-inf.* – 'You might take it that ...'), *Как видно, ...* (lit. *As seen* – 'Apparently / Clearly / Obviously ...'), *судя по всему* (lit. *judging by all* – 'to all appearance'), *Надо полагать, ...* (lit. *Must suppose-inf.* – 'I think / I guess'), *Думается, ...* (lit. *Think-refl.* – 'I think (that) ...'), etc. mark the writer's judgements, feelings, or viewpoint about something. According to the model of interaction in academic discourse offered by K. Hyland, these models relate to hedges as they "indicate the writer's decision to withhold complete commitment to a proposition, allowing information to be presented as an opinion rather than accredited fact" (Hyland, 2005). Hedged propositions allow writers to express their "uncertainty concerning the factuality of their statements or to indicate deference to their readers" (Hyland, 1994) – cf. the following epistemic devices that convey the information about the author's perspective:

*It seems that, at this step, there are interesting collaborations between secondary teachers, which greatly facilitates the integration of several school subjects into interdisciplinary projects* (Carmo, 2018);

*... we may conclude that the nature of foreign language learning in the current era of social networks appears to be to a large extent influenced by referring to some new roles of social media users ...* (Carmo, 2018);

*On the contrary, the low groups of students would not presumably learn the vocabulary from testing themselves with vocabulary worksheet or even creating a storyline with new words* (Carmo, 2018).

Boosters "help writers to present their work with assurance while effecting interpersonal solidarity" (Hyland, 1999). Boosting devices allow authors to "express their certainty in what they say and to mark involvement with the topic and solidarity with their audience", "they function to stress shared information, group membership, and engagement with readers" (Hyland, 1999), cf.:

*The validity of the figures obtained obviously depends on the quality of the databases used and their representativeness* (Carmo, 2018);

*Although some ingredients are surely common, others are specific to one recipe and not the other* (Carmo, 2018).

Cf. the following examples of Russian parenthetical clauses that convey this information: *Надо сказать, ...* (lit. *Must say-inf.* – 'It must be said / Actually ...'), *Следует отметить, ...* ('It should be noted ...'), *Необходимо подчеркнуть, ...* ('It should be emphasized ...'), *Нельзя не сказать о том, что ...* ('It must be said that ...'); *Важно отметить, что ...* ('It was / is significant to note that ...'); *Достаточно сказать, что ...* ('Suffice it to say that ...'); *Как хотелось бы отметить, ...* (lit. *As want-refl. subj. note-inf.* – 'I would like to note that ...'); *Важно отметить, что ... / Следует подчеркнуть, что ...* ('It was / is significant to note that ... / Notably, ...'), etc.

Syntax-wise, the collected data was then split up into the clusters relying on the following typology:

1) parenthetical main clauses (definite-personal clauses – cf. *Полагаю* ('I suppose') / *Считаю* / *Думаю* ('I think / I believe') / *Напомню* ('I would like to remind (the reader)') / *Напомним, ...* ('We would like to remind (the reader) that ...'); impersonal clauses with impersonal reflexive verb – cf. *Представляется* ('It appears (that) / It seems (that)') / *Думается* ('I think (that)') / *Кажется, ...* ('It seems (that)'); impersonal clauses with modal words – cf. *Надо полагать* (lit. *Must suppose-inf.* – 'I think / I guess') / *Надо сказать* (lit. *Must say-inf.* – 'It must be said / actually') / *Следует полагать* ('It should be assumed (that) / Presumably') / *(Причем) следует отметить* ('It should be noted') / *(Причем) следует подчеркнуть* ('It should be stressed / noted / emphasized') / *Необходимо подчеркнуть* ('It should be emphasized') / *Нельзя не сказать о том* ('It must be said that') / *Можно предполагать, ...* ('One can assume'); impersonal clauses that denote measure / degree / evaluation with predicative words ending with -о and with / without infinitive – cf. *Достаточно сказать* ('Suffice it to say (that)') / *Интересно (отметить / то)* ('It is interesting (to note) that') / *Важно (отметить / то), что ...* ('It was / is significant to note that ...') / *Возможно* ('Perhaps') / *Естественно* ('Naturally') / *Очевидно, что ...* ('Apparently / Obviously / Evidently / It is obvious / evident that ...'));

2) parenthetical subordinate clauses (subordinate clauses – cf. *Как я считаю, ...* (lit. *As I think* – 'I believe ...'); subordinate impersonal clauses – *Как (нам) представляется* (lit. *As (us) appear-refl.* – 'It appears (that) / It seems (that)') / *видно* (lit. *As seen* – 'Apparently / Clearly / Obviously') / *можно заключить* (lit. *As may conclude-inf.* – 'You might take it that') / *хотелось бы отметить* (lit. *As want-refl., subj. note-inf.* – 'I would like to note that') / *(нам) кажется, ...* (lit. *As seem-refl.* – 'It seems (that) ...'));

3) parenthetical words / parenthetical phrases – cf. *По всей видимости* ('Apparently / To all appearance') / *Судя по всему* ('To all appearance') / *По некоторым признакам* ('From certain indications / characteristics / By certain signs / symptoms') / *На наш взгляд, ...* ('In our opinion ...') (Fomina, 2017).

Consider some of the research results obtained by the research team. The following table represents the results of content analysis – absolute and relative frequency of Russian parenthetical words / clauses that function as boosters and hedges.

Table 1. Absolute and relative frequency of Russian parenthetical words / clauses.

Parenthetical words / clauses		Text 1 (Evtееva, 2014)	Text 2 (Tivyaeva, 2018)
		Absolute frequency / Relative frequency, %	Absolute frequency / Relative frequency, %
Parenthetical main clauses	Definite-personal clauses	<b>30 / 0.03</b>	<b>15 / 0.01</b>
	Impersonal clauses with impersonal reflexive verb	2 / 0.002	3 / 0.003
	Impersonal clauses with modal words	<b>38 / 0.04</b>	<b>34 / 0.03</b>
	Impersonal clauses with predicative words that denote measure / degree / evaluation	5 / 0.006	2 / 0.002
Parenthetical subordinate clauses	Subordinate clauses	0	0
	Subordinate impersonal clauses	<b>35 / 0.04</b>	<b>2 / 0.002</b>
Parenthetical words / phrases		<b>9 / 0.01</b>	<b>32 / 0.03</b>
<b>Total number of occurrences / Total relative frequency</b>		<b>119 / 0.137</b>	<b>58 / 0.057</b>

The content analysis performed by the team revealed that both texts feature frequent impersonal structures and forms of first person plural pronoun *мы* ('we') employed by the authors to indicate solidarity with the academic world, cf.:

*Необходимо подчеркнуть, что, несмотря на предположительное наличие описанной деривации, ни одно из значений не является главным, то есть отсутствует их иерархия – 'It should be emphasized that although these meanings are presumably semantic derivatives, there is no hierarchy among them'* (Evtееva, 2014);

*Нам же представляется, что именно сохранение и актуализация прототипического значения реализация порции действия позволяет глаголам *tun* и *do* использоваться в подобных конструкциях ... – 'It is the prototypical meaning of the verbs *tun* and *do* that appears to make these models acceptable ...'* (Evtееva, 2014).

Impersonal structures *Кажется / Представляется / Как представляется / Думается, что P ...* ('It seems / It appears / I think that P ...') lack "self-mention" devices (person pronouns and possessive adjectives that convey propositional, affective and interpersonal information (Hyland, 2005)) while the logical subject (the author) is implied.

Consider examples that feature the absence of explicit author reference and the presence of implicit *мы* ('we'):

*Отметим, что приоритетными сферами функционирования рассматриваемых лексических единиц являются мнемический монолог и мнемический нарратив – 'Notably, the words under consideration appear to be the most frequent in mnemonic monologues and mnemonic narratives'* (Tivyaeva, 2018);

*Заметим, что как прототипические значения, так и их инвариант характеризуются как гештальты – 'Notably, both prototypical and invariant meanings appear to be gestalts'* (Evtееva, 2014).

First person plural pronoun *мы* ('we') and its forms ("reader pronouns") – mostly implicit in Russian academic discourse – bind the author and the reader, integrate these two parts of the communicative process via common context, shared concerns, boost the level of the text's interactivity, thus contributing to a more successful and productive dialogue between the participants.

The study revealed that both Russian academic texts demonstrate zero occurrences of personal pronoun *я* ('I') and its forms (the only example found is the use of possessive pronoun *мой* ('my') in the author's notes like (*Перевод мой. – И.Т.*) ('translation by author') (Tivyaeva, 2018), (*Здесь и далее перевод мой – М.Е.*) ('here and hereafter translation by author') (Evtееva, 2014)). The avoidance of specific reference to the author by eliminating the use of first person pronouns – that is so characteristic of Russian academic discourse – is generally a conscious choice by writers to disguise the author and to

focus on factual information downplaying his / her “personal role to highlight the phenomena under study, the replicability of research activities, and the generality of the findings, subordinating their (writers’) own voice to that of unmediated nature” (Hyland, 2005).

The analysis revealed two clusters of the most frequent linguistic representations of the category of subject (see Table 1): 1) parenthetical definite-personal clauses; 2) parenthetical impersonal clauses with modal words; 3) parenthetical subordinate impersonal clauses, and 4) parenthetical words / phrases.

The statements with epistemic devices – cf. *можно, следует* – help authors represent research findings and avoid straightforward communicating their attitude to the research results and expressing the preferred interpretation. Such boosting expressions as *Надо полагать* (lit. *Must suppose-inf.* – ‘I think / I guess’), *Необходимо подчеркнуть* (‘It should be emphasized’), *Нельзя не сказать о том, что* (‘It must be said that’), on the contrary, were not found in Text 2 and are quite rare in Text 2 (0.006%).

Besides, the contrastive analysis of the texts resulted in certain differences between the authors’ academic discourses (consider the total relative frequencies of parenthetical words and clauses employed in Text 1 (0.137%) and Text 2 (0.057%)). The author of Text 1 relies on a much wider variety of boosting and hedging devices (Text 1 features 31 out of 54 structures analysed, while Text 2 employs 17). A most frequent expression *На наш взгляд* (‘In our opinion’) for Text 2 (0.03%) features rare occurrence in Text 1 (0.003%); the model expression *Можно предположить* (‘Presumably’) has an occurrence of 0.01% in Text 1 in comparison to its zero occurrence in Text 2.

#### 4. Conclusions

Through working on the project students learn to work as a team, develop relevant research skills, master the DA’s framework and techniques as well as oral presentation skills. The research findings consist in the revealed frequency of various linguistic representations of the category of subject, the means of its linguistic representation that prevail in the modern academic discourse, semantic and structural analyses of the data. We may conclude that integrating DA in project-based learning stimulates students and boosts their academic writing skills, empowering them with 1) the increased armoury of the resources employed by the authors of academic texts that helps avoid the risk of not establishing an academic dialogue with the reader, 2) understanding that the extent to which authors can reveal their identity varies and appears to be culture-/language-specific. The format proves to be a stimulating and beneficial experience as professional and linguistic competences may be better instilled through such projects than through writing a traditional individual term paper.

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## INTERDISCIPLINARY INNOVATION CAMP FOR NURSING AND ENGINEERING STUDENTS AT WNUAS

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### Abstract

Learning outcome descriptions from the Norwegian qualifications framework for lifelong learning expects students to get acquainted with innovation, entrepreneurship and innovation processes. Western Norway University of Applied Sciences (WNUAS), in cooperation with Junior Achievement Sogn og Fjordane, organizes interdisciplinary innovation camps for nursing and engineering students. This has been an ongoing process since 2014 with one innovation camp every year. The innovation camp is organized by staff from WNUAS, and the student assignments are provided by local businesses and organizations. These businesses and organizations are present and available for student guidance during the innovation camp. In total we have had 20 different assignments from 12 businesses and organizations since 2014. The aim of the study is to find out about the students learning outcome from innovation camp as a strategy for learning, and to evaluate and improve the innovation camp concept. 6 students participated in the study through a focus group interview, and 71 participated through an online survey. Findings in this report shows that the students were satisfied with innovation camp as a method for learning, and they describe their own learning outcome as good. They regard innovation camp as a diverging learning method that varies from the more traditional methods of learning. An evaluation study from the innovation camp shows that students lack a common understanding of innovation and entrepreneurship before participating at the event. The students also found that the assignments were too limited, hence that they were not challenging enough for creative thinking. This report leads to several conclusions in order to improve upcoming innovation camps at WNUAS. The improvements can be separated into two categories: 1. The students needs to be better prepared for the event. 2. The assignments need to be more open.

**Keywords:** *Innovation, entrepreneurship, higher education, pedagogical model, innovation camp.*

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### 1. Introduction

Entrepreneurship in education as a strategy for learning comes with many facets and variations. In order to understand the concept, we need, first of all, to look into what could be a common understanding of the phenomenon on an international basis. The European commission defines entrepreneurship in education as a dynamic and social process where individuals, alone, or in cooperation with others identify opportunities, and does something about them by transforming opportunities into practical and goal orientated activities (KD-KRD-NHD 2004). The context of these activities could either be social, cultural or economic.

This study is based on the Norwegian system for entrepreneurship in education, and one specific program delivered by Junior Achievement Norway: innovation camp. The aim of the study is to find out more about the students learning outcome from participation in our innovation camps, and to improve upcoming innovation camps based on the students experiences and learning outcome. (Ødegård 2014) defines entrepreneurship as a multidisciplinary phenomenon where experiential learning and interaction between subjects are important strategies for learning. Entrepreneurship as a learning strategy will also include interaction with external actors outside the education system, and they could include both local, regional, national and global actors (Ødegård and Ask 2014). Examples of such actors could be businesses, non-profit organizations, governmental organizations and business advisors. The purpose of introducing entrepreneurship to the educational system is to enable the students to master changes and restructuring in a future perspective related to professional practice and the ability to participate in the society. Another important aspect related to entrepreneurship in education is experiential and action based learning. Ødegård (2003) defines entrepreneurship in education as action based learning in a social

context, with the individual itself as an actor in the learning process. In this context the personal characteristics, abilities, knowledges and skills for the individual will create the foundation and direction for the learning process. In general there are four motives for introducing entrepreneurship in education: 1) *the foundation motive* - will stimulate to creation of new enterprises, 2) *the district political motive* – creation of jobs and opportunities in rural areas, 3) *the labor market motive* – creation of new jobs / providing students skills for the future and 4) *the educational motive* – give the students the opportunity to work with innovation, creativity, business startup and entrepreneurship as strategies for learning (Ødegård 2000).

According to Leffler (2006) there is a distinct separation between education *about* entrepreneurship, education *for* entrepreneurship and education *through* entrepreneurship. The first one has exclusively a knowledge accumulating purpose, and the last one emphasizes an entrepreneurial learning process based on experiential and problem based learning. The learning outcome could be reinforced by a network oriented strategy with extended access to information and resources for the students. This way of facilitating education will create an arena for learning that is closer to the real world (Järvi 2012).

Learning outcome descriptions from the Norwegian qualifications framework for lifelong learning expects students to get acquainted with innovation, entrepreneurship and innovation processes (Kunnskapsdepartementet 2014). Based on the learning outcome descriptions, the authors of this article decided to arrange innovation camps for nursing and engineering students at WNUAS. Innovation camps in higher education is not a new phenomenon. The program has been delivered by Junior Achievement Norway throughout the entire Norwegian educational system since early 2000 (UE-Norge 2017). The new perspective in this article is the interdisciplinary context for innovation camps in higher education. This has been rarely done in Norway. Mixing students in interdisciplinary groups, and give them the opportunity to solve given assignments by local businesses and organizations, will create a unique learning situation. The students are challenged to come up with solutions together, and to advise each other's from their own professional perspectives. In second hand, the solutions provided by the students can lead to implemented strategies by the assignment providers in their own businesses and organizations. The basics of an innovation camp is to let students and local businesses, or organizations, work together on given assignments. The assignment itself is given by the local business or organization, and it needs to be an experienced challenge for the provider of the assignment.

Annual interdisciplinary innovation camps have been provided for the nursing and engineering students at WNUAS since 2014. One of the main intentions is to let the students learn from each other by working together in groups. This will lead to a better understanding of each other professions. In a future perspective this can also lead to a better cooperation and understanding between nurses and engineers related to new developments and solutions for e.g. welfare technology and in treatment of patients. In a future perspective we believe that the different professions must depend on mutual competences, and the innovation camps might be a way to create mutual understanding between different professions. In total the students have been exposed to 18 different assignments since the beginning in 2014. There is a huge variety in assignments, from measures that will prevent spreading of infections in kindergartens to a new hospital bed that will prevent nurses to be worn out due to strain from heavy lifts. The assignment from 2018 is especially interesting, where the students were told to build a healing garden for patients with dementia. This assignment was given by a local municipality administration. The second assignment this year was finding out how to prevent obesity among psychiatric patients.

Boge (2012) concludes that interdisciplinary innovation camps will provide a good learning outcome if the process is well organized. At WNUAS we prepare the students for the innovation camps by giving them lectures about creativity, innovation and entrepreneurship prior to the innovation camp. The preparation includes a practical creative activity. We also provide them with knowledge about the actual assignments, and knowledge about the innovation camp structure and how it's organized. To remove the students from what we perceive as an ordinary education situation could be helpful in order to promote creativity and innovation in a teambuilding situation (Bager 2008). Experiences with innovation camps throughout the Norwegian educational systems shows that some students becomes "security seekers" when they are exposed to the entrepreneurial activities (Hasleberg and Hagen 2016). These students will often withdraw from the actual learning situation, and not participate fully to the situation. This is also an experience that we have had with our innovation camps at WNUAS. A solution to this challenge might be to introduce "peer students" (Hasleberg and Hagen 2016). This could be students who have experience with entrepreneurship as a strategy for learning, or students from former innovation camps.

## 2. Method

The collection of data in this study is based on two separate sources. The qualitative part was conducted as a focus group interview with 6 participating students from WNUAS using an explorative approach. We used an open interview guide with 4 questions. A qualitative approach is useful when you want to get an in-depth study of a phenomenon, and to get a better understanding (Kvale, Brinkmann et al. 2009). The method is also useful according to present the variety and details in your material. Participating at the innovation camp 2017 was the inclusion criteria for participating as an informant to the study. The main question that we wanted an answer to is: what do nursing and engineering students experience from participating at interdisciplinary innovation camps, and how do these experiences prepare the students for problem solving in the future?

In addition to the qualitative part we also introduced a simple questionnaire for the participating students at the innovation camp 2019. The questionnaire consisted of 9 questions and 71 of 99 students gave their feedback. The questionnaire contained three focus areas: a) Learning outcome for the students b) How the students experienced the innovation camp c) How the students experienced the assignment, the assignment providers and the academic content. Questions 1. to 8. were graded by the scale 1 to 6, where 6 is the highest score and 1 is the lowest. Question nr. 9 was text based, where the students could write comments about the innovation camp.

Data from the qualitative part is processed interpreted in a phenomenological-hermeneutical tradition (Polit and Beck 2018) inspired by Graneheim og Lundman (Graneheim and Lundman 2004). The analyzing process started during the interview, and was continued through the transcription process. Data was systematized regarding to the research questions, and meaningful units were withdrawn. Based on this we made a concentration of text where we divided the material into 3 categories: a) A common understanding of the term innovation b) The challenge of working interdisciplinary c) The assignments did not challenge the students enough in an interdisciplinary manor.

The questionnaire was analyzed by transferring the students scores into percentage based on the scale 1 - 6 where the upper part of the scale is the score 4-6 and, the lower part is 1-3. We divided the text based answers in the questionnaire into positive and negative feedbacks. The research was completely anonymous and volunteer, and approved by the Norwegian center for research data.

## 3. Results

The lack of a common understanding for the term innovation is obvious among the participants in the study. They have an understanding of innovation based on their own occupational perspective. The nursing students describes innovation as scary, referring to an automated health care that will make them redundant in the labor market. They also describe innovation in health care as difficult due to economy, knowledge and the willingness to make changes. The engineering students has a different perspective on this, since innovation is a part of their job on daily basis.

It is also clear that the interdisciplinary cooperation between the groups are challenged by the lack of knowledge to each other's professions. Both groups can identify the need of more professional cooperation between the two groups, and they clearly see the innovation camp concept as a way to learn how to cooperate with other professions. The cross curricular knowledge is also useful, according to the participants. They will get a deeper understanding of each other's professions, and professional challenges. The participants also describe the learning outcome from innovation camps as an improvement to the cooperative problem solving process for future professional practice.

Most of the participants in the study agreed to the fact that the innovation camp assignments did not encourage enough to creativity and innovation processes. The assignments were to detailed, and there were given to many descriptions and assumptions of a possible outcome. It's clearly expressed by the participants that a learning process focused on creativity and innovation will demand more open assignments and must give the students a better opportunity to create their own ideas and solutions.

The results from the questionnaire shows that 81% of the participants are in the upper part of the scale when it comes to an overall evaluation of the innovation camp. 73% of the students scored in the upper part of the scale on evaluating the innovation camp assignments, and 70% scores in the upper part regarding to their own learning outcome. By summing the negative responses from the text based part questionnaire we found that the assignment providers were to critical, which lead to obstructing the students motivation for being creative. We also found that the assignment providers need to spend more time giving feedback to the students. The positive feedbacks from the participants told us that the students have a need to get more opportunities for creative and innovative working methods. Some of the participants describes their learning outcome as highly valuable, and they regard the innovation camp as a good opportunity to get to know new people and other professions.

#### 4. Discussions and conclusions

Entrepreneurship and innovation camps as a strategy for learning aims to bring students and local businesses / local organizations closer together by creating a learning arena for creativity and innovation (KD-KRD-NHD 2009, Ødegård and Ask 2014, UE-Norge 2017). These intentions can be difficult to achieve when the students are lacking a common understanding for innovation and entrepreneurship. Innovation camps with open assignments will challenge the students to be innovative, even though it could seem difficult for some of the students to participate. In order to cooperate across professional borders, one needs to create a common language and a common understanding despite the fact that the two professions have their own separate languages and terms. It is important for the learning process is to accomplish a common understanding for the given assignments at the innovation camp, and how to move on into the problem solving process. During the innovation camp, and the following evaluation, the students stated that they got a better insight in each other's professions. This shows that interdisciplinary innovation camps can be a good strategy for cross curricular learning, and training for interprofessional cooperation in a future perspective. The students also expressed that the learning outcome could be useful for them in a future professional practice. They realize that in the future the demand of skills related to interdisciplinary collaboration will be important, and the innovation camp concept is a good learning arena to prepared for this.

Hasleberg and Hagen (2016) points out that some students will find it difficult to remove themselves from the comfort zone in order to work with innovation and creativity. Regarding the two professions in this study, one can say that the engineers are used to technical drawings and calculations, and on the other side, the nursing students are used to medical descriptions and plans for health care. If the students are not used to it, these habits of learning can be hard to break. If we take into consideration that the innovation camp assignments not were open enough, it will be even more difficult for the students to enter the arena of creative and innovative work process.

The fact that the assignment providers were present and coached the students through a problem solving process lead to a student active learning process where the students got the opportunity to ask open questions. Harland (2003) states that according to problem-based learning the teacher is not a teacher in a traditional sense, but more like a mentor who levels with the students and give advises in a common process of developing solutions. One could also use "peer students" as advisors for the innovation camp, based on their former experience with entrepreneurship and innovation (Hasleberg and Hagen 2016). This learning process corresponds with the sociocultural view of learning where the learning process is common for all, and the participants are equally valuable with their unique level and form of competence (Dysthe 1999). In this context, knowledge will be produced through interaction, and there are none given answers.

The preparation of students prior to the innovation camp is important in many ways. First of all the students will gain insight about the innovation camp concept, and secondly they will be given examples of innovations, and professional updates related to the innovation camp assignments. It is important to see the preparation of students in conjunction with the upcoming activities and tasks during the innovation camp itself. Tuckman and Humphreys (1965) theory about working in groups with the phases "forming, norming and performing" is relevant in this context. We also have to take into consideration the group dynamics, and be prepared for conflicts, insecurity and other group related challenges. A major objective is to involve all students and all groups to the learning space (Dysthe 1999).

As professional trainers in entrepreneurship and innovation we have learned a lot from our experiences with interdisciplinary innovation camps since the beginning in 2014. The innovation camp assignments need to be more open and we need to do a better quality check of the actual tasks and assignments. We must also give the students more opportunities to get to know each other better. This can be done during the preparation prior to the event. That being said, we also found that the preparations are more important than we thought in the beginning. During the preparations we need to clarify expectations from all sides, both students, lecturers and assignment providers. From the lecturers point of view it is important to clarify for the students their expectations of participation in every part of the innovation camp. It is also important to secure the students common understanding of the terms creativity and innovation. Choosing assignment providers is an important phase in the planning section of the work. We need to take several perspectives into consideration while choosing our partners: Does the partner have the recourses to become an assignment provider? Will their business / organization and possible assignment be motivating in the students work process? Is it possible to make the assignment open enough for the innovation camp concept? Do they have time to give the students proper feedbacks on their work? For further innovation camps we concluded that the creativity lecture as part of the preparation is important in order to put students in a creative mode. Regarding the upcoming innovation

camp in 2020 we are considering to try a new concept with only one assignment provider. This might lead to a more common perception of the assignment, and reduce the competition among assignments. Since the students don't get to choose themselves among the assignments, we have learned that they sometimes are motivated to solve one of the assignments that's not given to their group. By letting all students work with the same assignment, one can eliminate factor of assignment competition, and hopefully achieve more motivated students.

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# GLOCALITY AS INSTRUMENT OF CULTURAL POLICY AND ITS ABILITY TO PRESERVE CULTURAL CAPITAL

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## Abstract

Glocality today is a universal form of reflection of contemporary reality and, as a category of social philosophy, dialectically connects the concepts of "global" and "local." The terms "glocality," "glocalization," and "glocal" have their definitions and are actively used to describe and analyze the corresponding phenomena occurring in the life of society. Some events in the life of modern society can be explained only with the help of the concept of "glocality."

In this work, the authors set the goal of analyzing the nature of the interaction between global and local and identifying the possibilities for their harmonious coexistence. The research methodology determined the purpose and focus of the work. The authors conducted a comprehensive analysis of examples, which are a synergy of global and local characteristics of the existence of human society. In the course of the work, various methods were used, the main of which was inductive empirical, which consists in observing, fixing, generalizing and interpreting facts that serve as the basis for general conclusions. The hypothetical-deductive method was used to present the results of the study when, in some cases, general observations were given before particular examples.

Property rights may collide with other rights. We must understand the complex process of glocalization through direct and critical research simultaneously - detailed research and fine-tuning of everyday cultural practices, symbolic imaginary, and social relationships that reproduce global processes, connecting various distant planetary points. This includes looking at how global markets interact with political rules, social forms, and the production of cultural property through disparate and heterogeneous stories and geographies.

**Keywords:** *Globalization, glocalization, localization, culture, civilization.*

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## 1. Introduction

The modern world is the coexistence of different cultures with their values and pace of life. The term "coexistence" itself implies the close interaction of these cultures and people belonging to one or another culture. Moreover, this interaction is growing stronger over time and the development of science and technology: the infrastructure of cities is developing, the type of technology is changing, and as a result, the pace of people's lives is greatly influenced by the Internet, mass communication, mobile communications. The term "interaction" is gradually beginning to give way to such a term as "interpenetration," or perhaps even "mutual influence," which, of course, cannot but affect people's lives.

The phenomenon of globalization, on the one hand, and localization, on the other, has received the definition of glocality or glocalization. Moreover, the term "glocality" is acquiring a stable position of a scientific term.

"Global" and "local" are fundamental manifestations of reality. Globalization is an immanent "dialectic" process, defined by a series of empirically recorded changes, heterogeneous, but united by the logic of transforming the world into a single place.

Globalization of culture is considered to be the destruction of cultural identities under the influence of consumer culture. The global institutionalization of the world is interpreted as the organization of everyday local interactions and socialization by the direct influence of macrostructures of the world order. The second aspect - the localization of globalism - reflects the tendency to implement global through local. In this case, "global" is not only "international," but also "local" to the extent that the latter is globalized.

Among the general public, as well as sociologists, there is a popular point of view that the globalization of culture is associated with the destruction of cultural identities under the influence of the consumer culture. For many of them, it is the Western culture and global capitalism that impose their cultural products on the entire world, in the meantime, standardizing and unifying society. A. Giddens (2000) is one of those who consider that globalization produces integration and disintegration, cooperation and conflict, order, and disorder. The cause and reasons for such a belief may be adversarial.

Globalization is a process of global economic, political, and cultural integration and unification. In his work "Socjologia Analiza Społeczeństwa," P. Sztompka (2002) mentions that the birth of the word "globalization" is associated with the name of the English scientist R. Robertson (1992), who in 1983 used the term globality in the title of the article "Discussing Globality," and in 1992 outlined the basics of his concept (the idea of the integrity of the world due to the spread of achievements of Western civilization).

How does globalization affect the culture? Robertson proposes to replace the central concept of cultural globalization with the concept of "glocalization" - a combination of the words "globalization" and "localization." "Globalization - at first glance, something enormous, external that is approaching and ultimately suppresses everything else - is perceived in specific small manifestations, in local life, on one's own life, in the symbols of a culture marked with the sign "glocal" (1992).

## 2. Literature review theoretical background

Discussions and debates about the development of human civilization, the place of national cultures in it and their relationships have been going on for centuries: J. Habermas (1992: 8) stated the "new irreversibility," Z. Bauman (2000: 8) speaks of "the end of uniqueness." Local and global, as Robertson (1992: 91) claims, do not exclude each other.

On the contrary, the local must be considered as an aspect of the global. "Globalization, among other things, also means the contraction, the clash of local cultures, which should be given a new definition in this "clash of localities" [ibid]. Thus, the modern cultural space is a space of glocalization processes, and more precisely, it can be explicated as a glocal culture. Glocal culture is a world cultural space in which the interaction and interpenetration of local cultures as cultural and historical entities with their mentality and the ability to preserve their identity in the context of globalization are carried out.

According to P. Berger and S. Huntington (2004), the most critical "globalizers" are Americans. It is due to the increased US influence in the world in the second half of the 20th century. P. Sztompka believes that homogenization embraces the world, and above all, the core of culture - the language, because it is English that has become the global medium of communication, the language of business, and programming. In "Tyranny of the Moment," Thomas Hylland Eriksen (2001) talks about speeding up the time as one of the fundamental elements of globalization. The critical lack is control over one's own time. All that needs to be done quickly - threatens to supplant what needs to be done slowly.

The concept of glocalization allows us to understand the multiple relationships between global and local. The concept is modeled based on the Japanese concept of "dochakuka" (becoming a native), which, in turn, comes from "dochaku" (a native living in the homeland). Initially, this concept was related to the agricultural principle of adapting cultivation methods to local conditions. As S. Tulloch (1991: 134) mentions, in the 1980s, the Japanese businessmen adopted the term to refer to a global location or "global view adapted to local conditions" (1991). The concept soon spread throughout the world. Featherstone (1996: 64) presents an example: the American multinational Coca-Cola has put forward its version of glocalization under the slogan "we are not multinational, we are multilocal" (1996). Robertson (1994-95) argued his position as the need to resist the tendency to perceive globalization, as if it were only large-scale macro-sociological processes, neglecting the positioning of globalization. In other words, globalization always happens in a particular place, while local is (re)created in the discourses of globalization.

Robertson's point of view is similar to other models of cultural globalization that explore global-local intersections (Appadurai, Friedman, Hannerz, Pieterse). Chang, Milne, Fallon, and Pohlmann (1996), for example, argue that "global and local must be intertwined in any future theoretical framework designed to help understand the processes and results of the humanitarian heritage" (1996: 285). In the same way, Teo and Lee (2003) point out that "for culture, the concepts of global and local form a dyad that acts as a dialectical process" (2003: 302).

Studies of sociocultural aspects were based mainly on the "invited-guest paradigm," drawing attention to local influences (V. Smith). Aramberri (2001), Franklin and Crang (2001), and Sherlock (2001) agree that while maintaining a static and exclusive view of cultures and local characteristics, this model does not cover all the complex interactions between people and their glocalized environments. Most of the difficulties in interpreting glocalization are associated with the false opposition between

globalization and localization. Nuryanti (1996), for example, indicates that studies on the cultural vector are often characterized by a series of contradictions between the strength of tradition (local), which implies stability or continuity, and innovation in various fields (global strength): this means or implies a change.

Interestingly, it is in the field of culture and artistic heritage that the global-local dynamics have been studied, and here Teo and Li should be mentioned (2003: 290). Whereas in its original micro-market, the meaning of glocalization refers to the production of global products adapted to specific circumstances, in the case of a cultural component.

Cultural globalization as glocalization is characterized by the convergence of business and consumer culture between different countries of the world and the growth of international communication. On the one hand, this leads to the popularization of certain types of national culture around the world. On the other hand, widespread international cultural phenomena can supplant national ones or turn them into international ones, often even acquiring their cultural coloring.

The globalization of culture is associated with two phenomena. The first is the spread of Western individualistic values among a growing part of the world's population. These values are promoted by social institutions that recognize individual human rights and attempts to protect human rights at the international level. The second trend can be called borrowing of Western "rules of the game" around the world. Bureaucratic organization and rationalism, materialistic views, values of economic efficiency, and political democracy have been spreading in the world since the time of the European Enlightenment. The influence of Western values: rationality, individualism, equality, efficiency is overgrowing. However, the opposition to them is growing every year.

### 3. Where global turns to local?

Before the era of globalization there were strong ties; identity was a collective possession of local communities. Today, globalization has contributed to the erosion of the sacred values: ethnocultural identities are disappearing, creating a homogeneous, pragmatic, and rationalized context devoid of the sacred dimension. According to American socio-cultural anthropologist A. Appadurai (1996), globalization is a deterritorialization, i.e., the loss of the attachment of social processes to physical space. He explores global cultural flows, consisting of cultural-symbolic spaces-streams (landscapes): ethnoscape is formed by a stream of tourists, immigrants, refugees, migrant workers; technospace (technoscape) - a stream of technology; Finanscape - a stream of capital; media space (mediascape) - a stream of news; and ideospace – by a stream of ideologeme - a fundamental unit of ideology.

Globalization contributes to the structural complication and meaningful enrichment of identities, their hybridization, as a result of which the identity becomes multi-layered, combining ethnocultural and global levels in a single structure. Thus, globalization eventually propagates identities but does not destroy them. At the same time, cultural globalization is a complex and in-depth process. It is not just the cultural colonization of the world by some countries. It is an intense, though not always equivalent, cultural exchange between societies.

Modern researchers of the globalization phenomenon speak of a complex process of interweaving global trends in social development and local or customary features of cultural development, defining this phenomenon as the phenomenon of glocalization. In any culture, there is globalization. The process of glocalization is as follows: in the framework of expanding contacts with the outside world and Western culture, the emphasis is shifting more and more to the "local" component than to the "global" one.

The phenomenon of glocalization and localization can be seen in several examples.

Americanization in the food industry in India is not widespread among Indian consumers. McDonald's has faced several problems, despite a pre-developed market penetration strategy that has been successfully tested in other countries. The idea of a hamburger does not take root in India even among the most Europeanized part of the population. The protest of the Indian population against the McDonald's fast-food restaurant was associated with the beef in a burger, which is unacceptable for most Indians. McDonald's had to adapt its menu to local conditions: the labels on the big mac were changed into maharaja mac, such local dishes as a vegetarian burger, panir-salsa (fried home-made cheese with vegetables and spices) and panir-tikka (a small rectangular cheesecake with cottage cheese and vegetables with spices) appeared; black tea and coffee are served, according to the Indian tradition, only with milk.

Cultural patterns are transferred from one country to another and are taken mainly through the media. The Internet plays a huge role in cultural globalization. As an example of glocalization, the cultural peculiarities of IT-companies can be considered. Search engines are glocalized. The diversity of humanity and its cultural forms can be observed on the Internet. "Google" is not the only search engine in absolutely all markets, as some people may think.

Nevertheless, it is now striving to adapt to the cultural characteristics of different countries. P. Sztompka states that the core of culture is language, which is why we can observe vivid cultural features and local trends among search engines. In China, Baidu.com has a market share of 78%; in Japan, it is Yahoo with 60%, and in Russia - Yandex has 46%, far ahead of Google.

In all the countries as mentioned earlier, the local search engines provide for an interactive knowledge-sharing platform, an encyclopedia, and a social network. Baidu.com also has vertical searches - maps, news, videos, pictures, and more. Yahoo is developing many new services, such as "Yahoo Messenger," "Yahoo Mail," "Yahoo Maps," "Yahoo Finance," "Yahoo Groups," "Yahoo! Mobile", "Yahoo Shopping," and others for mainly two markets: USA and Japan. Yandex.ru is now operating in some CIS countries and builds its work on the local needs, analyzing the market, both global and local.

#### **4. Discussion and conclusion**

Globalization is the reason for the revival of local cultural identity in many parts of the world. Giddens A. (2000) comes with a question: if globalization created a united world, no one would ask: why, for example, the Scots are striving for more independence within the United Kingdom, and in Quebec, there is a powerful separatist movement? The answer is simple; it is the local nationalism that is reviving in response to globalization trends.

Cultural globalization today is not just westernization. Globalization is associated not only with unification but also with the interpenetration of cultures and their constant interaction and mutual exchange. For example, the performance of multinational corporations depends on their flexibility and ability to adapt to the cultures of different countries. Global culture is accepted, but with significant local modifications, the process of glocalization is taking place.

In their work, "Many Globalizations: Cultural Diversity in the Contemporary World," Peter L. Berger and Samuel P. Huntington argue that along with glocalization and localization, there is such a thing as easternization or alternative globalization, i.e., global cultural movements that arise outside the West and have a strong influence on it (2004). Alternative globalization can be attributed to religious movements generated by India, Buddhist movements that came from Japan and have great success in the West.

The globalization of culture does not mean that groups and individuals become the same in the cultural framework; instead, new cultural differences and accentuations are emerging in the context of local-global interaction. Thus, global changes in culture are not connected with the loss of its national originality by the state, the imposition of specific standards on the whole world, and the total unification. It is in the period of global changes in all areas of society that a sense of national identity intensifies, and localization and glocalization processes take place.

Thus, the value-semantic foundations on which the modern philosophy of glocalization is based, establish new principles of the relationship between humans and nature, transform the mechanism of civilizational development that has been taking shape over the centuries. As Sztompka P. (2002) states, contribute to the formation of unique spatio-temporal structures in culture, changing both the cultural-historical types and their forms of interactions, sometimes without even taking into account that "the only basis for tolerant relationships between cultures can be the idea of equality of all cultures and peoples." Accordingly, the ideas about the future of humankind become different, and the question of the fate of cultures is directly related to the question of the fate of their bearers, because the dominant "eccentric" strategy does not contribute to the way out of modern civilization from the systemic-paradigmatic crisis, the manifestations of which are associated with the intensive growth of scientific and technological achievements in all spheres of human life.

Thinking of globalization and localization as opposing processes is not very useful for understanding and explaining contemporary global multiculturalism. The constant (re)formulation of the local in many respects is part of the globalization process and is also globalizing itself. The processes of glocalization are not limited only to culture. However, using the theoretical concept of glocalization is very instructive for understanding socio-cultural dynamics. This helps to understand that, for example, globalization is developing not so much as overcoming cultural differences, but through the permissiveness of such differences and their strengthening. At the same time, it is essential to note that the concept of glocalization represents only an analytical perspective and not a defining theory. For researchers, the study of culture is the task of elucidating the boundaries between global and local.

From an analysis of the daily practice of multicultural relationships and how to (re)represent and (re)actively create a local culture for a diverse global audience, one can learn a lot about how globalization and localization are intertwined and how this glocalization - through tourism and other channels - transforms culture.

In general, we must understand the complex process of glocalization through direct and critical research simultaneously - detailed research and fine-tuning of everyday cultural practices, symbolic imaginary, and social relationships that reproduce global processes, connecting various distant planetary points. This includes looking at how global markets interact with political rules, social forms, and the production of cultural property through disparate and heterogeneous stories and geographies. More research is needed to understand how certain aspects of everyday life are glocalized, and how this process of glocalization - which is significantly differentiated according to geographical and political coordinates - deeply affects culture and the contemporary humanitarian environment.

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## COMMUNICATION REVOLUTIONS THAT MARKED THE HISTORY OF EDUCATION. PROVERBS IN EDUCATION - THESES AND PARADOXES

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### Abstract

As part of human society as a whole, the education system continues to play its role – addressing the newer needs of an increasingly technologized society (essentially new communication and information technologies – C&IT). The education system, changing itself, has to answer to all changing needs and challenges of the contemporary society; and the solutions offered are, in general, technology-based solutions. This paper aims to offer a different prospective, looking backwards in history still focused forwards, on the educative role of the wisdom literature and proverbs in particular, as educative means – not as an alternative but as an additional, particular instrument to be used during the education process. Also, this does not entail, by any means, to undermine the role of new technologies in education. The author's approach is to survey the history of education from that standpoint of the history of humans' communication – which was definitely marked by several stepping-stones, actually four communication revolutions, namely: (i) language revolution; (ii) writing revolution; (iii) printing revolution; and (iv) contemporary e-communication revolution.

As part of the books of wisdom (books of knowledge) or independently, the proverbs always played an important educative role – as subtle yet solid and continuous, particular kind to educate – before invention of printing and even writing. Praising the collective and anonymous author as universal and immortal educator, the main objective of this paper is to launch *four theses* related to the proverbs' resilience, durability and continuity, as well as *five paradoxes* regarding the proverbs' dynamics.

The novelty of this paper, besides emphasizing the communication revolutions that impacted the history of education, consists of launching the concepts of the proverbs' theses and paradoxes – specifically the four theses related to the proverbs' resilience and the five paradoxes of the proverbs' dynamics.

The subject and research path initiated may, eventually, enlarge future research avenues, and/or provoke discussions among [higher] education strategists, policy makers, scholars and educators.

**Keywords:** *Communication revolutions, communication and information technologies (C&IT), proverbs and education, theses on the proverbs' resilience, paradoxes of the proverbs' dynamics.*

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### 1. Stepping-stones that have marked the history of humans' communication and education

According to Hawking (2001), the history of *homo sapiens* – human beings as we are – started about 150,000 years ago which is just 6% as compared to history of the *genus homo* (2.5 million years). Historians agree that the “history of sapiens is only a very small part of the history of humankind” and “we still know far more about ourselves than about other species of human beings, including several that have become extinct since we first walked the Earth” (Harari, 2014). After unremarkable first half of this history of sapiens, Harari notices a series of revolutions: (i) the *cognitive revolution* about 70,000 years ago – by when the *fictional language* has occurred and people started to behave more ingenious; starting from Eastern coast of Africa, they have spread across the planet; (ii) the *agricultural revolution* about 11,000 years ago – be when sapiens set to more stable domestic farming instead of hunt animals or gather fruits and vegetables; (iii) the *scientific revolution* about 500 years ago. Wiener (1989, p.46) has shared the same view on the scientific revolution, stressing the role played by inter-human communication: “The last four hundred years are a special period in the history of the world. The pace at which changes during these years have taken place is unexampled in earlier history, as is the very nature of these changes. This is partly the result of increased *communication ...*” Or (*op. cit.*): “The thought of every age is reflected in its technique ... the eighteenth and nineteenth centuries constitute the age of steam engines, the present time is the *age of communication and control.*”

Amid highly respected opinions of top scholars in various science areas as astro-physics, history and cybernetics, for the purpose of our discourse, it is critically important to learn about the crucial points in the history of humanity that have marked its *education* goals and actors, means and processes – via communication: emergence of the *language*, *writing*, invention of *printing*, and *e-communication*.

The languages as articulate speaking have allowed earlier humans to communicate in a finer manner than by gestures and mimic ('non-verbal pre-language') or producing onomatopoeic sounds and phonemes, crying and howling, yelling and screaming ('wild non-articulated pre-language'). By writing – understood as handwriting – the messages could be transmitted 'as they were, carved in stone' at distances limited only by the transportation means available at that time, and – probably more important – over generations and periods of time limited only by the durability of the material support that was used for writing (stone, clay or wax tables, wood panels, sheep skin, bamboo strips, papyrus, paper and alike). Invention of printing was a real revolution (not accidentally contemporary to the *scientific revolution*) that increased significantly the capacity of one's writings 'as they are' to reach considerable larger numbers of individuals, in a more effective (unchanged message) and efficient manner (at a lot lower cost than hand-copying). Ultimately, the mass e-communication using new technologies for data generation, processing, transmission and storing (namely information and communication technologies – IT&C) is the contemporary amazing phenomenon we are witnessing each fraction of second, with almost no time, space or other types of barriers. In other words – words of 'revolutions' – we might say that:

- *The language revolution* is actually cognitive revolution (i) – when the language development made exchange / sharing of information possible, and, consequently, *made education possible*.
- *The writing revolution* was probably one of the effects of agricultural revolution (ii), as early forms of writing emerged during primary phases of agricultural revolution. The writing made possible the transmission of information in time and at distance, and *made possible the inception, diffusion and dissemination of education*, by hand-written and hand-copied books – which were the teaching materials of the first schools, precursors of mid-age universities.
- *The printing revolution* was an early signal of the industrial revolution – the initial stage of the scientific revolution (iii). The productive book copying allowed institutional development of libraries, schools and universities as the centres of information and knowledge. These books were the main teaching materials that *made possible the development of modern education*.
- *The e-communication revolution* (or information revolution) is the hard-core of the scientific revolution (iii). It allowed unmatched development of technology that made possible e-production, e-transmission, e-processing, e-storage of e-books and virtual libraries, distance teaching and learning, new education technologies and alike – actually *everybody's unlimited access to information and education* – featuring the new type of universities of the near-future.

### 1.1. Language revolution

The point in time when the language has emerged is considered one of the hardest problems in science (Christiansen and Kirby, 2003) and a number of theories about appearance of language are subject to scientific debates (Tallerman and Gibson, 2012). Chomsky (1996), based on the discontinuity theory, argues that about 100,000 years ago the language faculty was the result of "a single chance mutation" that occurred in an individual's brain; the champions of continuity support the idea of gradual evolution from primitive proto-language that became the language proper to *homo sapiens* less than 200,000 years ago. Based on the analysis of phonemes (Atkinson, 2011), Perreault and Mathew (2012) suggested that language first evolved around 150,000-50,000 years ago. Harari (2014) speculates that development of language made humans able to think in abstract terms, cooperate in larger communities and exchange comments (gossiping). The language contributed to the cognitive revolution, by when the *fictional language* occurred and people started to behave more ingeniously. It probably was about the time when *humans began to use metaphor-type expressions that eventually led to early proverbs*.

### 1.2. Writing revolution

The archaeologists discovered limestone tablets with pictographic symbols dated back in 3500 BC in Mesopotamia – where the cuneiform writing was invented as well (3400-3300 BC) – followed by Egyptian hieroglyphic writing, and Chinese writing. The writing has marked the border of evolution from prehistory to history: "Prehistory is normally made to end (and history to start) with the appearance of writing" (Bonanno, 2005, p.6). The *writing made the systematic education possible*, transmitting knowledge by neat messages (literally "carved-in-stone", originally) in space and time. The history of handwritten or copied writings reports a notable progress from scrolls (or *volumen*) to *codex* shape (Lyons, 2013, p.8): "In the Christian world of the second and third centuries ... The codex was a book

with pages that turned, instead of a long strip of material that unrolled ... The codex revolutionized the shape of the book itself ... that lasted for centuries.”

Historians believe that in antiquity, because of general illiteracy, the books (*op. cit.*, p.9) “were read aloud or declaimed to an audience by trained orators. Reading was a performance.” The early [handwritten] books allowed the *separation between individual and group teaching and learning*.

### 1.3. Printing revolution

Invention of printing is one of the markers of the scientific revolution (by its influence on science and education development) as well as part of the industrial revolution (Scarlat, 2019, pp.46-47). Gutenberg is credited with invention of printing with moveable metal type (Mainz, in the 1440s) and the so-called *Gutenberg Bible* was the first book produced with moveable type in Europe by then. However, the metal type was used in Korea before Gutenberg, and the xylographic woodcut printing was common in China even earlier by the eleventh century (Lyons, 2013, p.58). One major effect of printing books in larger number of copies at a higher pace (rather than hand-copying) was definitely larger access to education; as result, the illiteracy has diminished. Per Lyons (*op. cit.*, pp.9-10), “the so-called ‘reading revolution’ of the late eighteenth century saw an explosion of recreational literature and an expansion of the periodical press ... In the nineteenth century, the Western world achieved almost universal literacy.” – which underlines the *impact of printing on education*. It is also the period when printed *collections of proverbs have returned among the people as education means*.

### 1.4. E-communication revolution

The mass e-communication using new technologies for data generation, processing, transmission and storing (namely information and communication technologies – IT&C) is the contemporary phenomenon we are witnessing each fraction of second, with almost no time, space or other types of barriers. From Gutenberg printing to e-communication, from codex to e-books (still the e-books have codex shape!), from paper to e-memories, the mechanism and history of language (Wiener, 1989, pp.74) and communication have evolved and developed from man-to-man to man-to-machine and machine-to-man to *machine-to-machine communication*. Currently we talk about IoT (Internet of Things) which is basic machine-to-machine communication; so the computer networks and Internet are as well. Advanced research not only on phonetic but also semantic aspects of language will contribute to the not-far-away-future of IoB (Internet of Bodies/Brains). *Will IoB be the next big thing in education?*

The articulate speaking (language), writing, printing, and e-communication of knowledge have marked the development of education systems and processes – on all their dimensions: students, educators, teaching infrastructure and methods. Therefore, it is right to call these revolutionary steps in humankind history as *education revolutions*. It is also notable that each of them did not eliminate but necessarily included the previous one(s).

## 2. Education by wisdom literature: books of knowledge & proverbs

In spite of their venerable millennial age, the universities are very young as compared to the age of *homo sapiens* (what is a millennium as compared to a period of 150 millennia of *homo sapiens*? or to a period of 70 millennia of *cognitive homo sapiens*?) The question is: what was before the precursors of universities (religious – either cathedral or monastic – schools), dating back in the 6<sup>th</sup> century as Riché (1978) argued. It is behind the purpose of this chapter to review the history of school. However, it should be mentioned that first schools in antiquity (Marrou, 1948) appeared in Mesopotamia (by religious temples, to train the priests and scribes), China (as early as the 3<sup>rd</sup> millennium BC), Egypt (by the pharaoh court, for the members of royal family and administrators). The access to these schools was limited – for the use of ruling families and religious elite (Lyons, 2013); thus most of the population was illiterate. Teaching was performed in groups, from *magister* to disciples, and the knowledge was transmitted by repeating and memorization. [Hand]-written/copied books were rare, most of them religious.

The Greek schools (as Pythagorean Brotherhood, Plato’s Academy in Athens or Aristotle’s Lyceum or *Peripatetic School*) were open to intellectual elites, and devoted to the study of sciences as geometry and astronomy as well as philosophy and rhetoric. It is very likely that, amid scarcity of books, *magister was using proverbs as teaching aids* – Aristotle mentioning already old proverbs in his writings. In ancient Rome, the rich families were able to hire private tutors for their children. According to Crenshaw (2000), in ancient rural communities, there also were lessons of life and civic education, transmitted orally, as education provided within family (by the family-wise to the younger members).

The religious commands and lessons of life frequently have merged: one of the oldest books, the *Bible* (religious *per se*), includes a chapter of lessons of life and civic education (‘Book of Proverbs’).

By tradition, the paternity of these proverbs goes to the wise king Solomon; however, Clements (2003) shows that the proverbs collected were generated in different periods, associated to a lifestyle that lasted for about a millennium; therefore they were not strictly generated in a single restricted geographic area. Yet Alter (2010) argues that the source of proverbs is older: a collection of old Egyptian proverbs – ‘The Teaching of Amenemope’ or ‘Wisdom of Amenemope’ (the 2<sup>nd</sup> millennium BC) – that inspired the ‘Book of Proverbs’ *via* a translation in Aramaic language (Ruffle, 1995). According to Smothers (2000), the books of wisdom were rather popular in the Oriental antiquity. However, Tucker (2000) argues that, in ancient Israel, the wisdom literature was quite developed but limited to the royal court (for the education of the members of the royal family) as well as several schools for youth education.

Besides wisdom literature, the *proverbs played an important educative role* – not as an alternative but as subtle yet solid and continuous, particular kind to educate – *before invention of printing and even writing*. Therefore, we have to praise the collective and anonymous author as universal and immortal educator. In this respect, Scarlat (2019, pp.53-55) enounces *four theses related to the proverbs’ resilience, durability and continuity* (Table 1).

Table 1. The Four Theses – related to the proverbs’ resilience and durability (Scarlat, 2019, pp.53-55).

Communication revolutions	The Theses
<i>Language revolution</i> : emergence of articulate speaking (language)	<i>The first thesis</i> : The proverbs (anonymous and collective life experience lessons transmitted orally) preceded the invention of writing – <i>as primary education means for early humans</i> .
<i>Writing revolution</i> : invention of writing	<i>The second thesis</i> : The proverbs (anonymous and collective life experience lessons transmitted orally) continued to be used even after the invention of writing. <i>Proverbs were initially used for the education of royal and religious elites</i> .
<i>Printing revolution</i> : invention of printing	<i>The third thesis</i> : The proverbs (anonymous and collective life experiences transmitted orally) continued to be used even after the invention of printing – mostly for the basic education of increasingly larger population. <i>The printed books made possible the development of modern universities</i> .
<i>E-communication revolution</i> : mass communication using new e-technologies for data generation, transmission, processing, and storing (information technology and communications – IT&C)	<i>The fourth thesis</i> : The proverbs (anonymous and collective life experiences transmitted orally) continue to be used even after the emergence of IT&C – which facilitates mass access and accelerates their transmission. <i>Proverbs are still used as teaching aids even in university degree programmes</i> .

Using the same framework of communication & education revolutions, based on two-by-two matrix with two dimensions of analysis – source of proverbs (“generated by ...”) and their destination (“used by ...”) – Scarlat (2015, pp.39-44; 2019, pp.55-62) identifies *five paradoxes*: Paradox of the proverbs’ dissemination; Paradox of the proverbs’ enrichment; Paradox of the proverbs’ secularization; Paradox of proverbs’ use by the intellectual elite; Paradox of the proverbs’ value.

These paradoxes observe *the proverbs’ dynamics*, during different historical ages, along their millennial way from {*generated by the royal and religious elites* for their own use} to {*generated by masses* for their own use}.

### 3. Conclusions

Universities were the focal point of higher education for more than thousand years – which is an amazing example of stability. Indeed, one reason behind their millennium-long chronicle is the existence of *printed books* – as their developments have paralleled.

Along centuries, the proverbs have had an educative function in that respect of principles of moral and healthy life, common sense, and life lessons learnt, sometimes with a grain of humour. In particular, the proverbs can be used as teaching aids even in the area of the ‘younger’ science of management (Scarlat, 2008). Referring to the case of entrepreneurship education by proverbs, Afendras (2019) observes that “Family business was of course a very important locus for handing down entrepreneurial skills, as was child labour. The learning model here was internship and the transmission often included storying and proverbs. And it is precisely for this reason that societies through the ages developed communicative mechanisms to transmit condensed experience about everything that mattered to succeeding generations, before colleges, business schools and Institutes of Management: by telling

stories of personal experience, passing down folktales and proverbs, more condensed, epigrammatic forms of this process.” (*op. cit.*, pp.230-231).

The novelty of this paper – besides emphasizing the communication revolutions that impacted the history of education as well as the role of proverbs as teaching aids in modern education – consists of launching the concepts of the proverbs’ theses and the proverbs’ paradoxes – specifically the four theses related to the proverbs’ resilience and the five paradoxes of their dynamics – based on the analysis of a two-by-two **GU** matrix {proverbs’ **G**eneration, proverbs’ **U**se}.

The concepts launched as well as the subject and research path initiated may, eventually, enlarge and stimulate future research avenues – as trans- and/or inter-disciplinary studies, and/or provoke discussions among [higher] education strategists, policy makers, scholars and educators.

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## **CHILDREN WITH VISION IMPAIRMENT AND MULTIPLE DISABILITIES: ISSUES OF COMMUNICATION SKILLS AND PROFESSIONALS' CHALLENGES**

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### **Abstract**

People with vision impairment and multiple disabilities (MDVI) constitute a population with an enormous heterogeneity due to the combination of various disabilities. Education of children with MDVI concerns different domains and it is considered one of the most demanding fields in Special Education as each student with MDVI has different needs and entails unique educational challenges. In specific, the development of communication skills of children with MDVI is a fundamental domain of their education which affects their learning and active participation in all sectors of life. As a result, professionals are very concerned in which way they can design and develop effective intervention programmes, in order to assess accurately children's communication levels and in turn set realistic goals to consolidate and advance them. The present paper refers to an Erasmus+ project entitled "Promoting effective communication for Individuals with a Vision Impairment and Multiple Disabilities" (PrECIVIM) which acknowledges the need to train teachers in this field and bridges assessment and intervention for the development of communication skills for children with MDVI. The authors present and describe in this paper the following: a. the structure and the content of a training manual for the enhancement of teachers' and professionals' competences in communication skills of children with MDVI, and b. the training process, based on the developed training manual, in three countries (Greece, Cyprus and Romania) in different educational settings for children with MDVI. The obtained data regarding teachers' and professionals' feedback from the training process and their corresponding intervention programmes, revealed a range of good practices as well as concerns and challenges confirming the need of more focused training programmes regarding the education of children with MDVI. The authors conclude that the implementation of intervention programmes, when it comes to communication and levels of communication, depends significantly by a number of factors such as diagnosis, early intervention, system of support for professionals and families, assessment, teachers and professionals' competences, effective use of technology, alternative and augmentative communication, environment, and so on. Finally, it is argued that the aforementioned issues, should be an integral part of a systematic educational policy for the provision of educational opportunities in terms of equality and inclusion for all children including children with MDVI.

**Keywords:** *Children with vision impairment and multiple disabilities, communication skills, teachers' training.*

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### **1. Introduction**

Global measures of the number of children with MDVI vary between 30% and 70% of the overall population of persons with vision impairments (Kyriacou, Pronay, & Hathazi, 2015). However, despite the growing numbers of people who are diagnosed with MDVI, there are limited case studies or projects available regarding this population. During the past three decades, there has been a dramatic increase in the number of persons with vision impairments and additional disabilities (MDVI) within the general population of persons with vision impairments (Argyropoulos & Gentle, 2019).

Children with vision impairment and multiple disabilities (MDVI), may present developmental delays in conjunction with learning difficulties in all areas and levels of perception, cognition and functioning. Hence, it is reasonable to presume that all these delays would have a negative impact on their cognitive, visual, communication and language skills, gross and fine motor skills, daily living as well as social-emotional skills. Nevertheless, amongst all the above difficulties that children with MDVI face,

the issue of an effective communication seems to be one of the biggest ones because it constitutes a critical bridge between children and their educators or caregivers. For this reason, professionals are very concerned regarding communication issues because the vast majority of all intervention programs are based on communication and aim to consolidate and advance children's communicative competences (Chen & Downing, 2006; Dammeyer & Ask Larsen, 2016).

The present paper refers to an Erasmus+ project entitled "Promoting effective communication for Individuals with a Vision Impairment and Multiple Disabilities – PrECIVIM", which aims to support professionals in respect of their intervention programs towards communication and children's communicative competencies (<http://precivim.eu/index.php>, see also Table 1, the members of the PrECIVIM project). The current project acknowledges the need to train teachers regarding how to assess and teach communication skills to children with MDVI. On the other hand, assessing communicative skills in children with MDVI is a big challenge because communication is a complex domain with many sensory and cognitive sectors which need to be assessed. Receptive and expressive skills as well as sensory and motor skills are related to communication and as a result accurate and systematic assessment procedures are needed. The role of parents is always a critical factor in the process of structured and unstructured observations and constitute an important source of information for teachers to set realistic goals, develop appropriate learning exercises and address the educational needs of children with MDVI (Bruce, Luckner, & Ferrell, 2018; Hathazi, 2014).

In line with the above needs and within the context of the PrECIVIM project, a training material was designed and developed in order to enhance teachers' and professionals' competences in communication skills of children with MDVI, and in turn training events followed in different educational settings for children with MDVI accompanied with corresponding intervention programs (i. e. the implementation phase of the PrECIVIM project).

## 2. Design, objectives and outputs

All members of the PrECIVIM consortium decided upon the design and activities pertinent to the production of the training material -it was the 3<sup>rd</sup> intellectual output of the PrECIVIM project - as well as the structure of the training events. Of course there was a work plan from the beginning but details were decided during the project meetings which took place in the first year of the project.

### 2.1. Training material

The leading organization of the training material was the Babeş-Bolyai University (BBU) and all members of the project contributed according to the agreed work plan of the project (see Table 1).

*Table 1. Project Tasks regarding design and development of the training material.*

Intellectual Outputs (IO)	Project Tasks (T)	Activity Leading Organisation	Participating Organisations
<b>IO3: Training Material - Design and Content</b>	T3.1 Creation and adaptation of training material into the format of a syllabus framework	<b>UNIVERSITATEA BABES BOLYAI</b>	1. PANEPISTIMIO THESSALIAS
	T3.2 Creation of consultative workshops relevant to the training material		2. ROEHAMPTON UNIVERSITY
	T3.3 Creation of learning exercise formats		3. Amimoni
			4. Special School for the Deafblind, Athens
			5. Liceul Special pentru Deficienti de Vedere Cluj-Napoca
			6. St Barnabas School for the Blind
			7. Whitefield Academy Trust

Three modules composed the training material and its framework was based on the concept of bridging theory and practice; that is to say, that the training manual included many theoretical information with practical examples of case studies, activities, assessment methodologies, intervention programs, which were provided by specialists from schools and institutions of the project consortium (see also Table 1). According to the leading organization (BBU), the objectives of the training manual were: a. to get familiarized with updated literature review, b. to understand the implications of visual impairment and multiple disabilities on development, communication and learning, c. to have a hand-on experience with proposed activities and methodologies, d. to develop assessment according to the needs of individuals with visual impairment and multiple disabilities, e. to develop and use instructional materials to support the specific needs of individuals with visual impairment and multiple disabilities, and f. to invite trainees to self-reflective and self-evaluation procedures.

The modules of the training manual are considered as complementary sources which converged to an enriched resource for specialists in order to learn and extend on their knowledge regarding the population of children with MDVI as well as to provide them an opportunity to carry out practical activities and exercises that would improve working skills regarding evaluation and intervention. The components of the training manual are presented in brief in Table 2:

Table 2. The three modules of the PrECIVIM training manual.

Modules	Description
Conceptual Framework of development and characteristics people with MDVI	Defining MDVI Typology of disabilities in the population with MDVI Characteristics of people with MDVI and implications for development Development of communication in the context of MDVI Development of communication Assessment and reflections
Development of communication in the context of MDVI	Goals and objectives of assessment Types of assessment Standardized assessment Developmental assessment The educational assessment Functional or ecological assessment Observation- assessment tool Initial observation within the assessment of communication Inventory on the student's repertoire Selection of assessment tool Assessment Plan Assessment Instruments of communication
Assessment of communication	Milieu approach in developing communication Routine based interventions Co-creative communication: method of intervention in communication Alternative and augmentative communication Examples AAC how to select an item from the AAC system Intervention program for the implementing of an AAC system The objects of reference Symbolic communication strategies Developing symbolic communication through calendars Pictures as communication symbols Picture Exchange Communication System (PECS) Sign language The SCERTS Model (Social Communication, Emotional Regulation and Transactional Support) Speech development Communication environment Assistive technologies and individuals with visual impairments and multiple disabilities

## 2.2. Training roadmap and intervention programs

After the development of the training manual, a combined training scheme took place in nine schools and organizations which were selected by the members of the consortium. The schools were from different countries (i. e. Romania, Cyprus, Greece and the U.K.) and the training scheme, was a combination of two modalities; that is, distance and face-to-face learning events (Souza, Mattos, Stein, Rosário, & Magalhães, 2018). In specific, the face-to-face learning events was characterized as *training on the go*. That is to say, the face-to-face trainings took place while the schools were in operation and the teachers were working with their classes. As a result, the trainers were present during classes, they were involved during the intervention programs and after that, trainers and trainees, met and work together through presentations and workshops focusing on their students' real needs using observations and field notes, trying to discuss specific points that would improve or enhance teaching and intervention procedures. During all these processes, the training manual was used as a reference point and the trainers invited the trainees to work out selected parts of it which were relevant to their intervention programs. Hence, the trainers had the opportunity to meet many teachers within a school day individually and usually by the end of the day a plenary session took place. In this way, trainers and trainees had the chance to recap and plan the next steps.

Apart from the face-to-face training events, distance training events took place which functioned as supplementary material to the overall objectives of the project training phase (asynchronous learning events). The implementation phase (i. e. intervention programs) lasted approximately six months. Teachers, during the implementation phase, filled in reflective logs through which they were thinking critically regarding their experiences and challenges while applying screening inventories of the communicative profile of their students with MDVI.

The present paper, based on obtained data from teachers' and professionals' feedback during the combined training schemes and corresponding intervention programmes in three countries (Greece, Cyprus and Romania), revealed a range of good practices in conjunction with concerns and challenges. All teachers' and professionals' concerns seemed to converge in four domains: a. characteristics of MDVI and levels of communication, b. vision impairment and appropriate environmental adaptations, c. components of tactile perception and touch defensiveness, and d. assessment tools. The trainees acknowledged their lack of training and experience on the previous domains and asked to focus mainly on assessment tools in order to design more effective intervention programs. One of the tools that trainers and trainees worked out elaborately was the Communication Matrix (Rowland & Fried-Oken, 2010) which they managed to use it, through their intervention programs in order to evaluate their students' expressive communication skills in great detail.

In addition, good practices were considered all procedures which incorporated robust steps from a child's detailed communication profile up to a well-structured intervention program. An example of a good practice with its components is outlined in Table 3.

*Table 3. Components of a good practice of the PrECIVIM project.*

<b>Components</b>	<b>Description</b>
Input regarding student's communication profile	Defining MDVI Typology of disabilities Characteristics Communication level
Input regarding professionals' plan of their intervention	Goals and objectives of assessment Selection of assessment tool Prioritizing needs Assessment & Intervention Plan
Actions that were conducted during the intervention	PECs Books Objects of reference Hands-on activities social stories Millieu Approach routines based on imitations games
Professionals' observations during intervention	Diary Checklists Discussions with the working team Assessment activities Children's products
Professionals' reflection on the results of the implementation	Was the implementation successful? Are we going to use the same assessment tool? Are we going to use the same approaches and strategies?

### **3. Discussion and conclusions**

It is acknowledged that the development of communication skills differs greatly between children with multiple disabilities and vision impairment (MDVI) and children with typical development (Chen, 1999). Children with MDVI cannot exploit adequately the information derived from the environment (McInnes & Treffry, 1982). As a result, they need systematic instruction, scaffolding and facilitation. Most of the children who participated in the PrECIVIM project were at pre-intentional communication level regarding the model of development of communication (Rowland & Fried-Oken, 2010). They tried to communicate through a variety of behaviors such as: crying, fussing, smiling, body movements, and other nonverbal behaviors showing comfort or discomfort (Brady, Steeples, & Fleming, 2005). The communicative behaviors of children with MDVI at this level of communication, due to limitations of the ability to communicate in meaningful and functional way, may be unusual and therefore sometimes is difficult to identify and interpret them (Ayyildiz, Akcin, & Guven, 2016).

Before teachers and professionals implement intervention programs aiming at the development of communication skills, it is necessary to evaluate children's preverbal communication with appropriate

assessment methods (Westling & Fox 2004). The assessment of children with MDVI communication skills is quite challenging regarding the combination of disabilities (Bruce, Godbold & Naponelli-Gold, 2004). There is a variety of assessment tools for assessment of communication, ranging from the formal methods such as standardized and non-standardized tests and scales to informal ones (Warner & Wolf Nelson, 2004).

The PrECIVIM project highlights the added value of the development of partnerships between different organizations, collaborations between different specialists, and systematic evaluation of relevant activities in order to develop knowledge and good practices for equal educational and social opportunities for all children including children with MDVI.

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## TODAY'S HIGHER EDUCATION AT A CROSSROADS: IS THE EDUCATOR'S ROLE UNDERGOING A PARADIGM SHIFT?

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### Abstract

The education is currently under the pressure of environmental forces that induce challenging and rapid changes; these changes are interlinked, and influence or are influenced by the education systems and processes – in all their dimensions: students, educators, teaching infrastructure and methods. The higher education has to answer to new challenges and most answers gravitate around getting the best compromise between traditional versus new education technologies. If the blended learning seems to be a common sense solution applicable in several instances, a question stands still: If the source of information/knowledge can be quasi-instantly accessed then how to deal with this tremendous amount of data which develops exponentially in time? What should be the educator's role in the next future?

From the educator's standpoint, focused on the educator's role, observing the different progress rates of the available data, information and knowledge (on one side) and human capacity to process these available data, information and knowledge (on the other side), the author becomes aware of the higher pace of the first – in the midst of impetus of new communication and information technologies – and argues that, at this point in time, we are eye-witnessing a real education paradigm shift. The education system is at a critical point in time (call it *critical point of education – CPE*) when the educator's role must change from knowledge repository to skilled, expert knowledge explorer and identifier, switching from teaching the subject to teach students how to pick the right and relevant information related to the subject – from the ocean of available data.

Besides all the above questions, this paper launches the thesis of the *education paradigm shift* – in that respect of the educator's role in the predictable future, to provoke a discussion, and to open a research path, for higher education strategists, policy makers, scholars and educators.

**Keywords:** *Higher education, educator's role, education paradigm shift, critical point of education (CPE).*

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### 1. Introduction

Nowadays, the education, in general, (and the higher education, in particular) has to answer to the new challenges: How to cope with the discrepancy between the best universities and decreasing population in the developed countries (on one side) *versus* (on the other side) relatively less and not-so-good universities targeted by a booming population in the less developed countries? How to keep the pace with the best sustainable compromise (of economic development) between new technologies development and climate change? How to answer to the latest needs of the global economy, while careers change themselves (Pascadi & Scarlat, 2016)? How to rapidly adapt to the continuously and fast changing requirements of the new jobs associated to the state-of-the-art technologies? Ultimately, how will the education-related jobs of the future change?

Different evolving paths open controversial yet creative debates on hot subjects like: virtual university *versus* 'bricks-and-mortar' traditional university; entrepreneurial *versus* classical university; long-life learning *versus* formal education; free *versus* paid education; mass (uniform) *versus* elite (differentiated) education; e-books and virtual libraries *versus* paper books and traditional libraries; high-tech online platforms *versus* traditional teaching methods; virtual *versus* on-site educational tours, and the list is open (Burke & Shay, 2016). However, the common sense should prevail and answers gravitate around getting the best compromise (as effectiveness and efficiency) between apparently opposite elements (traditional *versus* modern). Some answers are trivial while others lie in the technology itself.

If the blended learning seems to be a balanced solution applicable in several instances (education infrastructure, teaching materials and methods), a particular question stands still: If the source of information (source of knowledge, ultimately) can be almost instantly accessed then how to cope with this tremendous amount of data?

The paper objective is to launch the *thesis of education paradigm shift* – in that respect of the educator’s role in the predictable future. Consequently, the remaining of this chapter is deals with: middle age universities as shapers of the modern higher education; the evolution of the educator’s role and the paradigm shift in its evolution (the higher education at crossroads), followed by conclusions.

## 2. Universities: The oldest *and most enduring* organizations

As compared to other types of organizations, the *educational institutions are among the oldest*. Some precursors of traditional universities are still active (as *The King’s School*, Canterbury, England, since 597). The oldest, still functioning universities are considered: *Al-Azhar University* in Cairo, Egypt (970/972); *University of Bologna*, Italy (1088); *University of Oxford*, England (1096/1167); *University of Salamanca*, Spain (1134) – on top of others that have followed. The middle ages universities have not emerged from scratch (Courtenay and Miethke, 2000); it is generally accepted that modern universities have the roots in the mid-age Christian tradition (Rüegg, 1992) and their precursors were religious (cathedral or monastic) schools, dating back in the 6<sup>th</sup> century (Riché, 1978). Evolved from the religious schools created by cathedrals for the clergy education in the Middle Ages, the proper universities were established in towns and defined as ‘communities of teachers and students’ similar to professional guilds. They were self-regulated and neatly organized, their constitutions providing clear admission procedures (like in guilds). In spite of the university autonomy and academic freedom, the clearly admission and functioning rules as well as the professionalism of its members (respect for their profession included) – all made universities very well organized and managed, apparently rigid institutions (Tolar, 1980).

Universities are among the oldest as well as *enduring institutions*. They prevailed over wars, famine, plagues, extreme natural adversities, or dramatic changes of political regimes: “Many of the higher education institutions ... have outlasted communism itself. Although universities ... are not known for rapidly embracing change, once they do expend the effort to incorporate new philosophies, change has a lasting effect.” (Tolar, 1998, p.161) The enduring paradox (most advanced ideas and top research *versus* rigidity) is explained exactly by the freedom of creative spirit – allowed by the framework of precise (not rigid) internal rules. Universities do not change themselves but *they change the environment*.

## 3. The educator’s role: From the *wise man* to *magister* to university professor. What after? Higher education at crossroads: A paradigm shift in the educator’s role!

Besides family education (in general basic), the role of school educator has shifted in time from *magister* teaching disciples (Greek-Roman antiquity) to professor *encyclopaedicus* (middle age’s Erasmus of Rotterdam) to contemporary university professors mastering (at their best) a single subject. Today, new sciences and deeper areas of knowledge are established in each sector of science, because of unprecedented volumes of information in each of them – so that it is almost impossible that a contemporary university professor to master more than a single subject, a very few or a narrow knowledge area. It seems that our society is about reaching a *critical point in time*; not necessarily as technology management but as *information management in education*. This happens when the *amount of available information* is larger than the amount of knowledge *homo sapiens* needs (limited to the amount of information his brains are able to process or *the brains’ processing capacity*). Both figures – the amount of available information (A) and the brains’ processing capacity (B) – display positive dynamics, yet the first one (A) features a lot higher, accelerated pace: undoubtedly, the volume of available information is the result of the accelerated progress of science/sciences and technology/technologies (currently, IT&C – that includes internet communication, social technologies, artificial intelligence, cloud and quantum computing – but also genetic engineering, biotechnology). On the other hand, the amount of information that human brains are able to process (B) – in order to turn it into knowledge – is linked to the human DNA. Per Hawking (2001), the complexity of DNA improved over time, as measured in bits of information: from 1 bit/100 years (during first two billion years since emergence of life on Earth) to 1bit/year (during last few million years) – as result of random mutations and natural selection.

The relatively low pace of improving the DNA complexity suggests a relatively linear increase in brains capacity to process the information. In this matter, following to earlier studies (Hick, 1952), Moscoso del Prado (2011) estimates the human reaction time at maximum 60 bit/s, observing that it depends on tasks to be fulfilled, and it possibly be higher (yet not claiming any upper limit). To note that

*invention of writing was crucial exactly because it made possible to transmit information along generations without expecting the slow progress of the DNA complexity.*

Consequently, as (A) is currently increasing exponentially while (B) displays relatively linear increase, it is expected that, at a certain point in time, the first curve intersects the second. Define this intersection point of the two curves above as *critical education point* (CEP). It means that *homo sapiens* is not able to cope anymore with exponentially increased volumes of available data and information produced by novel technologies. Of course, computers with their processing power and larger and larger memory devices help to a certain extent to enhance and amplify the human capacity. However, realistically, the question stands still: How can the educator cope nowadays with such tremendous deal of information (impossible to be processed by a single person)? How could the educator ask students to do what s/he cannot do? What should be the educator's role in the foreseeable future? Should we call him/her still educator? Ultimately, will the educator have any roll of any kind? *Here's the paradigm shift! We currently are eye-witnessing a real paradigm shift in education, related to the educator's role.*

The author's opinion is that education system is currently at a critical point in time when the educator's role must change from knowledge repository to skilled, expert knowledge explorer and identifier. *The educator will continue to exist in the near future at least, but with a different role.*

First and foremost, s/he has to be familiar with new teaching technologies (not only e-learning platforms but also diverse devices for AI – artificial intelligence, VR – virtual reality, AR – augmented reality) and teach students how and when to use them. Then, the educator has to switch from teaching the subject to teach and guide students how to pick the right information related to the subject from the ocean of data, literally; to distinguish the better from poor quality, the true from false information, and eliminate the fake data.

In the near, foreseeable future, the role of educator is not going to be diminished; exactly the opposite is the case: the educator's role becomes more complex, to teach how and when to wisely manage the technology tools in general; how and when to use the newer technologies as online and mobile teaching, AI, AR and VR devices; to promote experiential teaching together with students in order to effectively guide them to achieve the educational objectives. Pacansky-Brock (2017) explains how educators need to understand the applicability of the new educational technology-based tools (as social media and web 2.0 technologies) that are currently transforming the learning trends and preferences of students as well. The public web and open educational resources are going to replace the traditional learning management systems and technologies that no longer exist; and their mastering should be on the educator's list of competencies – in order to enhance “communications with and between students, and cultivating participatory, student-centred learning activities”.

Acknowledging the changes in the student body from *Millennials* to *Gen Z* or *iGen*, Fleck and Kakouris (2019) propose the use of adequate experiential teaching innovations (such as use of music and art to teach; use of art to trigger critical reflection; use of the superhero to stimulate creativity; use of alternative media such as film and TV to engage students), specifically engaging and inspiring students toward business venturing. Other educators' experience demonstrates that experiential learning (Kolb, 1984) is applicable to various areas of teaching (Itin, 1999; McCarthy and McCarthy, 2006; Breunig, 2009; Stremba and Bisson, 2009; Smith Budhai and Brown Skipwith, 2017). Bartels and Wagenaar (2018, p.191) describe “three pedagogical practices for recognizing and tolerating affective resistances to experiential learning and finding creative solutions to emergent research problems”.

The idea of combining the real and the virtual (Tavangar, 2014) by use of VR (Virtual Reality) and AR (Augmented Reality) technologies and their tools in education is opening unlimited horizons. Considering the advantages that come with the growth of artificial intelligence (AI), Harasim (2017) regards *connectivism* as a learning theory and renames the theory of online collaborative learning as *collaborativism*. Starkey (2012) explores the perspective of knowledge transfer and pedagogy within digital context, and underlies the importance of critical thinking during digital age – while considering both online and face-to-face interactions. Based on faculty interviews, Ko and Rossen (2017) focus their research on teaching massive open online courses (MOOCs) using open educational resources, learning analytics, and online tools (multimedia and mobile devices among them).

The issue of sustainability is studied in case of mobile technologies (Ng and Cumming, 2015), which are one of the fastest growing areas of technology used in education: the main challenges are the significant investments in mobile devices and associated technologies that should be made by the university, time and training required to initiate mobile learning programmes, and the fast pace of technology changes (associated with new rounds of investments). On the other side, the easy access of larger number of students, regardless of location, is an important advantage.

About three decades ago, Wiener (1989, p.58) observed that people “spend what may amount to forty per cent of this normal life as a learner ... It is as completely natural for human society to be based on learning as for an ant society to be based on inherited pattern.”

Only a generation later, we acknowledge the principle of LLL (Long Life Learning). Counter-intuitively, *the technology progress is not going to shorten the duration of learning* (as compared to the life span) for at least two reasons: increased complexity of [science and technology] knowledge, and higher pace at which volumes of data outpace the learning capacity of human brains. The solutions are on all sides: automatization of the education process and making it more effective and efficient; use of more advanced, technology-based education methods, as seen above; use of working machines (robots) able to learn at a higher pace than humans do. Hence, a new category of challenges for scientists: developing learning languages for other than inter-human communication: but for man-to-machine, machine-to-man, and even machine-to-machine communication, dealing with both phonetic and semantic aspects of language (Wiener, 1989, p.74). Consequently, *there is a need for more educators, for longer periods of time, able to play a newer, more complex role*. In addition, suitable online teaching programmes have to be developed, in line with the university mission (King and Alperstein, 2014).

Summarizing, the near-future-educator should:

- Master new education technologies.
- Be able to use new teaching technologies.
- Be able to teach students how to use the new learning technologies.
- Know to discern between: true *versus* false, fake or misleading information; important *versus* not important information; relevant *versus* not relevant for the discussion.
- Be able to teach students how to discern themselves.
- Mentor and guide rather than simply teach the students.

On the other side, the people will live longer (de Grey & Rae, 2007) and, eventually, think about becoming immortal (Fossel, Blackburn & Woynarowski, 2010; Cave, 2012; Popescu & Scarlat, 2017). Other than trivially enjoying the life, living longer means more time to cope with larger and larger volumes of information and to learn more (i.e. *more time for education*), to have more time to apply the acquired knowledge. Strictly, in terms of education, other questions arise: How will education look-like in the longer run and how its components will evolve? The answers are all beyond the goal of this paper. Therefore, the objective is limited to *launch the thesis of education paradigm shift* – in that respect of the educator’s role in the predictable future – in order to provoke a discussion on this subject, and, eventually, to open a research path, for [higher] education strategists, policy makers, scholars and educators.

#### 4. Conclusions

*In the near, predictable future*, the education system (as part of the human society) will continue its mission and address the needs of the increasingly technologized society, while the educator’s role is undergoing a *paradigm shift: from educator to master of new technologies as well as students’ mentor and guide to discern the right information from the available ocean of mixed information*.

*On longer run*, the future education will depend on future technologies and their impact on the human society, but mostly decisions made by humans. Therefore, the education system and educator’s role will significantly depend on how the future humans (both educators and students) will evolve – either still *homo sapiens* or different species adapted to the radical technology changes. The human race suffocation or extinction as result of wrong technology decisions is an extreme possibility (Wiener, 1989; Martenson, 2011; Harari, 2016). Is it to cope with sustainable technology development as *homo sapiens* or is going to be a different community of *homo networkingus* or *homo cyberneticus*?

Today, the higher education is at a crossroads. The humans are actually in front of largely spread options: within the angle between *wiseman* and *cyborg*, hopefully, the common sense will prevail.

*It is up to contemporary educators, it is their educative mission and mentoring role to steer younger generations to make the right decisions for the future.*

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## SPECIAL EDUCATION TEACHERS: TRAINING AND INTERVENTION STRATEGIES FOR INTERNET RISKS OF STUDENTS WITH INTELLECTUAL DISABILITIES IN SPANISH CENTRES

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### Abstract

The use of the Internet is a key aspect in the inclusion of students with intellectual disabilities (ID) in the current information society, although this process entails both benefits and potential risks. The perceptions of teachers and, in particular, of special education teachers are of interest for taking advantage of the benefits of the Internet since they are essential supports in the digital literacy of their students. In the same way, these teachers can favour the prevention and management of online risks. The purpose of this study was to explore the training received as well as their perceived ability to prevent and manage risks online. A cross-sectional study was conducted based on a survey design in which 134 Spanish special education teachers participated (27 male, 107 female), belonging to ordinary centres ( $n = 56$ ) and special education centres ( $n = 78$ ). Teachers had an average of 16.31 years of teaching experience ( $SD = 10.40$ ). Descriptive and contrast analyses were performed using the T and Chi square tests. The results show that 88.1% of the participating teachers have not received any training on online risks. Consequently, teachers perceive themselves as little or nothing at all prepared to prevent online risks (51%), or to manage them if they occur (61%). There are no significant differences in the competence perceived by teachers according to whether their educational centre is ordinary or special, or according to gender. On the contrary, there were differences in the application of five of the 24 preventive mediation strategies analysed. These results show that the participating teachers have not received adequate training to optimize the potential benefits of the Internet for people with ID, neither to prevent nor manage the associated risks. Hence, teachers tend to feel barely competent to address this issue. This fact is of important relevance since the special education teachers are one of the key supports in schools for students with ID both in direct educational intervention and in the advice of the rest of the teachers. Their lack of training calls into question their ability to develop a digital literacy that favours the inclusion of these students. Therefore, the need to design and implement specific training plans on this subject for teachers as well as measuring their effectiveness is concluded.

**Keywords:** *Intellectual disability, Internet, mediation, training, teachers.*

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### 1. Introduction

People with intellectual disabilities (ID) have alterations in cognitive functioning associated with difficulties in adaptive skills. Consequently, they require supports of different intensity and nature to improve their functioning in different environments and activities (Schalock et al., 2010). Digital inclusion is a basic right for people with disabilities (United Nations, 2006). The use of the Internet carries benefits that must be enhanced, and risks that must be prevented or managed (Chiner, Gómez-Puerta, & Mengual-Andrés, 2019). Caregivers (e.g. family members, teachers, support staff) represent the most important source of training and support for the use of digital devices by people with ID (Palmer, Wehmeyer, Davies, & Stock, 2012). What's more, they also turn out to be a very suitable source for online risk prevention (Wright, 2017).

The role of teachers in this regard is key since they support digital literacy and online access of students with ID (Kydland, Molka-Danielsen, & Balandin, 2012). This situation highlights the importance of teachers' training in order to implement online risks mediation strategies that favour the safe use of the Internet by their students with ID (Kalmus, von Feilitzen, & Siibak, 2012). However, there are still very few studies that address this issue (Normand & Sallafranque-St-Louis, 2016), and they are even less so in the field of special education teachers (Chadwick, 2019).

## 2. Objectives

This study aimed to know the training received by special education teachers as well as their perceived ability to prevent and manage risks online in students with ID. It also had the purpose to determine differences in teachers' perceptions according to their gender and type of centre they work at.

## 3. Methods

### 3.1. Participants

Stratified cluster sampling was carried out taking the three provinces of the Valencian Community (Spain) as stratum to randomly select the schools. A sample of 134 participants was obtained, composed of teachers who belonged to Primary Education Schools ( $n = 32$ ), Secondary Education Schools ( $n = 24$ ), and Special Education Centres ( $n = 78$ ). The majority were female teachers ( $n = 107$ , 79.9%), with an average age of 42.68 years old ( $SD = 11.09$ ). The teachers had a teaching experience that ranged from 1 to 39 years, with an average of 16.31 years ( $SD = 10.40$ ).

### 3.2. Instruments

A questionnaire was designed adapting the contributions made by the *EU Kids Online* project (Sonia Livingstone, Haddon, Görzig, & Ólafsson, 2011) to the characteristics of the population of special education teachers. In addition to the demographic information of the participants (e.g. gender, age, province, type of centre), the questionnaire, first, included a 5-point Likert scale (1 = not at all prepared, 5 = very prepared) in which teachers were asked about their perception of training to prevent or manage risks online for students with ID. Second, the instrument presented a list of 24 online risks prevention or management strategies and participants were asked to indicate which ones they had used in their centre or promoted with the families of students with ID. Third, using a dichotomous question, the teachers had to answer whether they had received specific training on safe use of the Internet by minors with ID and, if so, what the duration in hours of this training had been. Finally, the questionnaire presented a question about the sources from which the teachers had obtained information and / or training; they were also asked to mark which of these sources they would like to receive specific training from. The validity of the questionnaire was calculated using the Content Validity Index for which the review of 10 experts in education and ICT was requested, obtaining a result of .87 (Lawshe, 1975). Reliability was adequate reaching alpha values equal to or greater than .81 in the various sections of the questionnaire.

### 3.3. Procedure

A cross-sectional descriptive and comparative study was carried out based on a survey design. The study received the approval of the Ethics Committee of the University of Alicante (procedure UA-2017-11-15). An informed consent of all the participants was collected and the surveys were anonymised. The surveys were sent by post to the selected schools in an envelope, which included the informed consent, a cover letter, the surveys, and a postage-paid envelope for their return. The time required, to respond to the instrument was between 10 and 15 minutes approximately.

### 3.4. Data analyses

Descriptive analyses were performed to identify their perceptions on their training and skills to prevent or manage online risks. Differences between teachers' perceptions according to gender and centre were performed using contrast analyses (T and Chi square tests).

## 4. Results

### 4.1. Training received on Internet safety and teachers' perceived level of preparedness

Regarding the training received, 88.8% of the participants ( $n = 119$ ) indicated that they had not received any specific training related to online safety or online risks prevention and management for students with ID. Furthermore, teachers perceived that their training to prevent or manage risks online was moderate. Taking into consideration the 5-point Likert scale (1 = *not at all prepared*, 5 = *very prepared*), the respondents placed their prevention preparedness at an average of 2.78 ( $SD = .873$ ) and 2.65 regarding their skills to effectively manage risks ( $SD = .834$ ). Furthermore, 38% of the teaching staff indicated that they felt not at all or slightly prepared to prevent risks, while 45.6% expressed it in these same terms in the case of online risk management. The results did not show statistically significant differences according to gender or type of centre regarding the perception of teachers' preparedness to prevent or manage Internet risks for students with ID.

The teachers who had received specific training on this subject ( $n = 15$ ) indicated that it ranged from 45 minutes to 100 hours, with an average of 33.58 hours ( $SD = 32.98$ ). The results did not show statistically significant differences in the training received by the teachers, according to gender or type of centre. As reflected in Table 1, the sources from which teachers have mostly obtained information or training are the media (41%) and the workplace 30.6%). Regarding training sources prioritised by teachers, specialized teacher training centres (which are called CEFIRE at the Valencian Community, Spain) (59.7%) and training plans at their workplace (46.3%) stood out.

Table 1. Information and Training Sources on Internet use and safety received and wanted.

Source	Received		Wanted	
	n	%	n	%
Workplace	41	30.6	62	46.3
Training and Resource Centres for Teaching (CEFIRE)	27	20.1	80	59.7
Media	55	41	22	16.4
Internet service providers	7	5.2	31	23.1
Public Administration	20	14.9	56	41.8
Non-profit organizations	20	14.9	40	29.9
Specialized websites	29	21.6	32	23.9
Family and friends	36	26.9	16	11.9
Other sources (e.g. police, self-taught)	9	6.7	4	3
Have not received or wanted to receive information	8	6	0	0

When contrasting the results on received information and training sources according to gender and type of centre significant differences were identified. First, it was observed that males had obtained more information from specialized websites than female teachers (40.7% vs. 16.8%,  $\chi^2 = 5.931$ ,  $p = .015$ ). Second, teachers in ordinary schools had obtained more information from the media than teachers in special education centres (57.1% vs. 29.5%,  $\chi^2 = 9.192$ ,  $p = .002$ ).

#### 4.2. Online risks mediation strategies

Table 2 shows how the most frequent mediation strategies implemented are based on talking to students with ID about what they do on the Internet (88.1%), staying close to them when using the Internet (76.9%) or sharing online some activities (71.6%).

Table 2. Internet risk mediation strategies implemented and/or promoted by teachers.

Strategy	Total sample		Type of centre				$\chi^2$
			GEC <sup>(1)</sup>		SEC <sup>(1)</sup>		
	n	%	n	%	n	%	
Talks/workshops aimed at families	49	36.6	28	50	21	26.9	6.522
Talks/workshops aimed at the students with ID	59	44	15	26.8	44	56.4	10.609**
Talk about what they do online	118	88.1	49	87.5	69	88.5	0.000
Sit next to them while using the Internet	78	58.1	27	48.2	51	65.4	3.276
Stay close to them when using the Internet	103	76.9	37	66.1	66	84.6	5.304*
Share online activities	96	71.6	38	67.9	58	74.4	0.396
Activate content control filters	63	47	28	50	35	44.9	0.169
Install navigation and access control programs	44	32.8	23	41.1	21	26.9	2.352
Install antivirus or anti-spam programs	66	49.3	25	44.6	41	52.6	0.532
Prohibit them from using social networking sites	32	23.9	11	19.6	21	26.9	0.592
Control the use of social networking sites	37	27.6	12	21.4	25	32.1	1.347
Prohibit them from sharing personal information	32	23.9	7	12.5	25	32.1	5.821*
Talk about which sites are appropriate	81	60.4	32	57.1	49	62.8	0.234
Talk about misleading advertising online	81	60.9	35	63.6	46	59	0.131
Talk about the risks of data / identity theft	75	56.4	35	62.5	40	51.9	1.070
Talk about the risks of online chatting or flirting with strangers	94	70.1	37	66.1	57	73.1	0.466
Talk about what they would do if they were worried about something that had happened online	66	49.3	22	39.3	44	56.4	3.170
Control time on the Internet	59	44	21	37.5	38	48.7	1.240
Check their browsing history	28	20.9	9	16.1	19	24.4	0.900
Check their messages	25	18.7	9	16.1	16	20.5	0.182
Check friendships or contacts added to their social media profile	20	14.9	7	12.5	13	16.7	0.178
Place fixed devices in common areas	23	17.2	13	23.2	10	12.8	1.800
Allow them to use mobile devices only in common areas	41	30.6	16	28.6	25	32.1	0.058
Other (disable wifi password, firewall)	11	8.2	4	7.1	7	9	0.004
Not used any strategy	0	0	0	0	0	0	-

<sup>(1)</sup> GEC: special education teachers at general education centres; SEC: special education teachers at special education centres; Chi-square significant at \* $p < .05$ , \*\* $p < .01$ .

Special education teachers at special education centres implemented more frequently than teachers at general education centres strategies such as talks/workshops aimed at the students with ID (56.4% vs. 26.8%,  $\chi^2 = 10.609$ ,  $p = .001$ ), stay close to them when using the Internet (84.6% vs. 66.1%,  $\chi^2 = 5.304$ ,  $p = .021$ ), and prohibit them from sharing personal information (32.1% vs. 12.5%,  $\chi^2 = 15.821$ ,  $p = .016$ ). The results also showed statistically significant differences according to gender. Specifically, male teachers tended to implement more the strategy based on talking about which sites are appropriate (88.9% vs. 53.3%,  $\chi^2 = 9.999$ ,  $p = .001$ ).

## 5. Discussion and conclusions

This study aimed to explore the training received by special education teachers as well as their perceived preparedness to prevent and / or manage risks online in students with ID. Findings showed that the participants in this study had little training in the safe use of the Internet by their students with ID. Furthermore, they consider themselves only moderately prepared to deal with the online risks of their students, as other studies had previously found (Gómez-Puerta & Chiner, 2019). This situation contrasts with the recommendations regarding the importance of knowing mediation strategies for online risk prevention or management (Karaseva, Siibak, & Pruilmann-Vengerfeldt, 2015).

The most common implemented actions have to do with active mediation strategies such as talking to them or offering information. The use of these strategies can promote a greater understanding by students of online hazards while favouring positive risk management (Seale, 2015). However, teachers also use other strategies based on monitoring, restriction or technical control (e.g. being close to them when they use the Internet, sharing activities online). These strategies seem to reflect a lower confidence of teachers in the capacity of the student with ID to manage risks and an attitude towards overprotection, which is inadequate to favour the personal autonomy of these people (Seale & Chadwick, 2017).

Regarding the sources of information or training, a large part of the teaching staff has received information about the risks by the media. This source of information may not be adequately rigorous for training. However, a significant number of teachers have also received training in their workplace. In general, teachers claim to receive training from formal sources such as teacher training centres, their workplace, or from the public administration itself. Anyway, further research is needed to better understand the factors that underlie these findings (Gómez-Puerta & Chiner, 2019).

This study has several limitations that must be taken into account when interpreting its results. First, the sample does not represent the population of special education teachers. Secondly, the data only represent the perception of the respondents, which may be biased and not coincide with the objective reality of their training or risk prevention strategies implemented. Finally, the data collection method (postal survey) also has certain limitations (e.g. poor understanding of the questions, low response rate) and may also bias the results (Creswell, 2012).

In sum, findings showed that teachers lack adequate training to manage the risks associated with Internet access for students with ID. Likewise, the mediation actions implemented seem to underlie an attitude of lack of confidence and overprotection towards the person with ID, an aspect that should be specifically addressed in teacher training. Participants have received most of the information available to them through the media, which seems inappropriate. Training plans for this group of professionals must be designed, implemented and evaluated. Finally, it is advisable to continue investigating and deepening on this issue due, on the one hand, to the relative novelty of the subject and, on the other, the educational and social implications of the phenomenon.

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## DIMENSIONS OF STUDENTS' ENGAGEMENT AND SELF-INSIGHT IN UPPER SECONDARY EDUCATION

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### Abstract

The aim of this study was to analyse the dimensionality and reliability of an instrument capable of measuring readers' engagement and self-insight in literature education. A self-report questionnaire was administered to upper secondary grammar school students in three Austrian regions (n=417). Principal axis factoring with Promax rotation was conducted. As the number of factors to be retained was ambiguous, various models were tested. Finally, I arrived at an eight-factor solution which fulfilled the most relevant theoretical and statistical criteria for this study. The factors Insight and Self-perceptual depth are considered to be forms of self-insight, the factors Cognitive Perspective-taking, Identification, Narrative Presence, Pre-enactive Empathy, Realism, and Self-implicating Givenness constitute interrelated modes of engagement. The Cronbach alpha values for the subscales generated by PAF indicated adequate internal consistency. Limitations and implications are discussed.

**Keywords:** *Factor analysis, literature education, scientific study of literature, narrative engagement, self-insight.*

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### 1. Introduction

Empirical research on the assessment of pedagogical interventions in the field of literature education presupposes the availability of reliable and valid instruments to measure students' responses to literary texts. This study aimed to determine the dimensionality and internal consistency of existing measures in order to provide a psychometrically sound *post facto* instrument that is capable of testing the effects of instructional interventions on high school students.

Miall highlights the need to examine literature education empirically in order to improve the practices in the literature classroom (Miall, 2011). According to Fialho, Zyngier and Burke (2016), scientific study of literature education has mainly been conducted in three lines of research: 1. reading experience (Fialho, Zyngier & Miall, 2011; Janssen & Rijlaarsdam, 1995; Miall, 2006; van Schooten, Ootsdam & de Glopper, 2001), 2. knowledge that informs readers in their responses (Andriga, 1996; Janssen et al, 2012), and 3. growth of literary expertise (Peskin, 2010; van Schooten & de Glopper, 2003). The author concludes that very few efforts have been expended to produce evidence-based theories and to test their educational relevance.

With a few exceptions (e.g. Fialho, Zyngier & Miall, 2011; Shrijvers et al, 2019), instructional interventions in the field of literature education were not subjected to empirical testing. In order to be able to empirically verify impacts of instructional interventions on high school students' engagement and self-insight, the psychometric properties of given subscales were tested in classes 11 and 12 of grammar schools across Austria. Whereas transactional modes of engagement (Rosenblatt, 1995) are supposed to indicate students' level of agency, self-insight addresses shifts in self-perception and self-understanding resulting from the reading and teaching of literary texts.

To analyse engagement, the Empathy subscale from the LRQ (Miall & Kuiken, 1995) was applied. It measures projective identification with fictional characters and reflects the extended presence of these characters with the reader. The Emotional Engagement and Narrative Presence subscales were included from the Narrative Engagement Scale (Busselle & Bilandzic, 2009). They measure the feeling for and with characters and the sensation that the reader has left the actual world and entered the *diegesis*. From the ASQ (Kuiken & Douglas, 2017), Expressive Enactment (mini-scales: 1. Peri-personal Space, 2. Pre-enactive Empathy, 3. Self-implicating Givenness) and Integrative Comprehension (mini-scales: 1. Extra-personal Space, 2. Cognitive Perspective-taking, 3a. Realistic Conduct, 3b. Affective Realism) subscales were selected. The first set of mini-scales measures processes of transportation (Cf. Narrative Presence), the second set different modes of empathy, and the third set associations readers find between the text and the self or the real world.

Two subscales are used to explore self-insight: a. Insight from the LRQ (s.a.), and b. Self-perceptual depth from the EQ (Kuiken, Campbell & Sopcak, 2012). Insight focuses on shifts in self-understanding whereas Self-perceptual Depth examines changes in self-perception.

In the following study, the question of which dimensions of engagement and self-insight can be extracted from the data gathered from Austrian students in upper secondary education will be addressed.

## 2. Methods

### 2.1. Participants

The sample comprised 417 Austrian students attending grades 11 and 12 of public grammar schools. 225 were female (54.0%), 192 male (46.0%). The sample was evenly distributed between students from rural (n=211) and urban areas (n=206).

### 2.2. Procedure

The items of the instrument were translated into German and administered during the 2019/20 school year.

To obtain a representative sample of students in grades 11 and 12, we drew a sample from the population of 135 grammar schools in the regions of Burgenland (96 students), Carinthia (115 students) and Vienna (206 students). Representatives of the regional education authorities randomly selected schools and classes to participate in the given validation study. As a consequence, students were not selected on their competence in literature education.

Questionnaires were administered online via EvaSys survey tool, and the data were automatically transferred to SPSS for computation.

### 2.3. Instruments

For collecting quantitative data, various five-point Likert-type scales ranging from 0 (=not at all true) to 4 (=extremely true) were used. The self-report questionnaire comprised 56 items. To measure engagement, the subscales narrative presence (NP 1-3) and emotional engagement (EE 1-3) from the Narrative Engagement Scale (Busselle & Bilandzic, 2009) were applied. 23 items measuring integrative comprehension (INC 1-13) and expressive enactment (EXE 1-10) from the Absorption-Like States Questionnaire (ASQ; Kuiken & Douglas, 2017) were added. Moreover, participants responded to the empathy (EMP 1-7) subscale from the Literary Response Questionnaire (LRQ; Miall & Kuiken, 1995).

To measure self-insights, two standardized instruments were applied: the Insight subscale (INS 1-13) from the LRQ and the self-perceptual depth subscale (SPD 1-7) from the Experiencing Questionnaire (EQ; Kuiken, Campbell & Sopcak, 2012).

### 2.4. Data analysis

In this study, the underlying structure of the instrument was explored using exploratory factor analysis.

Although the structure of the subscales had been previously established using EFA, it was not appropriate to only use CFA because the subscales were newly combined to address the need for an instrument that assesses pedagogical interventions, thus potentially changing the latent structure of the data. EFA was performed on the full sample using SPSS version 26 after having confirmed that the assumptions for factor analysis were met and the data were suitable for this statistical procedure. Principal axis factoring was used to extract the factors because Tabachnick and Fidell suggest applying PAF instead of PCA when the researcher is interested in a “theoretical solution uncontaminated by unique and error variability and [researchers] have designed [their] study on the basis of underlying constructs that are expected to produce scores on [their] observed variables”. (2007, 63). This was followed by oblique rotation of factors using Promax rotation.

The decision on the number of factors to be retained was guided by three statistical criteria: 1. Kaiser’s criterion of eigenvalues above 1<sup>1</sup>, 2. inspection of the screeplot, and 3. PCA parallel analysis using the software developed by Watkins. Items with low communalities or high cross-loadings (above .32) were dropped from the initial solution. We adopted the suggestion that “if the cutoff for the number of factors is unclear, the researcher might find it useful to undertake several factor analyses with different numbers of specified factors.” (Pett, Lackey & Sullivan, 2003, 120). In addition to the statistical criteria, factor interpretability and usefulness of the solution (s.a.) were taken into account when deciding on the number of factors to be retained.

<sup>1</sup> Gorsuch (1983) suggests that this criterion is most accurate when there are fewer than 40 variables, the sample size is large, and the number of factors is expected to be between [n of variables/5] and [n of variables/3]. Only one condition is met in our case as the instrument comprises 56 items and the number of expected factors is smaller than n of variables/5. As a result, this criterion must be applied with caution.

After having established the measurement model by means of EFA, the reliability of the subscales was assessed using Cronbach alpha coefficients.

### 3. Results

#### 3.1. Suitability of the data

The Kaiser-Meyer-Olkin (.940) and Bartlett test of sphericity (.000) indicated that the data were adequate for factorization. According to Tabachnick and Fidell (2007), the sample size of 417 can be considered as good. A missing data (pairwise) correlation matrix was analysed. From the inspection of P-P plots for each variable, we can infer that the data were, overall, normally distributed. Mahalanobis Distance analysis with a cutoff level of  $\alpha = .001$  detected 16 multivariate outliers. These cases were excluded from the subsequent principal factors extraction.

#### 3.2. Factor analysis

Principal axis factoring (PAF) with Promax rotation was performed through SPSS 26 on 56 items for a sample of 401 students. Principal components extraction was used prior to principal axis factoring to estimate the number of factors and absence of multicollinearity. PAF revealed ten eigenvalues exceeding 1 (54.686 % of the total variance explained), but only five factors exceeded the criterion value obtained from Parallel Analysis (Horn, 1965). Inspection of the scree plot (Cattell, 1966) supported a five factor solution (47.350 % of the total variance explained). Therefore, the number of factors to retain is ambiguous.

Due to low communalities, items INS 12 (.122) and INS 13 (.217) were excluded. Factors 9 (EE 2 and 3) and 10 (INC 2 and 3) were deleted because only two items loaded on these latent variables and eigenvalues for factors 9 and 10 were low. In addition, cross-loadings were above .32 for items INC 2 and 3.

Thus, 50 items qualified for further analysis. PAF with oblique rotation of the variables was rerun and yielded 8 factors with eigenvalues exceeding 1, accounting for 53,752 per cent of the total variance explained. Inspection of the Pattern Matrix showed a relatively clear eight factor solution in line with the theoretical background provided by the authors of the instruments.

As statistical and theoretical criteria yielded different results on how many factors to retain, PAF was rerun with 5, 6, 7, and 8 specified factors. The 8 factor solution proved the most adequate fit. The Pattern Matrix displayed a clear structure (Table 1, Cf. appendix). Moreover, this solution is in line with the theoretical underpinning of the given instruments. Finally, it serves the research purpose of validating a measure that is capable of assessing shifts in both self-insight and transactional modes of engagement. In a five factor solution, the modes “Pre-enactive Empathy”, “Realism” and “Self-implicating Givenness” which are crucial to evaluating the efficacy of pedagogic interventions in the field of literature education were lost.

To enhance the interpretability of the factors, only variables with factor loadings as follows were selected for inclusion in their respective factors:  $>.55$  (factor 1),  $>.75$  (factor 2),  $>.61$  (factor 3),  $.58$  (factor 4),  $.75$  (factor 5),  $>.52$  (factor 6),  $>.59$  (factor 7),  $>.60$  (factor 8). Therefore, the following items were deleted: EE1, EMP 1, EXE 1, EXE 2, EXE 3, INS 1, INS 2, INS 10, INC 1, INC 8, INC 9, INC 11, SPD 6, SPD 7.

In accordance with the original labels of the standardized instruments, the factors are named, respectively: (i) Insight; (ii) Cognitive Perspective-taking; (iii) Self-perceptual Depth; (iv) Identification<sup>2</sup>; (v) Narrative Presence; (vi) Pre-enactive Empathy; (vii) Realism; (viii) Self-implicating Givenness.

Following Promax rotation, the 8 factors showed moderate intercorrelations ( $r = .14 - .65$ ).

#### 3.3. Reliability

The Cronbach alpha values for the subscales generated by PAF exceeded the recommended value of .7, indicating adequate internal consistency (Table 2).

Table 1. Descriptive statistics and reliability of subscales.

Subscales	No. items	Students' Ratings		Internal consistency
		<i>M</i>	<i>S.D.</i>	Cronbach's alpha
Insight	8	1.85	.83	.86
Cognitive Perspective-taking	4	2.54	.96	.87
Self-perceptual Depth	5	1.09	.83	.86
Identification	6	1.35	.91	.80
Narrative Presence	3	1.87	1.07	.81
Pre-enactive Empathy	4	1.02	.99	.86
Realism	3	1.77	.93	.80
Self-implicating givenness	3	1.27	1.05	.86

<sup>2</sup> Factor 4 was renamed from “Empathy” (LRQ) to “Identification” in order to guarantee discrimination between factors 4 and 6 which measure different aspects of the relationship between reader and character.

#### 4. Discussion and conclusions

This study yielded an instrument with valid and reliable scores that can assess high school students' engagement and self-insights. Eight dimensions of reading experience were extracted. The factors Insight and Self-perceptual depth are considered to be forms of self-insight, the factors Cognitive Perspective-taking, Identification, Narrative Presence, Pre-enactive Empathy, Realism, and Self-implicating Givenness constitute interrelated modes of engagement. The eight factors are investigated on the respective subscales which all show a satisfactory internal consistency ( $\alpha > 0.80$  for all subscales).

It has to be noted that confirmatory factor analysis needs to be performed in order to assess the fit of the proposed measurement model. A structural model has to be added to understand possible predictors of self-insight.

Furthermore, reading experience is dependent on the literary text assigned for reading and on the students involved. Therefore, the study has to be replicated with different materials and populations.

It must be considered a limitation of the study that three of the proposed modes of engagement (Emotional Engagement, Peri-personal Space, Extra-personal Space) had to be excluded due to statistical reason. Further research has to cover alternative modes of engagement with literary texts.

Finally, upcoming research projects should take other variables into account that might influence students' responses to literature (e.g. reading habits, reading motivation, personal bias, attitudes to teachers).

In conclusion it can be said that instructional interventions need to be empirically researched in order to test their learning effects on students. The proposed eight-factor instrument might serve as a valid and reliable measure of students' engagement and self-insight.

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## Appendix

Table 1. Pattern Matrix and Communalities for PAF with Promax Variation.

Items	Factors								COM
	1	2	3	4	5	6	7	8	
INS4	<b>.817</b>	.056	.074	-.112	-.143	.065	.015	-.110	.575
INS7	<b>.722</b>	-.156	-.162	.000	.050	.071	-.002	.182	.510
INS5	<b>.721</b>	.088	.093	.029	-.114	.057	-.075	-.088	.569
INS3	<b>.687</b>	.047	-.110	-.079	.078	-.152	-.044	.217	.468
INS9	<b>.623</b>	-.038	.146	.034	-.198	.123	.137	-.188	.441
INS8	<b>.619</b>	-.030	.180	.045	-.026	-.081	.126	-.114	.485
INS6	<b>.598</b>	-.144	-.164	-.022	.240	-.058	.024	.170	.411
INS11	<b>.551</b>	-.070	-.147	.046	.051	.088	.049	.186	.414
INC6	.005	<b>.850</b>	-.008	-.019	-.068	-.090	.005	.125	.651
INC7	-.040	<b>.823</b>	-.121	-.056	.075	-.021	-.049	.142	.645
INC5	.036	<b>.779</b>	.003	.045	-.106	-.018	.002	.077	.589
INC4	.039	<b>.754</b>	-.012	.055	.028	.012	-.057	-.069	.593
SPD3	-.030	-.036	<b>.867</b>	.118	-.180	.045	-.057	.000	.621
SPD4	.056	.060	<b>.714</b>	-.133	.079	.011	.033	-.029	.619
SPD2	.007	-.169	<b>.706</b>	-.020	-.024	-.018	.043	.171	.522
SPD5	.035	.069	<b>.664</b>	-.042	-.033	.089	.004	.002	.539
SPD1	.096	-.082	<b>.619</b>	.001	.131	-.034	.020	.142	.618
EMP5	-.035	-.005	-.041	<b>.720</b>	.013	-.072	.128	.025	.476
EMP3	.029	.122	-.167	<b>.621</b>	-.044	.090	.020	.109	.493
EMP4	-.129	-.155	.146	<b>.620</b>	.031	-.168	.042	.122	.327
EMP7	-.003	.182	.041	<b>.614</b>	.085	-.078	-.049	-.044	.493
EMP2	.055	.014	-.109	<b>.605</b>	-.041	.090	-.067	.049	.413
EMP6	.066	-.160	.115	<b>.583</b>	-.016	.053	.030	-.043	.404
NP3	-.049	-.135	.007	-.018	<b>.857</b>	.069	.101	-.083	.629
NP1	.049	.096	-.143	.039	<b>.759</b>	-.015	-.016	-.109	.538
NP2	.001	-.004	.002	.000	<b>.759</b>	.037	.037	-.173	.529
EXE5	.028	-.075	-.064	-.027	.052	<b>.841</b>	-.021	.181	.796
EXE4	.029	-.109	-.030	-.099	.005	<b>.759</b>	.163	.054	.573
EXE6	-.074	.052	.125	-.021	.154	<b>.544</b>	-.023	.090	.580
EXE7	-.030	.035	.149	.074	-.042	<b>.523</b>	-.036	.191	.537
INC12	.054	.173	-.041	.065	-.001	.009	<b>.721</b>	-.064	.656
INC13	-.038	-.106	.001	.083	.025	.104	<b>.707</b>	.096	.589
INC10	.056	.052	.060	-.064	.025	-.018	<b>.598</b>	.161	.560
EXE9	-.030	.135	.109	.049	-.169	.095	.037	<b>.719</b>	.675
EXE8	.008	.095	.106	.091	-.170	.097	.013	<b>.705</b>	.651
EXE10	-.027	.052	.075	.003	-.126	.263	.050	<b>.606</b>	.600

Note. Factor 1 = Insight. Factor 2 = Cognitive Perspective-Taking. Factor 3 = Self-perceptual depth. Factor 4 = Identification. Factor 5 = Narrative Presence. Factor 6 = Pre-enactive Empathy. Factor 7 = Realism. Factor 8 = Self-implicating Givenness. COM = communalities.

Bolded items indicate major loadings for each item.

## CREATING AN INTERACTIVE TOOL FOR STUDENT COMMUNICATION: LESSONS LEARNT

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### Abstract

Following significant success in the use of so-called “backchannel” tools in building student engagement within the School of Electronics, Electrical Engineering and Computer Science at Queen’s University Belfast a situation arose in 2018 where our choice of provider closed down. We attempted to use other available off-the-shelf tools but for various reasons these were not widely adopted. At the end of 2018 we decided to implement our own student-facing communication, question and, chat tool for students and lecturing staff to use. Called QChan the system went live, while still under development, to classes as large as 400 in size in January 2019. Developing a system to encourage use, be easily accessible and yet secure and robust enough to withstand experimenting computer science students was something of a challenge. In 2020, QChan is widely used in our school and has been a driver to better student engagement. We continue to develop QChan and also analyse it and the other platforms’ content to better understand how to consistently engage with students.

*Keywords: Backchannel, engagement, chat, technology.*

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### 1. Introduction

The engagement of students as active participants in teaching is a key topic of interest especially as we seek to move from the “chalk and talk” didactic form of delivery to one of discussion and giving students agency in their own learning. Key to this is breaking down the barriers, especially in the increasingly common large cohorts (Gibbs & Jenkins, 2014) found in universities. One such approach to encourage interrogative questioning is the use of “back channels” which allow interactions between staff and students alongside the traditional lecture (Baron, et al. 2016). Facilitating engagement in this fashion is seen to both increase the volume of questions from the class to staff but can also facilitate intra-student communication to build a community (Bry, Gehlen-Baum, & Pohl, 2011; Fortes & Tchantchane, 2010; Yong-Su Pohl & Gehlen-Baum, 2011).

We, at Queen’s University Belfast in the School of Electronics, Electrical Engineering and Computer Science, make use of such backchannel approaches and have been keenly interested in their adoption and effectiveness (McDowell et al, 2019-1).

Initially we used a freely available product called TodaysMeet in providing backchannel support. This was a web-based totally anonymous system where anyone with the room code could join and comment. Although engagement was good there were some issues with inappropriate comments being made which, due to the anonymous nature, could not be sourced back to any individual. TodaysMeet was then withdrawn by the company providing it.

The school then moved onto using Microsoft Teams for class-based questioning. This is completely tied to the user accounts and all questions/comments are seen with the full name of the person posting them. The take-up of teams was very low with few students using it to engage, and our research pointed to the issue being a lack of any sort of anonymity (McDowell et al, 2019-2; McDowell et al, 2019-3). We therefore decided to address this issue and look towards an in-house solution.

## 2. Requirements

Clearly the issues facing the two previous platforms were contradictory; anonymity led to inappropriate untraceable content and no anonymity led to a complete lack of engagement. The solution we determined to try was that of “pseudonymity” where each account was distinct and tied to student email but a chosen nickname was all that was visible to other students and, unless specifically requested, staff. Students were clearly told that they must act appropriately and that all comments could, if necessary, be traced back, but otherwise they were anonymous within the cohort.

This, along with a review of the existing systems and multiple conversations with stakeholder staff, led to the following requirements for the system:

- Pseudonymity of users within rooms
- Multiple rooms (for example for a module)
- Different access models (join by code, must be added, open to public)
- Different posting models (open forum where anyone can see any post by anyone or question channel where only staff members can see posts from students)
- Mobile-first development (the vast majority of students will use their mobile devices to access)
- Single-link login (saves another username and password or any federated login setup)
- No specialist software or install required (web based)
- Batch enrolment of students by staff

## 3. Development

With these requirements in mind initial development took place in December 2018 with acceptance testing in very early 2019. The first cohorts of students to be enrolled began to use the system (QChan) in mid-January 2019. The decision was made to fast-track development and deploy live to the students and then review and develop iteratively as needed.

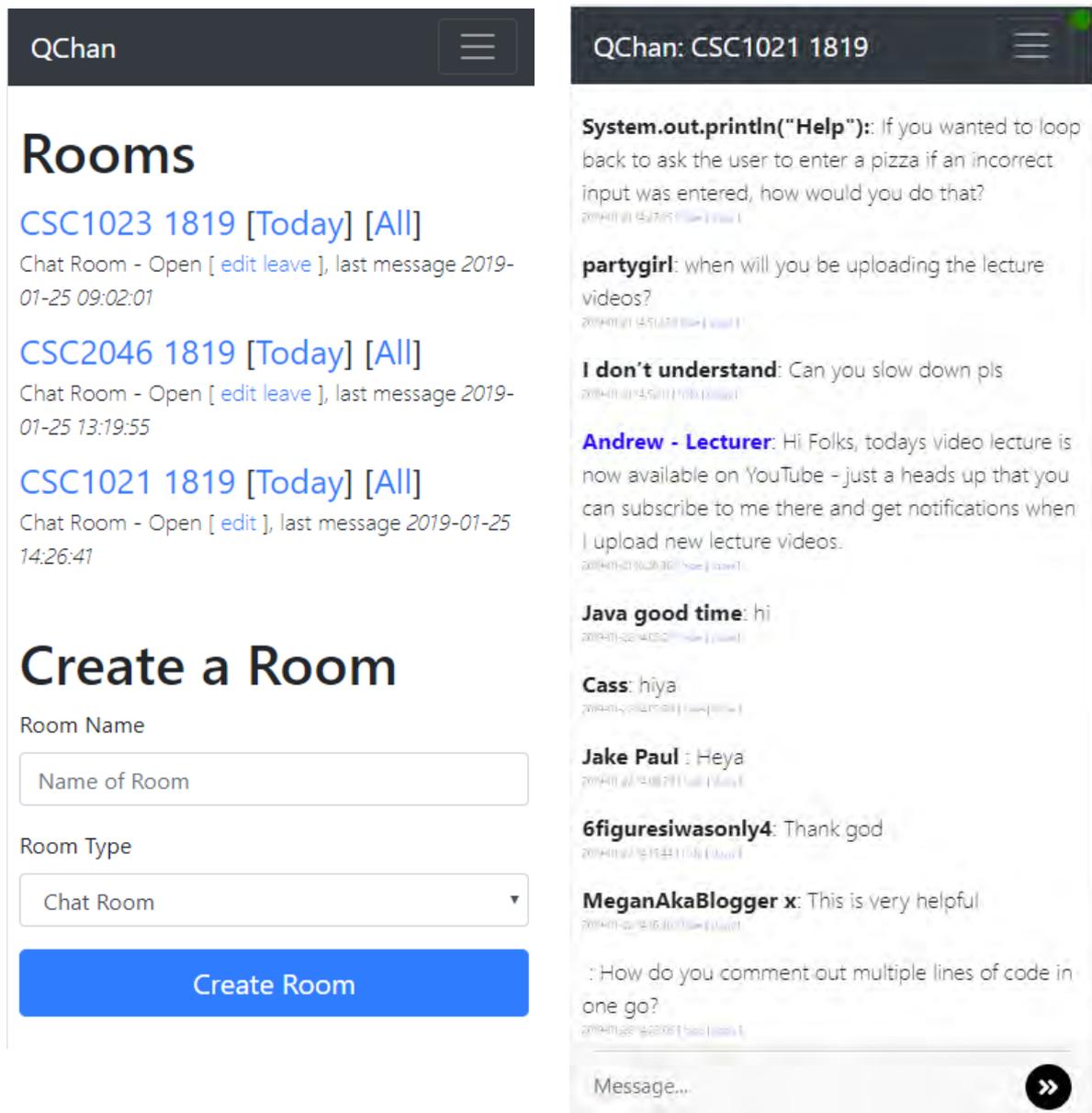
The initial deployment worked well, and student engagement was very good in early classes. Several bugs were quickly identified (and exploited!) by computer science students including allowing scrolling and flashing text in nicknames. A special “break this” room was created and students who wished to explore the confines of the system invited to do whatever they wished in there and report back. Several high-quality items of feedback and suggestions were received and incorporated into the functions. An example of QChan in operation can be seen in Figure 1.

## 4. Conclusion and future work

QChan has now been successfully used at Queen’s University Belfast by a number of staff over one and a half academic years. During that time many hundreds of students have been connected simultaneously and nearly 4,000 messages have been sent. The pseudonymous nature appears to have increased engagement while at the same time only requiring that two students were looked up and sent warning emails. Clear messaging that this was possible has largely removed the issues that were present with the fully-anonymous Today’sMeet.

QChan (<https://qchan.io>) is still under active development and we welcome any other higher or further education institutions that may like to use QChan or become development partners to get in touch through the corresponding author Dr David Cutting ([d.cutting@qub.ac.uk](mailto:d.cutting@qub.ac.uk)). We are actively now analysing the messages sent through the different platforms including sentiment analysis to better understand how to effectively use these tools to build better and consistent engagement.

Figure 1. Example QChan Mobile Interface with Room Menu and Student Engagement.



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## **EVALUATION OF IMMERSION PROGRAM FROM STUDENT' PERSPECTIVE IN SICHUAN UNIVERSITY, CHINA**

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### **Abstract**

The UNIVERSITY IMMERSION PROGRAM (UIP) of Sichuan University is an international communication program. It aims to broaden the global view and cultivate global cooperation awareness of the students. UIP consists of four parts, the first is general or specialized courses provided by professors from all over the world, the second is seminars or symposiums on various topics, the third is field study and visits, and the fourth is local cultural interactions. This paper intends to evaluate UIP in students' perspective. The article evaluates four parts mentioned above by using questionnaire survey and self-report survey. This research includes three steps. First step is evaluating field visits and cultural interaction by using 18 self-reports. Second step is evaluating courses and seminars by collecting relevant data from results of student's evaluation related to professors teaching quality. Third step is evaluating the whole effectiveness through interview method. Findings reveal the following facts. Firstly, students are more satisfied with local cultural interactions than other three parts due to more chances will be given to communicate freely with professors and international students. Secondly, advanced technology or infrastructure will improve their satisfaction in field study and visit. Lastly, the contentment of English courses is subject to teaching style of professors or the way to organize class. In the end suggestions and strategies are put forward to improve students' satisfaction and influence of UIP.

**Keywords:** *Student perspective, Sichuan university, evaluation, university immersion program.*

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### **1. Introduction**

Recent years, higher education has changed a lot under the great challenge of globalization and knowledge economics. Students received higher education are going to face more difficult professional problems and compete with talents from various countries (Miranda et al 2020). It means higher education need to cultivate both student's professional ability and inter-cultural communication ability. Based on that background, Sichuan University put forward international immersion program. This program aims to enhance communication with excellent university in other countries and cultivate cooperation, competition awareness among students. It includes four parts, one is general course taught in English; second is seminars organized by famous professors; third is field visits; fourth is local culture experience. So far, it has been held eight years successfully in summer campus. 144 top universities (such as Harvard University, Oxford University, and Cornell University) from 26 countries have involved in this program (SCU, 2019).

### **2. Research question**

How students feel about this program? What they can really gain from this program after participate it? How it influence participators in the near future, whether it bring some changes to their cognition or skill. This paper will analyze these questions from the four parts described above.

### **3. Culture experience evaluation**

Culture experience activities are through all the program, but it main gathered in class and in the process of Local cultural visit. Group discussion, case sharing are methods used by teachers to lead inter-culture communication in class. In the International Citizen Class, students are requested to make presentation about featured things or traditional custom in their hometown. Russian student introduced their unique ways to show welcome. Japanese student introduced their dress up convergence phenomenon in job fair, as people feel it's safe to dress same. Chinese students introduce Miao architectures which are better

suitable to living in groups and hoarding food. After classes and seminars, students visited places of interest or local special museums, for example Students visited Jinsha site as well as the giant panda breeding base, which have strong regional color and historical heritage.

Of the 18 self-reports, 12 students mentioned cultural sharing activity in class and 16 students mentioned local cultural visits. The cultural interactive activities organized by teachers purposefully are the method for students to conduct cultural communication in a concentrated and efficient way. Participants use "impress", "wonderful", and "enlighten my mind" most frequently to describe the cultural communication in the classroom. One student wrote "What impressed me most is story character analysis in the class. Students from different countries have different opinion about the same character, even students with same cultural background have different attitudes towards the same role"; another student wrote "the cultural sharing activity in the classroom increased my ability of understanding other cultures". The local culture visit not only helps participants to understand the local culture but also to learn to get along with people in different cultural backgrounds

Overall, cultural interactive activities were mentioned and described the most in the 18 self-reports. The activities give participants more opportunities to express themselves freely. Participants can promote their understanding of other countries and broaden their horizons through discussions, case studies, and chats. It is beneficial for students to exercise their English skills, improve the ability to communicate with international students in a relaxed and pleasant atmosphere.

#### **4. Field visit evaluation**

Field visit refers to the object of the visit is closely related to the student's major or the courses of the UIP. For example, Huaxi School of public health discussed the similarities and differences between Chinese and foreign public health policies and practices in class. In order to learn about the development status and practice of public health in China, students visited the Yulin community health service center in Wuhou district, Chengdu city. Under the guidance of the doctors in the center, students learned about the department Settings of yulin community health service center. The foreign students showed great interest in Chinese herb and were impressed by the massage.

In 18 self-reports, 12 participants used adjectives such as "amazing", "advanced" when describing field visits. Eight participants gave detailed descriptions of some of the advanced equipment during the visit, such as registration machines and remote consultation techniques. Students from the University of Manchester also compared Chinese public health system with their own, because of the advanced Chinese medical equipment and perfect primary medical service system they saw during the visit. They believe that our country has such a perfect public medical system. It is related to a strong government in China. The British public health system runs very slow. Only private hospitals have advanced medical equipment and a fast response system, but only a few people can afford this service (Daniel, 2015). One student expressed in self-report "one day I would introduce this advanced equipment into her country and apply them to the public health system".

Through self-reports, it is easy to find that the focus of the participants is on advanced facilities and high technology in field visit. We can show the prosperity of our nation to international students through showing high-level facilities and equipment, comprehensive service system, etc. For Chinese students, the sense of ownership and national pride are enhanced.

#### **5. Course evaluation**

UIP courses are organized by professors from top universities or research institutes abroad. Professors must meet the following criteria to ensure the quality of teaching: With the title of doctor degree or assistant professor; working as a teacher in foreign famous universities or research institutions; Or senior scientist or principle scientist of fortune 500 enterprises. The class is made up of 50 students, and the ratio of international students to local students is 1:5. The teacher's teaching style is unique and vivid. Cases or combined with their own experience are commonly used to explain the truth. Eleven of the 18 self-reports used words like "interesting" to describe the class

A single self-report cannot quantify students' satisfaction with the course, so this paper analyzes the course from the results of students' teaching evaluation in 2016(SCU,2018).the teaching evaluation makes a comprehensive investigation on the teachers from nine aspects, such as the basic daily teaching behavior, teaching attitude, teaching method, teaching content, after-class counseling and student satisfaction. The evaluation is based on a hundred-mark system, with an interval of 90-100 being excellent and 80-90 being good. The total average score of the 183 courses reviewed in 2016 is 81.3.

In 2016, national students conducted a teaching evaluation of 183 courses. From the single index score above, we can see that students scored 8.3 for "teachers' daily basic behavioral norms" and "attitudes toward teaching", which were the two highest scores among the single indexes. Students have the lowest score for the indicators of "Curriculum Understanding". "The teaching content", "course design" and "after-school tutoring" score is 8.2 between the highest and the lowest score. Through the above analysis, it concluded that the basic quality of the curriculum can be guaranteed, and teachers can organize the curriculum in a planned and purposeful manner. However, the teaching methods of teachers need to be improved. The problem that needs to be solved urgently is that students cannot fully understand the teaching content.

Some students pointed out that the foreign teachers' accent is heavy, their speech speed so faster that students can't make clear the content. Although parts of students got high score in CET-6, they still feel hard to keep up with the teacher. The interactive between students and teacher is not high. It reflects that students' ability to apply English is insufficient. Students need some time to adapt to face-to-face communication with foreign teachers and immersion teaching environment.

Table 1. 2016 UIP Teaching Evaluation Results.

Single indicator	average score	6.0~6.9	7.0~7.9	8.0~8.9	9.0~10.0
No lateness, early departure	8.27	7	53	104	22
NO arbitrarily transfer courses,	8.30	6	50	105	25
Strict teaching attitude	8.30	6	52	104	24
Various teaching methods	8.18	9	61	98	18
New teaching content,	8.20	9	61	97	19
Course design	8.20	8	63	95	20
After-school tutoring	8.20	8	58	102	18
Curriculum Understanding"	7.91	15	91	69	9
Students' overall satisfaction	8.03	11	76	87	12

## 6. Seminar evaluation

The seminar mainly focused on hot issues at home and abroad. In 2019, UIP opened a total of 76 seminars. The seminar not only struck the spark of students' wisdom, but also broadened the international horizon (Michelle, 2012). In order to gain an in-depth understanding of public diplomacy, the School of International Relations invited nine consul generals of ASEM members to conduct seminars with students on the theme of "public diplomacy". It help students to have an intuitive experience of engaging in public diplomacy, and also have a deeper understanding of bilateral relations, bilateral economic and trade, cultural, and educational cooperation.

Five of the 18 self-reports mentioned the seminar and some classmates wrote in the self-report that "this seminar has opened up students' horizons and enhanced students' understanding of the construction of the Belt and Road interconnection with Asia and Europe". While learning knowledge, students can also discover the advantages of classmates from different countries, and learning from each other. One student writes in self-report that "The students from Osaka University are rigorous in thinking and doing things seriously! The students from the University of Washington have many ideas and open thinking".

## 7. Summary and suggestion

Among the four parts of UIP, cultural experience activities are mentioned the most in student self-reports, followed by general courses, professional visits and seminars. So the most impressive thing in the whole project is the cultural experience activity. It provides students and teachers with a relaxed and pleasant atmosphere of communication and promotes students' understanding of different cultures. In trace interview, 10 participants believed that through this project, they became more confident in communicating with foreign students; two participants believed that through the sharing of cases of international students in class, they pay more attention to empathy in their daily lives and consider issues from multiple angles.

### **7.1. Promote the construction of all-English courses**

Encourage and support the transformation of bilingual courses to full English courses. The university need to strengthen students' practical English application ability, improves teachers' internationalization ability and promotes the construction of English-only courses by organizing teachers' ability improvement training and overseas study visits (Ricardo et al, 2020).

### **7.2. Recruit international students from all over the world to create an international campus atmosphere**

To form an environment for students to use English outside the classroom so as to improve their English communicative ability. Some students' problems in the project are due to their lack of ability to think and solve problems. Subject committee should reform the teaching content. Professor need organize the teaching content according to the teaching syllabus, and timely incorporate the international cutting-edge academic development into the teaching content.

### **7.3. Develop students' international education concept**

Pay attention to students' comprehensive application of knowledge. Adding Students' class performance, homework, mid-term and final grades, learning results after class, into evaluation system (Wiwik,2010). It is a good way to broaden students' international horizon through participating the activities of UIP. To promote students to establish a sense of international competition and cooperation. In this way, students' participation in UIP project can be improved.

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# LIFE IN THE BONDS OF SOCIAL EXCLUSION AS A DISADVANTAGEOUS FACTOR OF EDUCATION

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## Abstract

Social exclusion is a phenomenon affecting different spheres of an individual's life, and its consequences are seen at many different levels – economic, social, spatial, cultural and others. Life in the bonds of social exclusion is devastating, especially for children. In the field of education, exclusion is becoming a disadvantageous category that indicates a wide range of causes of school failure. The environment from which children come to schools is naturally of great importance for their educational process. It is therefore necessary to identify obstacles that make it difficult for pupils to learn, as well as phenomena that make children potentially or actually fail in schools.

In our research we focus, from a qualitative perspective, on a description of the role of a socially excluded environment, as even a partial determinant that affects the educational path of children who come from such a background. Our aim is to create a complex picture of the barriers that hinder the educational process of pupils and, subsequently, to identify the appropriate areas of support that the pupils need in order to overcome those barriers, and to make them work in the future.

*Keywords: Exclusion, environment, disadvantage, pupil, education.*

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## 1. Introduction

In Czech social pedagogy, the so-called natural environments of education are traditionally the focus of attention. These include mainly family, school, local and group environments. Current pedagogical research focused on environmental issues extends the range of interests to the work and leisure environments.

One such environment, and from the point of view of contemporary social pedagogy the most important one, is the environment of socially excluded persons. In general, social exclusion is defined as social disadvantage, marginalization, and an inability to access resources, i.e., the marginalization of people with limited access to education, culture, health, sport, employment, etc. However, social exclusion does not only mean that these are poor people. This concept is much broader, and not everyone who is poor is unconditionally socially excluded. Different authors on social exclusion describe and divide it differently. What they agree on is that it refers to a specific group of people who have a specific form of action and behaviour that we call a culture of poverty.

The term 'culture of poverty' emerged in the early 1960s in the United States and referred to a specific culture among immigrants, especially from the Caribbean. The term was introduced to the social sciences by Oskar Lewis. His work on defining a culture of poverty has found followers on the one hand, but has been widely criticized on the other. Cohen (2010) states that the culture of poverty is a concept in social theory that argues that the values of people living in poverty play an important role in maintaining their poverty and maintaining the cycle of poverty between generations. For Harrington (1962), the culture of poverty is a structural concept defined by the social institutions of exclusion that create and maintain the cycle of poverty in America. The culture of poverty not only applies to the United States, but is described in all countries, both developed and developing.

People in a culture of poverty have a strong sense of marginality, helplessness, addiction, and inappropriateness. They are like foreigners in their own country, and they are convinced that the existing institutions do not serve their interests and needs. Along with this feeling of helplessness, there is a widespread feeling of inferiority and personal inappropriateness.

People in a culture of poverty have very little sense of history. They are marginalized people who know only their own problems, their own local conditions, their own surroundings, and their own way of life. They usually have neither the knowledge, the vision nor the ideology to see the similarities between their problems and the problems of others like themselves elsewhere in the world. In other words, they have no class consciousness, although they are very sensitive to status differences (Lewis, 1968).

Skarupská (2016) defined the specifics of the culture of poverty, from which we can choose the main feature of these people, namely a huge passivity. Other specifics include living in the present, narrow cognitive functions, simple language and thus simple thinking and underestimation of education, very weak family ties, and an oppositional relationship with the majority (yet with the expectation that the community will take care of them). Typically, this is a generational transfer.

In the Czech Republic, according to the last survey conducted in 2015 by the GAC agency (Čada et al., 2015), there are 95,000 - 115,000 people, of whom 75% have completed only a basic education, living in approximately 300 socially excluded localities. Children under the age of 15 account for approximately half of them – about 50,000.

According to Czech legislation, these children are in a group of pupils with special needs. These pupils are entitled to support measures (Decree No. 27/2016 Coll.), which are primarily the possibility to use a teaching assistant. The position of teaching assistant is linked only to classroom work. It is not possible to work deeper with a family and cooperate with other support organizations. The disadvantage of this decree is that it is very general and focuses on children across the whole spectrum of specific needs – from gifted children, through children with some type of disability, to children from socially excluded backgrounds.

Therefore, some primary schools located close to socially excluded localities have established the position of social pedagogue, which has a much wider scope of help than just a teacher's assistant. The scope of work of a social pedagogue was prepared by the Association of Educators in Social Pedagogy (2020), and this scope of work gives a social pedagogue very broad competencies, not only for work in the school environment but also for work with families and other institutions, especially with the social and legal protection of children. Unfortunately, the legislative position of social pedagogues is not anchored in the Czech Republic, so whether or not they will work at a school depends on the effort and will of the school principal and, especially, on the will of a founder, because it is necessary to secure funding for this position. Therefore, in addition to its main objective, which is stated in the title of this paper, our investigation also seeks to contribute to the establishment of this position by law.

## 2. Objectives / methods

In our research project, we assumed that individuals are embedded in the environment and form an indivisible whole with this environment. Their development is naturally conditioned by a number of external and internal factors that affect them in this environment. These determinants are in interacting relationships. Of course, the specific environment with all its relationships influences the educational process of children, so examining the conditions in which students live, explaining the relationship between the environment of students and their education, and describing the student's background itself, are requirements that are reflected in the research of modern pedagogical sciences.

The aim of our research was to describe the role of the socially excluded environment in relation to the educational process of children from families living in such an environment. We aimed to characterize the main pitfalls, problems and obstacles that disadvantage students, from the perspective of both their families and the social workers and teachers who work with the students and their families. Subsequently, we identified the appropriate areas of support that students (and their families) need to be successful in school. The main objective of the investigation was:

- ✓ *To describe the role of the socially excluded environment in a pupil's educational process and subsequently identify the main areas of support.*

In examining the research problem conceived in this way, we leaned towards a qualitative approach. Interviews with pupils, their parents, teachers and other staff who support pupils and families in various areas of life (housing, employment, education, etc.) have become a method of data collection. The following were involved in the research:

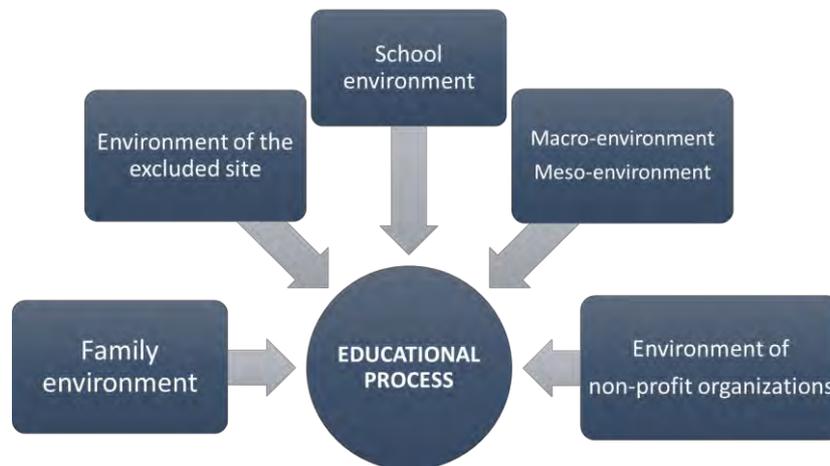
- ✓ 10 families living in socially excluded sites
- ✓ 10 workers with families (5 teachers, 1 career counsellor, 4 social workers with families)

We acquired about 30 hours of recorded interviews. These were then transcribed literally and the data was analysed using thematic analysis. We looked for common topics that the participants talked about and that related to our main research question.

### 3. Results

From the responses of the research participants, we identified five environments that play an important role in relation to the educational process of students and that affect their success or failure in school:

*Figure 1. Determinants of the pupil's educational process.*



1. Family environment
2. Environment of the excluded site
3. School environment
4. Macro-environment, meso-environment
5. Environment of non-profit organizations

#### 3.1. Family environment

The role of the family environment was mentioned as crucial for the upbringing and education of pupils by all participants in the research. They clearly identified the role of the parental pattern in the transgenerational transmission of values, life strategies, actions and behaviours. They mentioned that both the parents and their descendants, the pupils, approach education and school in the same way. This is naturally reflected in the upbringing of children and guidance to fulfil their school responsibilities and to learn, in order to make their achievement at school satisfactory and improve their chances for social employment. Those parents, who seek to create a stimulating and supportive environment for the development of the needs and interests of their offspring, are those whose children are more likely to be more successful in the educational process.

#### 3.2. Environment of the excluded site

According to teachers, social workers and parents themselves, a disadvantaged environment, especially a life in social exclusion, is seen as a clearly dominant negative influence in relation to the upbringing and education of children. One of the priorities of families in difficult life situations, and one in which parents invest their efforts and time, is to solve their own existential problems. Naturally, the necessary time investments and efforts in supervising, controlling and helping a child with school duties, as well as efforts to motivate children to learn and continue on their educational paths, are not made, and overall the motivation to succeed in school is low. However, not only external motivation, but also the internal motivation of students in their own educational experience is insufficient. In a socially excluded environment, there are no positive patterns that could be followed by children and young people, no patterns of behaviour that presuppose successful integration into society, patterns of behaviour that support responsible, independent and self-sufficient survival strategies and independence from external sources (e.g., in the form of social benefits or ongoing assistance and support from the non-profit sector). Experts state that the path of social exclusion is also conditioned by the degree of individual effort, resilience to the negative influences of the environment, and the ability to overcome adversity, in the form of various social problems, to ensure optimal social functioning in society.

The environment of socially excluded localities is perceived by research participants from the ranks of experts who work with families as demotivating and lacking in incentives. *Well, I think it's the socially excluded site, that there aren't many of those stimuli, that it's a demotivating environment, and if the stimulus happens to be there, it's more scary and disconcerting (P, 299-301).* They even define it as a socially pathological environment. *... but the problem here is that there is an awful lot of drugs. And those socially pathological phenomena are quite visible here. Now the question is how to eliminate it (I, 13-15).* Together, they recommend not to segregate and concentrate families, especially in large ghettos outside cities; on the contrary, they place hope in efforts to integrate the population into society – within the housing policy of cities and municipalities.

In connection with this topic, experts questioned whether it is possible for the young generation to break free from the shackles of social and economic exclusion. *... It is important for them to be able to get out of that location, of course, to be able to move out of that location, either alone or with their partner, with the one or two children they have. However, they do not see the way. They have no perspective, they have no possibility (P, 356-360).* Experts claim that it is life outside the conditions of social exclusion that models a positive attitude towards education and a higher probability of their success at school.

### **3.3. School environment**

Significant factors influencing the upbringing and education of pupils from socially disadvantaged backgrounds were identically mentioned: pedagogical workers – teachers, educators, workers in leisure activities and others working in the school environment. The importance of the teacher-pupil (or teacher-pupil-family) relationship was pointed out, as was the need for professional non-teaching staff in schools. The principal (Ř, 76-88) called out: *Give me three social workers at the school and I will change the situation!* He also emphasized the need for social workers, educators or mediators in a particular school. As principal, he would have them at his disposal and assign them work, and they would be directly accountable to his management. They would control attendance and absences, oversee school preparation, and be available for negotiations between the students' parents and the school. Experts clearly emphasize equal access to education and the joint education of children from socially disadvantaged / excluded backgrounds with other children. They emphasize the role of the process of integration and inclusion in their future lives. The existence of schools with signs of so-called segregated education, where children from this environment (often Romany children) make up more than 50% of children in a class / school, was unequivocally condemned. Unfortunately, the experience of such schools shows that such schools exist in the Czech Republic, despite all integration and inclusion efforts. They also attached considerable importance in the child's educational process to quality pre-school education for children, lasting at least 2 years. The primary influencing factors in the school environment are, of course, quality teachers, teaching assistants, educators and other staff, who can make the school environment more friendly for pupils and their families and motivate children to develop.

Below is a list of specific individual proposals that the experts pointed out in working with students:

1. The need for trained staff (not only teachers but also other staff with pupils' families)
2. Stricter rules for controlling pupils' attendance
3. Compulsory school attendance up to 17 years
4. Motivationally set methods of working with children and youth
5. The need for strong role models
6. Support for hobby education
7. Not having homework

### **3.4. Macro-environment, meso-environment**

The research participants assessed the cooperation of institutions involved in addressing the integration of socially excluded families into society at the national, regional, and municipal levels as insufficient. There were suggestions for the professionalization of activities and for the effectiveness of cooperation between the state, ministries, city and regional authorities, non-profit organizations and school facilities. In particular, social workers clearly acknowledged the concept of joint education in the form of inclusion and the possibility of supporting pupils from socially disadvantaged or directly excluded backgrounds.

The meso-environment is seen by research participants as motivating and stimulating, especially in the area of positive peer influences. In the naturally friendly ties between children and youth, there is a mutual enrichment and intertwining of cultural patterns, patterns of behaviour and values themselves. However, the labelling of pupils by teachers and classmates still remains a risk, due to visible social differences and low living standards, manifested mainly in the material provisions of children.

### 3.5. Environment of non-profit organizations

Experts from the non-profit sector spoke very positively about the role of leisure activities in motivating the development of children and youth from socially excluded backgrounds, as well as the role of partial support and assistance to families in specific services (such as tutoring, social activation service, services of a mediator between school and family, and other social services). These weaken the mechanisms of social exclusion and can ultimately lead to better integration into society, to participation in society, and thus to better living conditions. However, with one breath they drew attention to the lack of leisure activities for children and young people from socially excluded families, and to the inappropriate or passive way of spending free time.

## 4. Conclusions

A socially disadvantaged environment and a life in social (and economic) exclusion is a factor that clearly affects the educational process of pupils. Insufficient support for the pupil's family, the parents' lack of interest in educational results, a lack of motivation to go to school, fulfilling the requirements of home preparation, and a low level of aspiration to continue in the educational trajectory, are all risks that lower the chances of success in the educational process. The so-called culture of poverty and its manifestations are firmly imprinted on the lives of the young generation, which finds itself in their bonds and sees no way out. Models of behaviour reinforced by the patterns of parents and other family members are then reproduced in the lives of the next generation living in social exclusion. In this situation where the basic needs of families are not satisfied, the dominant values are naturally those that lead to survival – the value of life; or more precisely the values of survival – housing, work, life without debt. The most important thing is considered to be a solution to problems, often existential, in everyday life.

From interviews with pupils, parents and experts, we clearly identified the main shortcomings in the support of pupils who are marked by social exclusion. Subsequently, recommendations are made that should be taken into account when addressing issues related to the education of these students:

1. Supporting the whole family in fulfilling their functions with respect to all members, especially children.
2. The need to eliminate insufficient support of a child in education by the family, legal representatives or relatives; insufficient guidance for home preparation or communication with the school.
3. The need to eliminate risky behaviour occurring close to a child, whether it involves various types of addiction, violence or abuse.
4. The need for a multidisciplinary team of school staff (trained teachers, social workers, social educators, psychologists, school-mediators between school and family, etc.)
5. The need for active and meaningful ways to fill free time.
6. The need for functional changes at the state level in the areas of housing and employment.
7. The need to motivate students for their own development and education.

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## PERSONALIZED LEARNING IN MATH, THROU PROBLEM-SOLVING, AND THE USE OF ICT

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### Abstract

The challenge of learning math for the 21st century is personalized learning. Personalized learning in math gives everyone the chance to touch the greatness of mathematics.

Personalizing math learning means designing, developing, and applying teaching strategies and techniques while taking into account everyone's skills and intelligence. Personalized learning in mathematics is a necessity, to create opportunities according to the abilities to achieve the ultimate goal, which is the preparation of the capable citizens of tomorrow. Since problem-solving leads the list of skills and competencies that need to be achieved through math learning, developing math learning through problem-solving doubles the importance of learning math. And, if we further add to this mixing with fully defined relationships: personalized learning + problem-solving, we add another element that should characterize today's learning, which is the use of technology, we can prepare generations that not only can learn math but also produce math being the forerunners of technological change to make their implementation in every area of life.

In this article, we will see how we can achieve personalized learning through problem-solving in mathematics in Lower Secondary Education (AMU, in Albanian) and the role that ICT plays in achieving the highest possible results.

**Keywords:** *Personalized learning in math, problem-solving, ICT, gifted and talented, success in math.*

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## 1. Introduction

The education system around the world has on its shoulders the weight of the positive change of the world as a whole, as well as the function of the regulator of all other systems, on which states operate. In these conditions, it is the essential task of the entire education system to design and be the forerunner of all the changes that take place in all areas of life. Education systems need to prepare generations of students, who need to be practical and have a clear mind to face challenges and move forward.

At the same time, by mastering these two qualities, the students immediately adapt and successfully cope with this technological *boom* that has been served to the world. The concept of education as a whole is very broad, but the field of mathematics is the pillar of education as a whole.

For this reason, orientation policies regarding teaching and learning mathematics around the world have clearly and foresightfully defined future teaching and learning practices, based on clear ideas and principles to make them as resistant to change as possible. But while mathematics is the pillar of education as a whole, problem-solving is the pillar of mathematical learning. On the other hand, technology plays the role of strengthening teaching practices, by creating conditions to enable this new form of learning and to promote and activate these transformative approaches to the future-oriented learning process.

## 2. Personalized learning

### 2.1. What is personalized learning?

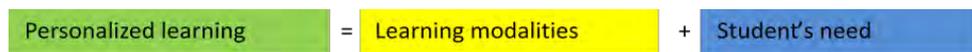
Personalized learning has long been a challenge for teachers, who are passionate about teaching. It requires differentiated treatment for differentiated needs, according to differentiated skills. Personalized learning means the differentiated provision to meet differentiated needs. (Leadbeater, 2005). The teacher is now no longer in the center of attention, he is the support of his students, who learn through a very wide range of great modalities. In this way, he should guide the critical thinking and creative abilities of his students by encouraging them to conclude and by giving them the satisfaction of something they discover for the first time.

## 2.2. Personalized learning in mathematics

21st Century education has 7 key features that make it different from a 20th Century approach. These are (1) Personalized learning. (2) Equity, diversity, and inclusivity. (3) Learning through doing. (4) Changed roles of the teacher. (5) Community relations. (6) Technology. (7) Teacher professionalization. (Bolstad, et al., 2012).

Children of a certain age group each have their mental potential, they are very complex and have developed their senses in different ways. The focus of all math teachers should be on adapting the teaching style, depending on the more developed skills that his students have. From this point of view, considering the theory on the learning modalities of Chris Drew (Drew, Re-examining cognitive tools: new developments, new perspectives, and new opportunities for educational technology research, 2019), which classifies them into 4 major groups, such as visual, auditory, kinesthetic, and tactile, and given the fact that students in a class have different inclinations and diverse abilities, math teachers should use a variety of modalities to suit the needs of students. Mathematically we would express personalized learning with this identity (Figure 1):

Figure 1. Personalized learning model.



One way to personalize learning math is by differentiating the difficulty of the content, unlike older teaching models where all students learn the same content at the same time. Personalized learning is related to the ambitious teaching of mathematics and as such it is very well suited to talented students.

The average level of the classroom *loses* talented students. But as we search for a wide range of modalities, techniques, and strategies, for personalized learning we remember that problem-solving will always be there, to enable us to achieve the highest possible learning outcomes. On the other hand, the implementation of ICT in teaching increases the opportunities that we can offer students for better quality learning in mathematics. Technology is not just a tool. It can give learners a voice that they may not have had before (Couros, 2011).

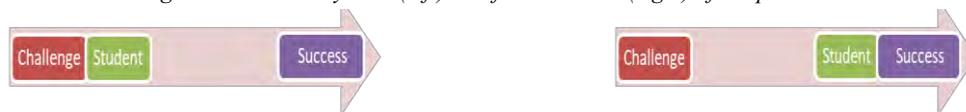
## 2.3. Personalized learning in math through problem-solving and ICT

Developing math through problem-solving means encouraging students to reason rather than memorize certain mathematical template facts and knowledge. *Problem-solving is not only a goal of learning math but also a key tool for doing so* (National Council of Teachers of Mathematics (NCTM), 2000).

On the other hand, moderating the role of the teacher not to provide ready-made mathematics, but to teach students to produce mathematics, plays an essential role on the road to success in this area. In this context, the teacher should select mathematical problems that encourage critical thinking and mathematical reasoning so that the knowledge they receive in school benches resists time.

The difficulty of mathematical problems positions students between challenge and success. Once a math problem is introduced, each student is positioned between challenge and success. The following diagrams show the position of *starting* and *arrival* for a particular student at the time he is presented with a problem in math (Figure 2).

Figure 2. Familiarity with (left) and final solution (right) of the problem.



The goal is to shift it to the area of success. This distance is not the same for all students in the class, but the time it takes to achieve success is different for different students.

Despite the distance that challenges and success have for different students, several factors that would narrow this distance and the time to achieve success are:

1) **Well-planned design** of the teaching techniques. The application of selected techniques and modalities should be accompanied by both parties with perseverance, exchange of ideas and thoughts, specific stimulus questions that excite mathematical reasoning, critical and logical thinking. Students learn to solve problems in mathematics primarily through *doing, talking, reflecting, discussing, observing, investigating, listening, and reasoning* (Copley, 2000).

2) **Implementation of technology in teaching mathematics**, because technology as a cognitive tool does not do the thinking for students, but provide strategies and guidance to help students to process information more efficiently (Drew, Cognitive Tools for Education | 5 Examples, 2020).

3) **Creating a supportive climate in the classroom**. The classroom should be transformed into an environment that motivates, encourages, supports, and gives opportunities, in an environment where

everyone, regardless of their abilities, feels like a problem solver in mathematics. The coordination and management of all of the above factors are in the hands of the teacher, because as Sidney Hook puts it, *The teacher is the heart of the educational system* (SAGE UK, 2020).

### 3. Case study

#### 3.1. Context

In the nine-year private school “Imelda Lambertini in Elbasan, Albania there is an annual practice with 6th grade students who start for the first time in Lower Secondary Education (AMU in Albanian).

In the first 3 weeks of teaching with sixth graders, math teaching is somewhat special. These 12 teaching hours are hours of recognition and cooperation that is realized through the solution of problems for each of the main themes assimilated up to the 5th grade.

This annual practice has multiple purposes, where in addition to consolidating the knowledge gained up to the fifth grade and creating strong foundations to prepare students who are good, problem-solving, math has two important aspects which are in function of further teaching.

**First**, seen from optimizing pedagogical work as a teacher, this is a period where through research the groups of students are determined according to the learning mode, to plan teaching hours in the function of personalized learning.

**Secondly**, the identification of new talents in mathematics, to create a group of gifted students with whom to work in a differentiated way.

The choice of learning through problem-solving aims to develop in students the following skills: critical and creative thinking, teamwork, independent and self-directed work, the use of technology, the use of new knowledge in real-life situations.

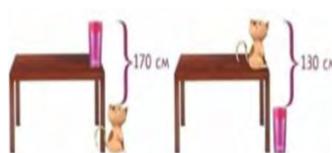
Equipping the school with a good technological base in recent years has significantly improved math learning outcomes. There has been an increase in the number of students who assimilate for a shorter time the solution of some mathematical problems, as well as the feedback they receive at the moment when different quizzes or questionnaires are treated through the KAHOOT! or other applications!

In one of the hours when the knowledge on the applications of the action of the meeting was being strengthened, the students had to face problematic situation, implemented by authors and presented below.

#### 3.2. Problem solving process

**Problem situation 1.** *What is the height of the table?* (Figure 3)

Figure 3. Problem 1. What is the height of the table?



As soon as the problem arose in front of the students, they started asking questions such as: *What is the length of the cat, What is the length of the glass*, and someone even found that it is a problem with missing data. At first, he was asked to look carefully at the figure, remembering that we were only asked the length of the table, but even after that the situation was turbulent.

The problem has no text for the data, and after it was implemented Polya's First Principle: **(Understand the problem)** (Polya, 1945) and asking *Is there enough information to enable you to find a solution?*, the should be 'Yes.'

After the not very clear reactions of the students, the teacher (one of the authors) thought of bringing a very simple problem situation that has been solved in advance, using on the same mathematical concept. We went so far as Polya's Second Principle: **Devising the plan:** *Here is a problem related to you and solved before. Could you use it?* (Polya, 1945).

**Problem situation 2.** For these situations, students needed 2 identical boxes of flour, not filled full, a cup, a glass, a scale. The task was to weigh both boxes in advance and mark the common weight of both boxes together. For the experiment, they were asked to take the first box, remove a cup of flour and add a glass of flour, and weigh it, taking notes of its measure. From the second box students were asked to remove a glass of flour and add a cup of flour, weigh it and mark its weight.

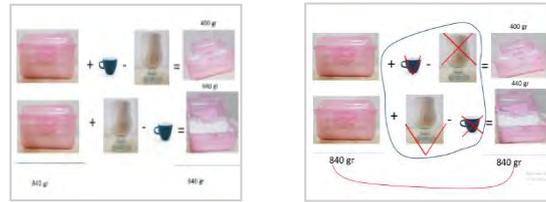
Leading by teacher, they notice that the sum of the measures after these changes is the same as the initial one. 70% of students explained that this happens because mathematically over the weight of

$x$  kg (which is the mass of the same 2 bags of flour at the beginning), we have added and subtracted the same quantity (1 cup of flour and 1 glass of flour), so this mass will remain unchanged.

Dividing by 2 the amount was found: the students found how much the mass of a box with flour in the beginning was. In parallel with the actions performed, the illustrations are made in Smart Board.

The next steps were illustrated on the SmartBoard in the classroom (Figure 4).

Figure 4. Modeling problem situation with SmartBoard.



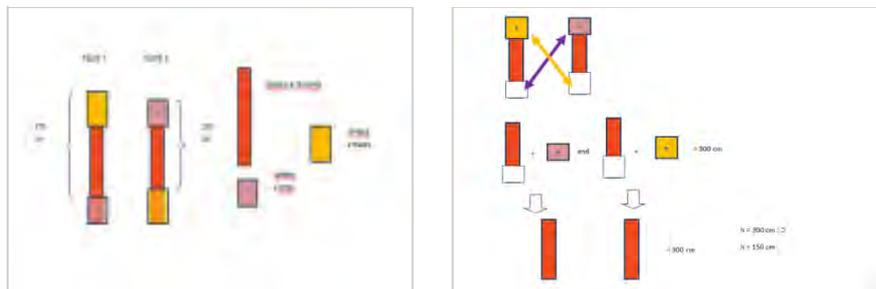
We went back to the case of the problem: After discussion on the analogies of the objects we used in the first problem situation with those of our problem, accurate answers were obtained from most of them.

Students: *In the role of the flour box is the length of the table and in the role of the mass of the cup and the glass are the length of the cat and the length of the glass.*

By scheming the length of the table, the length of the cat, the length of the glass using rectangles in and after presenting the situation on the SmartBoard, the students understood the solution of the problem, reasoning that: *Even in the case of our exercise, the length of the cat and the glass are added and subtracted from both lengths of the same length of the tables.* We add together the parts of which we know the total height, in given case  $170\text{ cm} + 130\text{ cm} = 300\text{ cm}$ . So the height of the tables is  $300\text{ cm}$ . This means that one table is  $150\text{ cm}$  high.

The parts we add are: *The white part represents the height missing from the table. This height is the same as the height of the glass in the first figure and the same as the height of the cat in the second (Figure 5).*

Figure 5. Scetch of the initial problem on SmartBoard.



Using the SmartBoard to demonstrate the situation helped students to perceive the solution in their minds because the more senses they use in the learning process, the more productive it becomes.

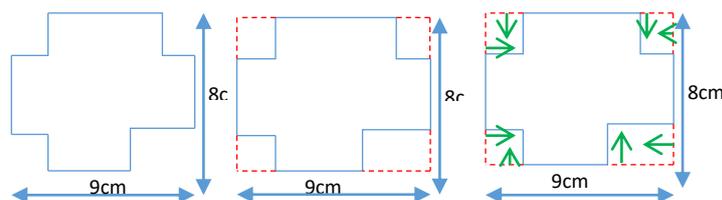
**Problem situation 3.** Find the perimeter of the blue figure.

After treating the solution of the previous problem, we moved on to another problem situation which combines elements from the topic of measurement with that of geometry.

Talented students were instantly oriented towards the solution. For the rest of the class, the initial situation was skeptical, as students were looking for another clue.

After taking the right time, the successive instructions for appearing in the SmartBoard of the auxiliary figure, a large part of the students realized that the solution of the exercise was supported by the same theoretical mathematical concept as that of the first problem (Figure 6).

Figure 6. Successive instructions for solving problem.



Applying experimental learning, guided practices, accompanied by class discussions and guidelines to conduct research and draw conclusions, strongly supported by ICT produce high-quality teaching hours. Technology develops abstract ideas for teachers by which the student's prior knowledge, abilities, and skills, links to materials with mathematical concepts, address common understandings, and introduce more advanced ideas (Center for Technology in Learning, 2007).

### 3. Conclusions

By applying personalized learning, laying the foundation for problem-learning mathematics, and having strong ICT support, math teachers can ensure students' success in math.

In terms of personalized learning, we can metaphorically say that we can consider students in a class as different flowers in a garden and that they require different ways of caring, while the teacher as a *gardener* must adopt the service each of the types of flowers in the garden depending on the conditions it requires to grow as qualitatively as possible. In other words, every student should be seen by teacher as unique person and not just as a child.

In terms of problem-solving, applying the principles of problem-solving accompanied by reasoning, experiments and visual presentation of experiments performed, makes it possible to activate many senses in the learning process, thus making it more productive and significantly improves critical thinking and logical reasoning.

The use of ICT (in this case SmartBoard) highlights the activation and interest of students during the lesson, especially those who are visual, auditory, and tactile learners. The results showed the Smart Board's increased interest and activation of students by stimulating them to be the strength of the learning process. On the other hand, it creates happy students, who believe in their abilities and who are activated to achieve success.

But the use of ICT in teaching mathematics, requires good management of the learning process by finding the right technological resources and their use.

#### *Acknowledgments*

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# **DITCH THE PLASTIC TRINIDAD & TOBAGO: THE DYNAMICS OF A MULTI-SECTORAL SCHOOL-COMMUNITY PARTNERSHIP**

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## **Abstract**

In the Caribbean, the average person contributes about 5 kg of plastic waste per day, one of the highest in the world. However, for Trinidad and Tobago (TT) this is about 1.59 kg. A 2018 report found TT produces roughly 200,000 tonnes of waste annually, with 25% coming from plastics, especially from single-use packaging plastic. Though 55% of plastics end up in landfills, just 19% is recycled. In light of this, TT is about to pass legislation to recycle, recover and re-use waste materials and encourages collaboration among NGOs, CBOs, the private sector and government agencies to educate the public on the impact of plastic waste on health and the environment. Such education is urgently needed as a national survey of secondary school population in 2016 found that just 63% possess a pro-environmental disposition and just 51% were environmentally literate. Involvement of all citizens, in particular, youth who will inherit this problem, is clearly needed to advocate for control and elimination of single use plastic.

Building environmental awareness of youth and their communities can be accomplished through advocacy in multi-sectoral partnerships, seen as beneficial to learning for sustainability. The success of such partnerships is contingent on the capacity of stakeholders to articulate a common vision, and negotiate issues of power, accountability and collaboration while being sensitive to cultural context. This study presents an analysis of a multi-sectoral partnership in a semi-rural district in TT. The partnership advocated for the replacement of single use plastic shopping bags with reusable bags, a project which took place over the course of one year. Partners included local and foreign universities, environmental agencies, secondary schools, and community members of the main partner school. Multi-sectoral partnerships which cross international borders then present unique challenges. The study sought to determine the structures and processes that facilitated the partnership, using a case study design.

Data was collected through Interviews of stakeholders, and analysis of artefacts (minutes of meetings, reports, events, and products). Initial themes emerging through thematic analysis included a common vision, equitable power sharing, camaraderie, agency, national and community visibility and status. Few studies of this nature have been done in TT or the Caribbean, and as such the study has potential for providing important understandings of tools and processes for enhancing school-community partnerships in the cultural context of small island developing states

**Keywords:** *Multi-sectoral partnerships, environmental education, single-use plastics.*

## **1. Background**

The disposal of plastic waste is a global problem. For the Caribbean, whose oceans are the homes of protected marine species such as the Leatherback turtle, plastic bags within the ocean ecosystem are particularly dangerous. TT produces roughly 200,000 tonnes of waste annually, with 25% coming from plastics, especially from single-use packaging plastic (Ritchie & Roser, 2018). TT encourages collaboration among NGOs, CBOs, the private sector and government agencies to educate the public on the impact of plastic waste on health and the environment (EMA, GORTT, 2018). Such education is urgently needed among youth who will inherit this problem. A 2016 national survey of the secondary school population found that just 63% possess pro-environmental dispositions and just 51% were environmentally literate (EMA, GORTT, 2016). However, partnerships between the numerous local environmental agencies are rare. Further, while schools are often stakeholders and beneficiaries of environmental programmes they are hardly engaged as partners with these agencies.

### **1.1. PAN: Protect and nurture Trinidad and Tobago**

In 2018 a partnership between local and international tertiary institutes, local schools, and environmental agencies coalesced under the sobriquet of PAN – Protect and Nurture the Environment Trinidad and Tobago. The Steel Drum which is referred to as the Pan, is the national instrument, and thus the acronym has special significance for the islands’ cultural heritage, and the image of the steelpan is a central feature of the partnership’s logo. PAN is an informal partnership which was triggered by the early service learning initiatives of an American University (AU) in 2009 and 2016. AU worked in partnership with Asa Wright Nature Centre (AWNC) – a leading environmental NGO. PAN launched its first project in 2018 and were able to successfully launch this project with the slogan, “Go Green Not Polythene”. The highpoint of the project was a day of advocacy and education in a rural district. The day involved distributing flyers and reusable shopping bags, and culminated in an afternoon of environmental games at a local grocery where customers were rewarded with reusable bags. The strength of the partnership was such that the group was able to implement a second project in 2019, and is in the process for planning for its third project in 2021/2022. The authors of this study are University faculty and members of PAN. We were intrigued by a partnership that could cut across its many cultural differences to work collaboratively on behalf of the environment. Partnerships hold a great deal of promise for fulfilling the objectives of environmental advocacy (Birdlife International 2008; Tilbury & Wortman, 2004). These partnerships, when they involve schools, are able to realise the goals of environmental education, namely, knowledge building, attitudinal and behavioural change. Partnerships, however, can pose several challenges such as, negotiating commitment, accountability, and power sharing (Eames & Bolstad, 2004). The nature of PAN and its resilience led to questions on the nature and dynamics of the partnership, despite its cultural differences and institutional constraints.

### **1.2. Defining partnerships**

Partnerships have been defined as “a process in which two or more organisations or groups work together to achieve a common goal and do so in such a way that they achieve more effective outcomes than by working separately” (p. 3, BirdLife International, 2008). Partnerships create synergy built on a shared vision, transparency and equity, which allow partners to combine resources, talents, attract financial and technical support, and bring together diverse perspectives to add value to local initiatives (Bird Life International, 2008; Tilbury & Wortman, 2004). Partnerships take a plethora of structures from formal and informal to locally based to internationally formulated. Partnerships with schools have double goals of problem solving and youth development, and school partnerships for the environment find value in grounding their work in locally based and important problems for the school community (Monroe, et al., 2016). All partnerships are characterised by several complex psycho-social and value constructs which must be negotiated for effective problem solving and innovation. The skills of negotiation, accountability, relationship building, and resource and knowledge brokering, pattern recognition of stumbling blocks, are just some of the tools available to partners (Thomson & Perry, 2006; Moore & Wesley, 2011). Research has the capacity to unearth these often intuitive behaviours and values, and in so doing provide partnerships with the capacity to harness such tools consciously for their mutual benefit.

## **2. Objectives of the study**

Environmental projects which have involved collaboration among schools, communities, NGOs and CBOs have been shown to be highly effective in their educational and advocacy roles. While such programmes exist across Trinidad and Tobago, few of them have been evaluated to understand the dynamics of collaborative partnerships for the environment. The purpose of this study is to understand the dynamics of a unique multi-stakeholder partnership which was organised around advocacy to end single plastic bag use in a semi-rural district in the island of Trinidad. The study sought to analyse the structures and processes that facilitated the partnership, using an in-depth case study design. The study raised the question: What were the processes and structures which facilitated a multi-stakeholder, school-community partnership for environmental advocacy (the GGNP project), in a semi -rural district in Trinidad and Tobago? The findings of this study have potential for providing important understandings of structures and processes which facilitate school-community partnerships in the cultural context of small island developing states.

## **3. Methodology**

This research adopted a qualitative approach to investigating the complex issue of a multi-stakeholder school-community partnership advocating against single use plastic grocery bags. Adhering to an interpretivist worldview, we chose a single case study design, which is descriptive in

nature. A case study affords an in-depth analysis of an issue. The case is the PAN partnership structure, and the processes that brought about its formation and sustainability. We sought to explore and understand the meaning of the experiences of participants as they planned and executed the GGNP project established through the PAN partnership. We drew on a broad range of data collection methods - interviews, observations, documents, and a survey. The survey was an open-ended 14 item questionnaire which interrogated participants' motivation and experience of the project. With their permission, 11 participants of the PAN partnership agreed to engage in the research. Documents of minutes of all meetings and emails were sourced for the period of the GGNP project (March 2017- February 2018). The primary researcher was involved in all stages of the project and brought her observations of the project as a source of data. Seven participants, representing 5 organisations, responded to the survey questionnaire administered online. Follow-up interviews were conducted with some of these participants to clarify views expressed in the survey. Data analysis was done through inductive content analysis, arriving at the themes through open, axial and selective coding with reference to the literature. Limitations of this single case study are researcher subjectivity, generalizability to the wider population, and being difficult to replicate.

#### 4. Findings

The following themes (in bold) emerged from interrogation of the data:

**An evolution from Service Learning to Partnership:** The concept of PAN emerged at the first meeting of an ad hoc group of 13 representatives, including environmental NGOs and educators in March 2017. The American University Professors shared the results of their 2016 service learning initiative with the expectation that representatives at the meeting would provide insight on the way forward for their next project in 2018. The rich discussion that ensued provided an understanding of the breadth of initiatives already at work in Trinidad and Tobago, as well the role of environmental education in local schools. Participants decided to create a coordinating committee comprising several of the attendees who committed themselves to a follow up meeting. In the mix was the idea of birthing a multi-sectoral environmental partnership already in conceptualisation by AWNC under the sobriquet – PAN (minutes of 20th March 2017). By the second meeting of the group on April 4th, the dynamics of the group began to be established and roles emerged organically. This meeting was a conversation for visioning. Within the group there were several knowledge brokers, who were able to bring to the table in-depth information on the state of the environmental waste management in Trinidad and Tobago. The idea of PAN as a viable organisation project was established and the need to develop a logo and clear mission statement linked to sustainability was requested. The discussions among the group led to a series of actions and persons volunteered to fulfill the actions and committed to the next meeting. It was clear that there was no friction between members of this group. A **democratic culture** had quickly established itself. There was clearly a sense of **camaraderie**; these were people who felt comfortable with each other. In the survey participants describe their PAN colleagues as “wonderful and committed”, enjoying working with “diverse backgrounds” and “passionate” people. They were moving towards a common goal, though exactly how this goal would be fulfilled was not yet established.

##### 4.1. Establishing group dynamic

The second meeting was a cornerstone in partnership formation. It established the core group, the roles of its members; its modus operandi, its vision and its decision making structure. Each member of this group represented a source of expert knowledge, and garnered unsolicited respect. Emerging from this meeting was a culture of mutual decision making through knowledge brokering and visioning, and a culture of voluntarism. It was a culture that led to ownership of the project and one which allowed individual members to fulfill both personal and organisational goals while working towards a common purpose. The following themes emerged as characterising its modus operandi: Visioning as a democratic activity, Voluntarism, Public sharing of knowledge, Networking, Knowledge and Resource Brokering. It took a full 11 months from the second meeting for the culmination of the GGNP initiative. During this time the group met every month sometimes twice a month using the format and procedures established in the cornerstone meeting of April 04th. The project evolved from an amorphous desire of addressing pollution through education, advocacy and community action into a solid plan with distinct objectives, and activities. Each decision involved **discussions, and ability to compromise, a willingness to listen to the other, and a commitment to voluntarily take on a task**. These observations were supported by the **survey results** which identified collaboration and consensus as the decision making processes.

## 4.2. Roles and responsibilities

Emerging from the data (minutes) were the organic evolution of partner roles and responsibilities. Each individual voluntarily took on a role that they had both the skills and resources to accomplish. These roles included: **Repository and logistic facilitator:** AUNC took on this role. Their remit as an environmental NGO was networking, advocacy and education and they therefore had the tools to fulfill this mandate. As such this NGO acted as an important logistical pivot that kept the momentum of the initiative alive across international borders. **Resource brokers:** The American University was the partner with most access to finances and various levels of expertise. At a local level several of the PAN members were instrumental in sourcing local resources and networking: **School and community liaisons and organisers:** A critical aspect of the GGNP project was the involvement of the rural school and its community, as well as a traditional, academic oriented urban school. The service learning component of the AU wished to facilitate a meeting of AU teachers and local schools. These secondary school students and their teachers were the conduit through which PAN believed that sustainable attitudinal change sustainable would emerge. **Public Liaison:** This member used their networking and contacts to provide the publicity for the event. This gave the walk-about event a certain amount of public accolade and status which transferred to the schools and their students. **Resource support:** Other members acted as resource support pitching in where and whenever needed.

## 4.3. Psycho-social rewards

A second factor which played into the development of agency - that empowerment to act without coercion - were the psycho-social rewards of involvement in such an initiative. This factor emerged through an analysis of the survey and interviews. Respondents spoke to the satisfaction they received through involvement - "a wonderful experience getting to know people and agencies... seeing the impact of change in attitude... and the impact of the project on students,". The survey also confirmed the strength of a common vision which was strongly impacted by the need to influence youth, and to create an authentic service learning experience through community partners. For these partners the challenges lay in juggling their personal commitments with the time demands of the project, and they noted the important role that technology played in lessening this form of stress. The few challenges identified reflect the strength of this partnership and the positive effect the project seemed to exert on its participants. The dynamics of the PAN partnership reflected the strengths of partnerships described in the literature - that is the synergy that a common goal and democratic decision process exert on agency and personal satisfaction.

## 5. Conclusion

The project provides a lesson on how even in limited financial circumstances, a diverse community can broker its expertise, resources, knowledge, and finances to work on an authentic and significant environmental project, and experience a sense of personal satisfaction and accomplishment which creates resilience and sustainability in multi-stakeholder partnerships.

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# EDUCATIONAL AND THERAPEUTIC BENEFITS OF “CONTENT-FOCUSED ACCESSIBLE E-LEARNING MATERIAL” FOR VISUALLY IMPAIRED UNIVERSITY STUDENTS

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## Abstract

The idea of “educational therapy” is quite different in Japan compared to foreign countries, especially in the US, where educational therapy is quite advanced. Therefore, this study determines the educational therapeutic benefits of the author’s “Content-Focused Accessible E-Learning Material” for English self-learning, based on the concept developed in the US, particularly focusing on visually impaired students. These students experience various difficulties in higher education, such as 1) the absence of learning materials in braille, 2) commercial unavailability of magnification-capable learning materials and digital materials, and 3) lack of text-to-speech function in many learning materials. To study whether the material had any therapeutic benefits for these students, the author obtained feedback from 33 students. The feedback was based on the following questions: (1) technical aspects: Did the material reduce/rid the load/concern they felt; and (2) mental aspects: Did the material increase the willingness/autonomy or decrease anxieties and did they feel accomplished or motivated to improve their longitudinal English self-study? The findings show that the material was beneficial to them in five ways.

In conclusion, the goal of this study was accomplished to a considerable degree; accessible learning material that enabled visually impaired students to study English efficiently was created, and the use of this material reduced students’ mental burden in learning. Additionally, it is worth mentioning that students using braille and those who had no major visual difficulties commented that both could share the same learning material, enabling them to study together. Students are hoped to continue carrying out a longitudinal self-learning after graduating, as they build their careers.

**Keywords:** *“Content-focused accessible e-learning material”, educational and therapeutic benefits, visually impaired university students, English learning.*

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## 1. Introduction

In this article, the author uses feedback from visually impaired university students to determine the educational therapeutic effectiveness of “Content-Focused Accessible E-Learning Material.” Their comments indicate that they felt they had received significant benefits from this material’s existence, and that the absence of or inconvenience of using accessible learning materials had caused hardship for them.

According to previous studies<sup>i</sup>, “educational therapy ” conducted in Japan is defined as in-school interventions designed for mentally and physically disabled children who attend appropriate schools. The main therapy method is movement education and therapy, where teachers sing songs, encourage body movements, and draw pictures with students, along with other therapies.

In domestic studies, the keyword educational therapy does not exist. Movement education and therapy is the Japanese equivalent to the phrase educational therapy, and is the primarily teaching method for children or students in special schools in Japan. Meanwhile, the keywords “educational therapy” and “educational therapeutic” exist in many studies conducted overseas<sup>ii</sup>. As it is presented in these studies, educational therapy could include many of the concepts incorporated in Japanese schools; the phrase educational therapy may simply be more common overseas, particularly in the United States. In the US, some national and private organizations offer educational therapy.

Educational therapy as it is conducted in the US is closely related to the educational therapeutic benefits found in the study of “Content-Focused Accessible E-Learning Materials” which the author created and then used with visually impaired university students. Students with visual impairment often struggle when learning English. For example, some question patterns which are typical for sighted

students are difficult for visually impaired students to solve or even grasp. They also lack learning materials in higher education levels, such as braille versions of English exercise books. Some students also are unable to utilize technical accessibility options, such as operating a computer screen reader or braille display, especially when their visual impairment is suddenly or gradually acquired.

This article demonstrates how the author's "Content-Focused Accessible E-learning Material" creates an educational therapeutic benefits for visually impaired university students.

## 2. The definition of "educational therapeutic benefits" in this study

In this section, the author defines the educational therapeutic benefits regarding "Content-Focused Accessible E-Learning Material" based on educational therapy. As mentioned in the introduction, the US has several organizations, both national (e.g., Association of Educational Therapists<sup>iii</sup> [AET], the National Institute for Learning Development [NILD]<sup>iv</sup>, etc.) and private, which offer educational therapy. AET defines educational therapy as:

*What is Educational Therapy?*

Educational therapy is the practice of providing personalized remedial instruction to children and adults with learning challenges, including but not limited to dyslexia, ADHD, executive functioning deficits, and language, visual and auditory processing issues. The ultimate goal of educational therapy is to foster development of self-confident, independent individuals who feel positively about themselves and their potential as lifelong learners.

Educational therapists understand the social, behavioral and emotional factors that can impact learning. They have extensive training and experience in administering academic assessments, developing intervention plans, and implementing strategies to addresses challenges with reading, writing, spelling, math organization, and study skill. [skip the rest]<sup>v</sup>. (underlined by the author)

In this study, educational therapeutic benefits based on educational therapy regarding "Content-Focused Accessible E-Learning Material" is defined as follows;

- 1) to provide remedial instruction to visually impaired students with challenges in studying English.
- 2) to reduce negative emotions (e.g., wanting to avoid learning English, or experiences of anxiety, anger, frustration, etc.) due to visual impairment through studying "Content-Focused Accessible E-Learning Material."
- 3) to encourage students to raise their self-esteem regarding university performance.
- 4) to inspire students to be willing to be a longitudinal learner of English, depending on their career path.
- 5) to foster development of self-confident, independent individuals who feel positively about themselves and their potential as lifelong English learners.

In this article, these kinds of effectiveness are referred to as educational therapeutic benefits for visually impaired students that can be achieved by studying "Content-Focused Accessible E-learning Material."

## 3. The common difficulties faced by visually-impaired English learners in university self-learning

Students with visual impairment usually use assistive technology which enable them to access learning materials: braille, enlarged characters, text-to-speech function, and PC magnification, among others. However, none of these devices are perfect for all students, even those with high technical skills. For example:

### a) braille

There are fewer learning materials for higher education levels. For example, learning materials for TOEIC preparation do not exist, other than a few very old versions on Sapie Library, the bibliographic database for visually impaired people which provides digital talking and braille materials. Visually impaired students have long-standing difficulties in self-learning for TOEIC.

### b) enlarged characters

For students with severe low vision, using a magnifier for a long time can cause physical and mental exhaustion.

Magnification-capable learning materials and digital materials for higher education are not commercially available.

Students are required to request that self-learning materials be created.

Although several publishers produce online language learning materials, as Adobe Flash Player is used for screen transitions, it is impossible to magnify screens using screen magnification software.

In either case, students must wait for a long time for the materials to be completed. As a result, many students are in peril of losing out on important opportunities during the period in which they are motivated and interested to learn, and need to engage in learning activities.

#### **c) text-to-speech function**

For many learning materials, the screen reader does not support the text-to-speech function.

In essence, a self-learning environment for students with visual impairment has not been fully developed. In many cases, sufficient progress cannot be made only through “technical accessibility to information”. The author has therefore developed what “Content-Focused Accessible E-Learning Material,” which could solve the problems often faced by visually impaired university students to a considerable degree.

### **4. Educational therapeutic benefits acquired by “content-focused accessible e-learning materials” based on feedback comments from the students**

#### **4.1. Pedagogic dimensions of the intervention**

First, it might be inevitable for us educators to consider suitable pedagogical interventions when we efficiently manage students’ feedback. According to Arimoto (2017a, 2017b), based on the ERIC database<sup>vi</sup>, there are numerous types of pedagogical interventions for an assessment system.

The following items are in the ERIC database which the author paid special attention: feedback, growth models, sustainability, needs assessment, formative evaluation, home study, instructional material evaluation, participant satisfaction, experiential learning, affective objectives, student-centered curriculum, instructional development/effectiveness/improvement/innovation, creative teaching, diagnostic teaching, educational therapy, special classes, teacher effectiveness, student development, student participation, educational needs, educational objectives, outcomes of education, student rights, evaluative thinking, active learning, discovery learning, theory of mind, and, best of all, self-efficacy, self-esteem, and so on, which are especially important factors in teaching visually impaired university students..

Among these educational items, the author paid special attention to educational therapy in this study, which leads to self-efficacy and self-esteem. To teach university students with visual impairments, special teaching methods and careful attention are critical since they have various kinds of difficulties in English learning, as mentioned above. Educational therapy is defined as “Educational practices that contribute to the treatment of students’ organic or functional disorders” (e.g., remedial reading instruction that improves self-esteem).

“Content-Focused Accessible E-learning Material” has been proven to have educational therapeutic benefits from students’ feedback. For this reason, educational therapy is focused on in this study.

#### **4.2. Feedback questions**

The author assigned 25 first-year students and 8 third-year students who were visually impaired to study “Content-Focused Accessible E-Learning Material.” To study whether the material had any therapeutic benefits for these students, the author obtained feedback from the students.

Students’ visual impairment is as follows (total number respectively):

blind (4 students), almost blind (3 students), severe low vision (6 students), loss of most of visual field (4 students), low vision (10 students), narrowed visual field (3 students), central scotoma (1 student), night blindness (3 students), and light aversion (1 student). Many cases had combined symptoms of visual impairment.

Students can also be classified into five categories as follows: users of braille (6 students), users of text-to-speech function (6 students), users with almost complete loss of visual field (4 students), other users (low vision, narrowed visual field, central scotoma, night blindness, light aversion) (18 students), users who can read printed learning material without major difficulties (5 students).

Feedback questions are the following;

- 1) Pick up one of the “content-focused accessible e-learning materials” which you think is necessary for you and study at least ten grammatical items
- 2) Provide feedback both on what is effective and what needs to be improved/revised
- 3) About this learning material 1
  - 3.1) Provide the reason(s) why you chose the learning material(s)
  - 3.2) Did you feel that the learning materials were effective, and did they affect your sense of achievement?
  - 3.3) Did this material develop your autonomy and fluency for self-learning English?
- 4) About this learning material 2

4.1) Has this material reduced your difficulties, anxieties etc. in self-learning English and other things? If Yes, which points were reduced, and how were they reduced?

4.2) Does this learning material reduce your difficulties, anxieties etc. in longitudinal self-learning English to the future?

5) (voluntary disclosure)

5.1) What kinds of difficulties and anxieties etc. have you ever experienced due to visual impairment?

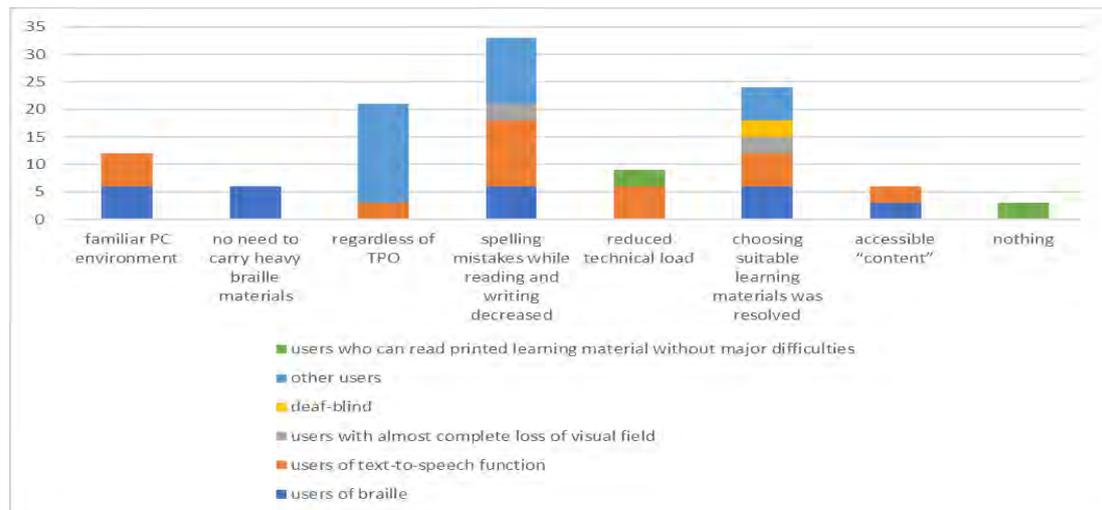
5.2) What kinds of devices and effort have you made to accommodate your visual impairment?

5.3) Do you think special kinds of accessibility to information in English learning are required? If Yes, what type(s)?

**4.3. Findings**

The author categorized the results of the feedback into two groups: (1) technical aspects and (2) mental aspects, as follows. The findings show that the material was beneficial to students in the following ways (Table 1): 1. The students could use familiar PC environments , 2. As this material did not focus on technical accessibility, but rather more accessible “content” supported many kinds of visual impairment, it enabled students to study more efficiently, 3. They did not have to carry braille materials, 4. They could study regardless of TPO (e.g. via iPad), and, 5. Spelling mistakes while reading and writing decreased. Additionally, since the students’ difficulty in learning English was mainly due to the visual impairment itself, this material reduced their anxiety. The reduced technical load (i.e. creating digital and braille data, physical and mental exhaustion caused by long use of magnifiers, lots of visual line movement) led to a feeling of accomplishment/willingness. The major concern of choosing suitable learning materials was resolved as the learning material was created by the teacher, which motivated them to study English.

Table 1. Results of the feedback (%).



What it is worth mentioning is that students using braille and those who had no major visual difficulties commented that both could share the same learning material, enabling them to study together. This comment would lead to inclusive education, which has considerable significance for a future society that focuses on inclusivity and equity.

**5. Opportunities for further studies**

- 1) It is hoped that an additional longitudinal study can be carried out to discover whether the participants who have developed autonomic attitudes toward learning English and other subjects have become more confident about self-learning and retain this ability after graduating, as they build their careers.
- 2) It is hoped that this learning experience will enable visually impaired university students to understand their special needs fully and to ask for the consideration and support they need in inclusive educational situations and society.

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<sup>iii</sup><http://www.aetonline.org/>

<sup>iv</sup><http://nild.org/>

<sup>v</sup><http://www.aetonline.org/>

<sup>vi</sup> Arimoto, M. (2017a), Arimoto, M. (2017b).

# ANALYZING EXPERIENCES OF USING EFFECTIVE FEEDBACK IN THE ESL CLASSROOM THROUGH THE USE OF DIGITAL TECHNOLOGIES

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## Abstract

This article of systematic literature review presents the analysis of a series of experiences that use effective feedback in educational activities through the use and integration of digital technologies, specifically, in the classes of English as a second language in higher education. The revision analyzed 14 different experiences. As part of the analysis, criteria are defined to describe and compare them, linked with the possibilities of feedback to favor the formative processes at the higher education level. Criteria include: country of origin and level of education, design of feedback used, the timing of the feedback, the means of providing feedback, and the consideration of digital technologies. The main results indicate that the use of feedback, in the ESL classroom, allows learners to boost their capacity of analysis, critical thinking, and the resolution of problems linked with interlanguage. As a conclusion, the salience and positive impact of digital technologies are highlighted in favoring the positive and effective feedback, in the particular case of English as a second language. Finally, it is evident the use of computer -mediation, screencast, and web-based learning environments as the primary sources of authors used more frequently to implement effective feedback in higher education. It concludes that the set of experiences analyzed provides light in terms of the considerations needed to design and adjust formative processes that allow boosting effective feedback mediated by digital technologies. As future work, there will be the elaboration of a methodological proposal that helps to adjust the formative processes that enable the integration of digital technologies as mediators in the process of feedback between teachers and learners.

**Keywords:** *Effective feedback, digital technologies, interlanguage, critical thinking, higher education.*

## 1. Introduction

Currently, the design and adjustment of the formative processes at the higher education level request constant update and innovation from the instructors, innovation in terms that allow instructors to develop didactical strategies that boost the improvement of the formative process (Sandí & Cruz, 2016). In this sense, the implementation of effective feedback arises as the possibility to provide an answer for the current society requests linked with the improvement of the formative processes (Anson, Dannels, Laboy, & Carneiro, 2016; Ghaderi & Farrell, 2019; Wang, Gong, Xu, & Hu, 2019).

The purpose of this article consists of the analysis of a series of experiences from different countries that have implemented effective feedback in educational activities, specifically, in the classes of English as a second language in higher education. This analysis identifies distinctive characteristics that contribute to the design of formative processes that allow implementing effective feedback mediated by digital technologies. The results of the research provide support with the considerations that should take into account the design and adjustment of the formative processes to implement effective feedback.

## 2. Background

Research about effective feedback scopes, its design, the timing, and the means of providing effective feedback have been analyzed for the last 25 years, with the purpose of correcting positively. Corrective feedback has spawned a voluminous body of research in the past two and a half decades (Li & Vuono, 2019). In addition, it has been interesting how this process of effective feedback, especially at higher education level and among the means of providing feedback, the implementation of technology-mediation can be identified. Besides that, today, it may be pointed out

that technology-mediation could have a positive impact on providing effective feedback due to the use of means like computer-mediation, screencasts, and web-based learning environments, among others. It could also generate effective feedback and more contextualized in the current learning environments (Wang, Gong, Xu, & Hu, 2019)

## 2.1. Digital technologies

Digital technologies can be described as a set of technological sources (hardware and software) that enables knowledge management (processing of information) in innovative, interactive, and collaborative ways that boost the development of formative-mediated processes (Sandí & Sanz, 2020). It should be taken into account that digital technologies cannot change the educational systems and methodologies by themselves, these changes depend on the correct use given to digital technologies (Sandí & Sanz, 2018).

## 2.2. Effective feedback

According to Ghaderi & Farrell (2019), effective feedback is an essential element of any learning which could be understood as the process where teachers inform the students about their work in progress (Noor, Aman, Mustafa, & Seong, 2010). Besides, the feedback can be used as a pedagogical technique teacher use to draw attention to students' erroneous utterances, and which may result in learners' modified output (Lee, 2013). In this sense, feedback is one critical component of classroom-based instruction, and it can exert powerful influences on learning and achievement (Yu, Wang, & Teo, 2018). The feedback could be implemented through different digital technologies (Wang, et al., 2019). However, different authors (Cunningham, 2019b, 2019a; Wang et al., 2019) say that instructors need to be aware of the way they convey their feedback and the way the technology they use to create and deliver that feedback impacts the message that they send. Finally, the computer-based feedback is one of the most important elements in computer-based learning environments.

## 3. Methodology

The investigation was developed with a qualitative methodological approach through a systematic revision of literature, following the protocol proposed by (Kitchenham et al., 2009). The protocol proposes to use the following structure: a) definition for the search: Research questions (RQs), revision scope, criteria for references inclusion and exclusion, keywords and search String. b) search execution: define the selection of primary works and diffusion of analysis criteria. c) result analysis: specify the characterization scheme and analyze results. The decisions made for taking the process of research forward, according to the protocol proposed, are:

**a) Search strategy. Research questions:** 4 RQs are defined which comprehend conceptual aspects such as: RQ1: How are the concepts of digital technologies and effective feedback defined? RQ2: What are the possibilities of digital technologies and effective feedback in education? RQ3: What are the possibilities that are identified in applying effective feedback in a class of English as a second language in higher education? and RQ4: What are the potentialities identified in digital technologies to favor effective feedback in an ESL Classroom? **Revision scope:** The RQs are determined with the purpose to serve as guide to identify experiences about the use of effective feedback in educational activities and the possibilities for digital technologies to favor their implementation in the ESL classroom. The strategy for the search used to find articles linked to feedback and digital technologies was based on searching in different scientific and academic databases, such as IEE Xplore Digital Library, ScienceDirect, SCOPUS, among others. They were chosen due to their availability and access to the information required (Cruz & Bazán, 2018). **Inclusion and exclusion criteria:** The following criteria for inclusion and exclusion were defined: *Criteria for inclusion:* Published texts in their full version, written either in English or Spanish, published from 2005 to 2020 inclusive, related to feedback and digital competencies. These criteria allowed identifying experiences and results of activities that used digital technologies to boost the application of effective feedback. *Criteria for exclusion:* references not related to the RQs, texts written in other languages different from Spanish and English, duplicated investigations based on other existing investigations, references with no access or incomplete document. **Keywords and search string:** keywords were defined: feedback, digital technologies, ESL, among others. And, search string: feedback and ESL, feedback and digital technologies, among others.

**b) Search execution.** With the first sources found, the criteria established were applied, resulting in the documents used and cited in this investigation. For doing this, the title, abstract, and keywords were skimmed. After the preselected documents were obtained, extensive reading of the documents proceeded. Finally, the criteria for inclusion and exclusion were applied again.

c) **Result analysis.** For the result analysis, the definition and description of the criteria of analysis were necessary, those described in subsection 3.1. Then, the description of experiences and the use of effective feedback in the ESL classroom proceeded according to the research criteria defined.

### 3.1. Definition of the analysis criteria

This research analyzes the background related to the active objectives of effective feedback in the EFL classroom through the use of digital technologies. For doing this, some criteria are established to focus on a homogeneous analysis based on different literature review, the selection of criteria is based on (Kitchenham et al., 2009) and the objective of study that aim at describing and comparing the experiences related to the possibilities for effective feedback to favor formative processes at higher education. For doing this, 2 categories are identified: **A) General aspects.** The criteria for this category are related to the contextualization of experiences. Through these indicators, for example, it is possible to consider the country of origin and level of education. **B) Aspects for effective feedback.** The criteria included in this category allows to analyze whether effective feedback is provided or not. For carrying out this study, the analysis focuses on the design of feedback, timing of the feedback, and the means of providing feedback. The criteria of analysis here proposed are now described for the revision and study of the experiences.

**A. General description. Country of origin:** This criterion refers to the country where the research is carried out. **Level of education.** This criterion identifies the level of education of the experiences studied. The possible criterion's values are: i) Primary, ii) Secondary, and iii) Higher education.

**B. Aspects for effective feedback. Design of feedback:** This criterion aims at identifying if the design is based on elaborated or global feedback. Elaborated feedback includes, in addition to the correct answer, supplementary information designed to foster deep learning of the target information while global feedback simply identifies the error and provides the right answer. Besides that, there are a variety of ways that feedback can be elaborated: explanations, follow up questions, location of the correct information in the text, or a combination of multiple types of information (Finn, Thomas, & Rawson, 2018). In addressing to process-oriented tasks, this effect suggests that students with low prior knowledge would be expected to benefit more from elaborated feedback that provides them with detailed information on how the problem should have been solved and why it should have been solved this way (Smits, Boon, Sluijsmans, & van Gog, 2008). **Timing of the feedback.** the criteria present in this category allow to know how effective feedback is provided. These criteria show if feedback is provided immediate or delayed. It is hypothesized that learning outcomes of students with low prior knowledge would be fostered by immediate (after each task) elaborate feedback, whereas those of students with more prior knowledge would be enhanced by delayed (after a few tasks) global feedback (Smits et al., 2008). **The means of providing feedback.** This criterion searches to analyze the means used to provide feedback. The criterion helps to identify the way feedback is provided. it means to identify whether feedback is delivered through teacher's corrective feedback or technology- mediated means. With respect to technology-mediated means, feedback can not only be provided using multiple modalities (e.g. text, audio, visuals or a tutor on screen), but also in a spatially and temporally integrated format. In other words, after answering a question or completing a task, the reader is only a mouse-click away from the feedback appearing on the screen (Swart, Nielen, & Sikkema, 2019).

## 4. Analysis of the results

This section presents the application of the criteria for the analysis of experiences selected. Some of the sources analyzed do not focus on the higher education level; however, they turn interesting due to the results they also present in terms of the use of effective feedback in English as a second language. Consequently, they are also considered for the analysis; such is the case of two experiences at secondary (Calisto-Miranda & Ortiz-Navarrete, 2019; Wang et al., 2019) and one experience at primary level (Noor, Aman, Mustaffa, & Seong, 2010). Table 1, presents the experiences identified, and it summarizes the results of the application of the criteria of analysis previously defined.

Table 1. Experience comparison according to criteria of analysis.

Experiences	General description		Aspects for effective feedback		
	Country of origin	Level of education	Design of the feedback	Timing of the feedback	The means of providing feedback
(Noor et al., 2010)	Malaysia	PY	Global	Immediate	TCF
(Calisto-Miranda & Ortiz-Navarrete, 2019)	Chile	SY	Elaborated	Immediate	TCF
(Wang et al., 2019)	China	SY	Elaborated	Delayed	TMF
(Ghaderi & Farrell, 2019)	USA	HE	Elaborated	Immediate	TCF
(Yu, Wang, & Teo, 2018)	China	HE	Elaborated and global	Immediate and delayed	TCF
(Swart et al., 2019)	Netherlands	HE	Elaborated	Delayed	TCF
(Ortiz, Fuica, & Saez, 2019)	Costa Rica	HE	Elaborated	Delayed	TCF
(Lee, 2013)	USA	HE	Elaborated	Delayed	TCF
(Al-Jarrah, 2016)	Jordan	HE	Elaborated	Delayed	TCF
(Cunningham, 2019b)	USA	HE	Elaborated	Delayed	TMF
(Cunningham, 2019a)	USA	HE	Elaborated	Delayed	TMF
(Anson et al., 2016)	USA	HE	Elaborated	Delayed	TMF
(Smits et al., 2008)	Netherlands	HE	Elaborated	Delayed	TMF
(Ortiz-Navarrete & Diaz-Larenas, 2017)	Chile	HE	Elaborated	Delayed	CF

HE=Higher education. SY=Secondary. PY=Primary. TCF=Teacher's corrective feedback. TMF=Technology-mediated feedback. CF=Collaborative feedback.

**A. Aspects general.** The *country in which the investigation is developed* shows that the development of methodological proposals has focused on America with 57.14%, followed by Asia with 28.57%, and last by Europe with 14.29%. Regarding the *educational level* criteria, 78.57% of the methodologies are mainly used in higher education/university, 14.29% in high school, and 7.14% in primary.

**B. Aspects for effective feedback.** Regarding *the design of the feedback* 85.72% of the experiences analyzed focuses on elaborated feedback, while 7.15% focuses on global feedback, and 7.15% combines both types of feedback. The latter shows that most of the experiences analyzed focused on the implementation of effective feedback using elaborated feedback. In this type of feedback, the learner has better opportunities to learn and restructure his errors (it means there is an opportunity to learn from the error) (Sandí & Cruz, 2016).

Then, considering *the timing of the feedback*, 71.42% of the experiences revised consider important to incorporate delayed feedback. In contrast, 21.43% of the experiences revised lean for immediate feedback, and 7.15% combine delayed and immediate feedback. Even though there is a division concerning which feedback is more effective, a recent study (Swart et al., 2019) indicates that delayed feedback is the most effective for learners restructure their errors. These results evidence that most of the experiences aim at a positive and effective timing of the feedback.

Regarding *the means of providing feedback*, 64.29% of the experiences analyzed focus on teacher's corrective feedback, while only 35.71% of the experiences rely on other means such as technology-mediated. These results show a) teacher's corrective feedback is still used the most as a primary source for effective feedback, and b) technology-mediated means start gaining a position as a positive source for effective feedback. In some of the experiences analyzed, digital technologies are used to boost effective feedback, such as the case of Smits et al. (2008), Cunningham(2019a) and, Wang et al. (2019). They used sources, for example, web-based learning environments (pre-tests, study tasks, and feedback post-tests), screencasts for writing and, computer mediation.

## 5. Conclusions and future work

The purpose of this article is to do a comparative analysis of the different experiences that used effective feedback in ESL classrooms at the higher education level. The article also had the purpose of identifying distinctive characteristics that contribute to the design and adjustment of formative processes linked to the implementation of effective feedback and, mainly, mediated by digital technologies.

The investigation made it evident that there are efforts to consolidate the mediation of digital technologies in the implementation of effective feedback. However, the results obtained verify that the experiences analyzed focus mostly in offering corrective feedback through the instructor, and in a few cases, offering corrective feedback through technology-mediation. This means that the experiences that integrate effective feedback through technology-mediation are reduced. Nevertheless, the investigation concludes that the set of experiences analyzed bring light in terms of the task of analyzing the distinctive characteristics that a methodological proposal should include for suggesting corrective feedback. As future work, it is thought to design a pedagogical strategy to guide step by step, the design of educational situations that boost the use of effective feedback through the integration of digital technologies.

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## THE METHODOLOGY OF ACTION RESEARCH (AR) AND THE IMPACT ON TEACHERS' PROFESSIONAL DEVELOPMENT

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### Abstract

The incorporation of AR into the way of work of in-service teachers is based on the approach by which teachers should be part of knowledge-creating communities and not only engage in knowledge 'conveyance'. The generated research knowledge serves as leverage for professional development and promotes teachers' self-efficacy processes, while taking part in the development and change of knowledge, and in integrating the research process with the teaching. This incorporation promotes teachers' professional development and contributes to the system's quality.

This study was conducted among 44 teachers who engaged in AR. The study data were obtained from the analysis of these ARs. The data focused on elements that serve as guidelines for the ARs, such as the definition of the problem, the intervention plan, the examined issue, the research's target audience, the research partners and social-emotional learning (SEL) expression in the action research. The teachers also shared their insights from the AR – these insights served as basis for the collection of statements.

The research questions were:

1. What characterizes the action research conducted by teachers in their educational environment?
2. Is SEL expressed in the action research proposed by the teachers, even if they were not pointed in that direction?

This study's uniqueness is in its meta-examination of AR variables and an in-depth examination of the respondent's answers regarding the meaning of AR for them as teachers. This study also provides insights for teachers' teachers about the importance of incorporating AR into teacher training and a way of promoting teachers' professional development in the field, a way to enhance team collaboration and a tool that contributes not only to teachers in their classroom, but to the entire school.

**Keywords:** *Action research, SEL, professional development, self-efficacy, teacher training.*

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### 1. Introduction

The professional development of in-service teachers requires intense scrutiny of the unique characteristics of this group of teachers.

Integrating action research of in-service teachers as they manage their teaching is based on the perception that a teacher must participate in a knowledge-creating community and not just deal with knowledge 'transmission'. The research knowledge that is thus generated constitutes a stimulus for the teacher's professional development and, when the teacher is a partner in developing and changing the knowledge and integrating it during the process of research in teaching, advances her self-efficacy processes.

Action research is known as an especially promising strategy in the training/continued education of teachers with a research orientation as well as a means for introducing innovations into the teaching field. The latent potential of action research has been noted in many studies that dealt with educational policy (European Commission 2013; 2015).

Action research deals with valuable practical objectives, it is participatory, reactionary and developmental, linking theory and practice (Stern et al., 2014). In addition, it is important to emphasize that it is based on daily observation of the professional, reflective act and the giving of meaning to it. These teachers are more self-directed toward the unique needs of the student. They develop self-perception and self-efficacy.

Given that the objective in action research is to identify better action methods and to understand the mechanisms that facilitate improvement, each teacher-researcher involved in an action research will attempt to identify, implement, and understand the best possible way of acting. The purpose of action research is not to prove the error or failure of a certain practice but rather to enhance it (Artist Manual, 2019).

The educational initiatives and actions that teachers develop resolve dilemmas, problems and issues created within the classroom framework, the teacher's room, the school or through relations with the community. Educational initiatives may also emerge from the desire to develop or change an action direction or from the desire to enhance existing processes. The process of structuring the educational initiative and its assimilation and the research surrounding it reflect high order thinking processes during which the teacher identifies the need for the change and the essence of what should be changed. This is based on educated mapping of the needs of the school system, on mapping the existing and desired state of affairs, and on identifying an area for an educational initiative that will be linked to an area that is significant to the teacher himself (Hoekstra & Korthagen, 2011).

Researchers have generally focused on the field of science, but their remarks and conclusions are relevant to every teacher: action research of this type can contribute greatly to positive development of training methods and the work of science teachers, change teaching methods immediately and directly, and simultaneously enrich the foundation of science teachers' professional knowledge and thus enable them to develop professionally (Mamluk-Naaman, Eilks, Bodner & Hofstein, 2018). To continue and broaden the application of action research, long-term continuous oversight alongside development of and making accessible courses, study material and instructors are needed to motivate the teachers to act, innovate and examine the teaching methods they use in their classrooms.

Nevertheless, these processes must not be separated from the processes of fostering social-emotional learning (SEL). SEL is seen as an important element in and inseparable from educational and learning processes, because of, among other reasons, the accelerated technological developments and cultural and social changes characterizing the twenty-first century.

Instilling and acquiring SEL competences are intended to be reflected in an improvement in learning achievements, positive social functioning, an ability to adapt to complex situations, and a decrease in behavioral problems and emotional stress. Control of these skills is expressed over the course of time in behavior shaped by internal beliefs and values, alongside being able to see the other, as well as in taking responsibility for one's choices and behavior. In a broader context, a link between these skills and successful personal, social and vocational functioning has been found (Durlak, 2015; Jones, Greenberg, & Crowley, 2015).

SEL must be interwoven and assimilated in every area of education and be schoolwide. A caring environment, which is safe, supportive, concerned, nurturing and participatory, must be created for students. Students must be provided with opportunities to learn specific qualifications that will reinforce their social-emotional abilities and heighten their emotional happiness and welfare (Schonert-Reichl & Kitzl, 2016).

It is important to note that a central part of SEL is concern for the welfare of teachers and fostering of their social-emotional competences. The sense of burnout and the pressure that the majority of teachers report affect their relations in class and the achievements of their students in their studies. The fact that teaching is among the most draining of professions mandates an investment in the well-being of teachers and in developing their social-emotional competences (Patti et al., 2015). In regard to this aspect, we note, even though it was not examined in this research, though it is worthwhile examining it in the future, that SEL among teachers may also be a way to empower their research sensitivity.

## 2. Methodology

The research data were collected by analyzing 44 action research carried out by 44 teachers. The data focused on parameters guiding the action research such as problem definition, intervention plans, the issue being investigated, the research's intended audience, partners in the research etc. Likewise, the teachers provided their insights regarding the action research, and on the basis of these insights, statements were collected.

A qualitative research method with the addition of quantitative aspects was used. The qualitative findings were classified according to categories, and in conjunction with relating to the essence of the categories, quantitative reference to every category was made using theoretical statistics, to identify tendencies or trends among the study participants.

A unique element that was examined in this study is SEL expression in the action research. Did the teachers, when selecting the topics to be introduced in the teaching-learning change processes, have an awareness of their students' well-being? Was the awareness of SEL assimilated among teachers even if they had not taken continuing education courses on the subject?

### 3. Findings

Figure 1. Source of Dissatisfaction/Problem.

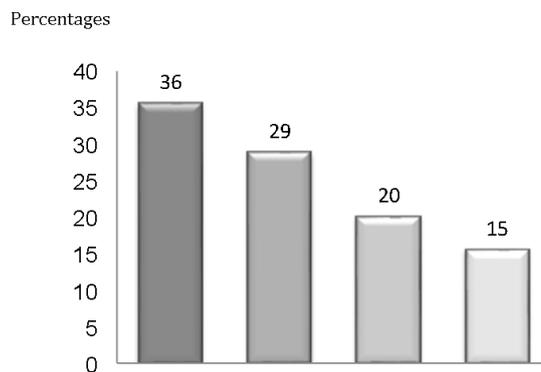


Figure 1 presents the sources of unease. Most of the dissatisfaction stems from deficient functioning of the group or of the individuals within it. In second place are problems related to students' learning processes. Problems deriving from social difficulties are in third place and only 15% of the action research studies were conducted because of teachers' dissatisfaction with their own teaching. It would seem that learning and functioning problems bother the teachers the most.

Figure 2. Sorting the Subjects into Categories (in percentages).

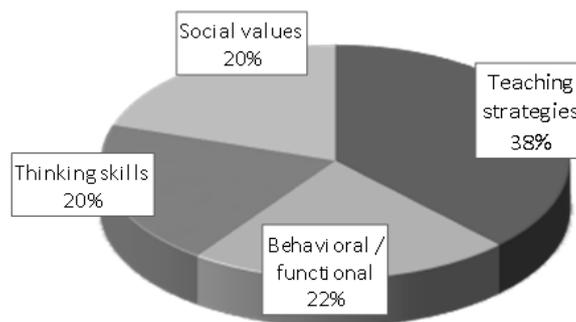
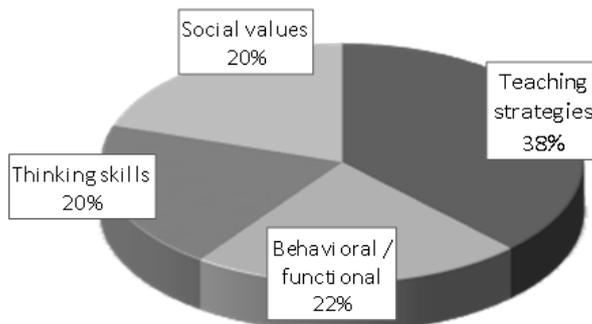


Figure 2 indicates the ways of dealing with the unease, as reflected in the research topics. When we are discussing research conducted by teacher-researchers, the majority choose a change in teaching strategy. The remaining research topics are divided almost equally into topics reflecting implementation of social values, behavioral changes and thinking skills. When we compare Figure 3 to Figure 2, we can see that the social unease is handled by assimilation of social values. From this comparison, it appears that functional problems are not dealt with only through behavioral methods but also through teaching strategies and thinking skills.

Figure 3. Action Research Work Environment (in percentages).



It is interesting to note that the research action environments are on different organizational levels, as seen in Figure 3. Most of the activities were carried out in the classroom (42%), but some were conducted on the age grade level (17%), the group level (13%), the individual level (8%), the teacher level (8%), the school level (8%), and even a little on the parent level (4%).

Figure 4. Research partners.

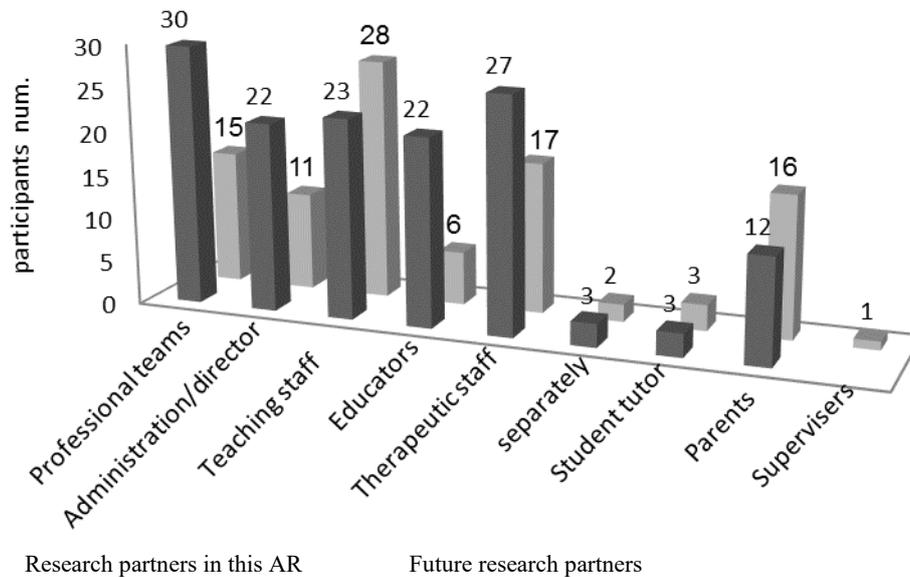


Figure 4 shows the choice of research partners in the present study and in the continuing study. It is important to emphasize that many of the teachers in the study proposed more than one research partner. According to Figure 4, in an examination of the research partners, we can see that there is a gap between the research partners selected by the teacher-researchers in the present study and those that the teachers will select for the continuation study. In the future, they will seek less help from professional teams, will need management and the treatment team less, especially homeroom teachers; they will, however, use their teacher colleagues and parents more. When comparing all the statements, it was found that in the present study, the teachers needed 142 partners, whereas in the future study, they will only require 99 partners. It may be that given that they have already learned about the subject and conducted an action research, they feel more secure now in their abilities.

Table 1. Distribution of the expression of main cognitive, emotional, behavioral abilities as defined by the Collaborative for Academic, Social and Emotional Learning (CASEL) in action research (N=44).

Social and emotional learning (SEL) ability	Ability characteristics	SEL expression in absolute numbers	SEL expression in percentage (rounded off)
Intrapersonal ability	Self-awareness & self-management	24	55
Interpersonal ability	Social awareness & interpersonal relation skills	14	32
Cognitive ability	Responsible decision making	6	100
Total		44	100

In table 1 we can see that all the action research in the school systems, there was an expression of social-emotional competences that were directed to developing teachers’ determination and increasing their well-being.

In terms of the reflection of the social-emotional abilities in the action research, we assumed that because the teacher-researchers who participated in this study had yet to take SEL continued education courses and learn about its fundamentals, and hence were not aware of the possible link between them and the action research, we would find that in some action research studies, the fundamentals would be reflected and in others, not.

In retrospect, our assumption was proven wrong. In all the action research studies, there was some expression of social-emotional basics. Possibly, this may be explained by the characteristics of action research: the fact of the unease and dissatisfaction with what is happening in the classroom and/or school creates the need for introducing a change, which leads to deepening of the teacher’s self-awareness and self-efficacy. In other words, action research promotes and summons thinking that reflects social-emotional abilities. Any change that is assimilated in a given situation as a result of unease in the field is an expression of it. Therefore, in every action research, there exists an expression of social-emotional thinking on one level or another of self-management, which also includes control, discipline and self-motivation that lead to goal setting and organizational abilities.

From these results, it seems that there was an expression of the teachers' intrapersonal ability to introduce changes for the benefit of the system, because of their personal awareness and self-management (55%). In contrast, there are problems that required interpersonal skills and social interaction with individuals and/or the group, when the teachers had to draw from their social awareness and interpersonal relation skills (32%). Part of the unease must be resolved using responsible decision making and use of the cognitive ability of high order thinking. Only 13% of the teacher-researchers chose to make the change. It is likely that the reason for this is the type of problems that they identified were more focused on the intrapersonal aspect and less on the interpersonal in terms of its cognitive part.

As mentioned above, the teachers who participated in the research had not taken continued education courses focusing on social-emotional ability topics. Nevertheless, it seems that when there is unease regarding processes in the school at different levels, the teachers try to solve it by integrating social-emotional learning.

Accordingly, we can see that need to give teachers the appropriate tools that will support them and assist them in deepening SEL processes for the benefit of students, themselves, the school and the entire system.

#### 4. Conclusions

Action research has a lot of advantages for teachers: It encourages critical observation and self-examination; This procedure helps teachers to foster self-belief and to recognize their own abilities and potential. This process derives them to develop their self efficacy; It promotes the forming of a future perception of the teachers based on intensifying the practical and theoretical knowledge.

Integrating AR in the educational system contributes to the teachers in their classes' to the team partnership and to the school system. It promotes the professional development of in-service teachers in the field. So our recommendations are:

It is important to use action research as a permanent component in teachers' training, as a tool for in-service teachers. It is also important to use action research as a permanent component in the professional development of in-service teachers in order to improve existing and desired processes. And it is important to use the action research as a tool for realizing the teaching vision with a face to the future

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# IMPACT OF MAKER-SPACE PROJECT TO PROVIDE COMPUTER SCIENCE EDUCATION TO MIDDLE SCHOOL STUDENTS IN THE ALABAMA BLACK BELT REGION

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## Abstract

This paper describes a program to introduce computer science (CS) to middle school students in rural Alabama, USA, and presents research on the impact of the program on teachers and students. The hands-on program established a dedicated area equipped with grade-appropriate CS resources, in which students receive mentored, structured, and continuous hands-on activities using the Micro:bit system. The goal was to have students engage in “learning CS through making”, a pedagogical approach grounded in educational research that is expected to promote deep awareness, interest, skills, and learning about CS. The teachers participated in intensive professional development and received regular follow-ups from the course instructors. Researchers utilized a mixed method, repeated measures design to investigate the impact of the project on teachers and their students. The main research question is: What is the impact of the Maker-Space Project on participating middle-school teachers and their students?

Teacher attitudes and skills were measured at baseline and at two points in the first 2 years of the project. Other measures related specifically to the teacher professional development (PD). A survey was used to collect student data at participating schools. All students completing the 8<sup>th</sup> grade were surveyed to collect baseline and comparison data. The survey included demographic data; prior experience with computing; and confidence, enjoyment, attitudes, and identity. In addition, pre-post survey data from students in the maker-space course was collected and analyzed. Post-course student data was compared to the baseline and comparison group data.

Researchers also visited the schools to observe the maker-space classrooms, visit with students and interview teachers. Researchers talked to the students and videotaped their discussions and their demonstrations of their projects. They also interviewed the teachers using a semi-structured protocol.

The professional development positively impacted the teachers’ understanding of computer science and their use of active learning and hands-on learning in their own classrooms. The teachers reported being optimistic about their own ability to learn computer science education content and about their ability to teach the content to their 8<sup>th</sup> grade students. Teachers reported changes in skills, competencies, interests and behaviors of their students. The teachers are pleased with the progress of their students in learning about computer science, especially coding. Working cooperatively, creative problem solving, and classroom engagement were behaviors seen in the Makerspace classrooms. Teachers reported seeing increased interest taking courses in high school and in computer science careers.

**Keywords:** *Computer science education, middle school, educational research.*

## 1. Introduction

The National Science Foundation (NSF) of the U.S. government funded a project to develop, implement, study and evaluate a program that to provide access to hands-on computer science (CS) education to students in middle schools. The project team developed a makerspace-based CS curriculum that is tied to the standards contained in the Alabama Digital Literacy and Computer Science (DLCS) Course of Study, leading to a stand-alone CS course called “CS Makers”. The project took place in school districts of the Alabama Black Belt region, a region of the state with high minority and poverty rates. Teachers in four middle-school classrooms participated in professional development and established a dedicated area in their schools. The goal was to have students engage in “learning CS through making”, a pedagogical approach grounded in educational research that is expected to promote deep awareness, interest, skills, and learning about CS (Ryoo, Margolis, Lee, Sandoval, & Good, 2013). To date, 125

students took the CS Makers course; 79% of the enrollment was minority and over 50% of the participants were female. An external evaluator investigated the impact of the program on teachers and students.

## **2. Makerspaces and teacher professional development**

Project leaders developed CS curriculum, based on their curriculum logic model. The curriculum consisted of weekly lesson plans and other helpful resources (e.g. videos, power point presentations) for the teachers to support their offering of the CS Makers course, and a pacing guide for the teachers to help them determine the day-to-day coverage in teaching the course. Teachers followed the lessons at varying paces, depending on the formats of their classes. Several of the teachers were able to use the website and other resources provided to develop their own lessons.

Each participating school committed a physical space called the “makerspace” where CS Makers instruction took place. Makerspaces are collaborative workspaces inside a school where students gather to learn and explore the CS Makers course content in an experiential way. The project provided grade-appropriate CS resources for the Makerspaces. During the makerspace class period, students conducted mentored, structured, and continuous hands-on activities facilitated by teachers who participated in rigorous professional preparation in computer science education. The curriculum utilized the Micro:Bit system (Williams, 2016).

The teachers participated in intensive professional development (PD) and received regular follow-ups from the course instructors. Their PD consisted of an initial summer institute and three follow-up face-to-face workshops. The PD provided hands-on training to the teachers with topics in the CS Makers course. The presenters’ team also shared pedagogical strategies with the teachers on how to teach specific CS topics. Feedback from the teachers at the workshops was used to make revisions to project resources. In addition to face-to-face meetings, periodic virtual project “check-ins” were made with teachers to learn from them about progress with course instruction, their immediate needs, and challenges with the course that we could help to address.

## **3. Research methodology**

Researchers utilized a mixed method design to investigate the impact of the project on teachers and their students. The main research question was: What is the impact of the Maker-Space Project on participating middle-school teachers and their students? Qualitative methods provided an in-depth understanding of goals, objectives, expectations, and outcomes. The researchers used interviews and on-line and pencil-paper surveys to assess the short-term and long-term impact of project participation on students and teachers. The Dillman Tailored Design Method (Dillman, Smyth & Christian, 2014) was used for the survey methodology; interviews and qualitative data collection and analysis utilized the methods suggested by Mertens (2015), Patton (2011) and Creswell, (2013a and 2013b).

## **4. Findings: Impact of CS Makerspace intervention on teachers**

Measures were developed to assess attitudes and skills of teachers, as well as the specific impact of the teacher professional development (PD). Baseline teacher data on skills were collected. PD and impact data were collected at three points during the project.

The post-PD survey related to the format, curriculum, and expected outcomes of the professional development. This survey was launched by the project director following the PD sessions attended by the four teacher participants. The response rate was 100%. After the professional development sessions with the project team, the teachers were very positive about what they learned and were confident in their understanding of computer science. They were optimistic about their ability to teach their students.

Teachers were asked to rate their agreement with statements related to the primary expected outcomes of the professional development. Responses were scored on a scale of 1 (strongly disagree) to 5 (strongly agree). Table 1 below shows all responses. For all questions, every participant either agreed or strongly agreed with the statement, and no item scored lower than 4.25. Agreement was strongest for ability to call on PD instructors (4.75). Agreement was weakest for learning community and importance of CS Making in 8<sup>th</sup>-grade curricula.

Table 1. Teacher responses to ratings of items related to expected outcomes of Professional Development for the Makerspace project.

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean			
(1.1) I am confident I can call on PD instructors as needed.	0.00%	0	0.00%	0	25.00%	1	75.00%	3	4.75
(1.2) I developed a learning community with other teachers in the group.	0.00%	0	0.00%	0	75.00%	3	25.00%	1	4.25
(1.3) I understand the DLCS standards (8th grade).	0.00%	0	0.00%	0	50.00%	2	50.00%	2	4.50
(1.4) I understand the concept of CS Making.	0.00%	0	0.00%	0	50.00%	2	50.00%	2	4.50
(1.5) I understand the purpose of the recent Professional Development in CS Making.	0.00%	0	0.00%	0	50.00%	2	50.00%	2	4.50
(1.6) I believe in the importance of CS Making in 8th grade curriculum in my school.	0.00%	0	0.00%	0	75.00%	3	25.00%	1	4.25

The teachers reported being optimistic about their own ability to learn computer science education content and about their ability to teach the content to their 8<sup>th</sup> grade students. They were the most confident about learning design thinking (4.50) and the Micro:Bit system (4.50) and the least confident about learning programming sequencing (3.75) and programming data abstraction (3.75). In terms of their confidence in teaching, they were most confident about design thinking (4.25), Micro:Bit (4.25) and algorithms (4.25). They were least confident about teaching programming data abstraction (3.5).

The teachers were asked about these elements of the professional development: materials, ice-breakers, lectures, individual hands-on learning activities, group hands-on learning activities, homework, pacing of the curriculum, learning space, and equipment. Responses were scored on a scale of 1 (very unhelpful) to 5 (very helpful). No participant gave a response of unhelpful or very unhelpful, and all averages were at least 4.5. The items that respondents scored as the most helpful were the materials provided by the instructors, the pacing of the curriculum, and the learning space (4.75). All other items averaged 4.5.

## 5. Findings: Teacher interviews

Researchers interviewed teachers and students in their home schools during a Makerspace class. Students demonstrated their Micro:Bit projects at the same time. An analysis of the transcripts of the teacher interviews yielded the following findings.

All the teachers understood the mission of the project: “get kids exposed to the creative aspect of computer science”; “encourage students to pursue a career”; “get kids interested”; and “introduce kids to coding”. One teacher specifically mentioned the shortage of African Americans and females in STEM. All teachers said the project would make a difference in the future (5-10 years was specified by one teacher).

When asked how participating in the project had impacted them, the teachers were very positive. Their responses had teachers several common themes:

- New skills: “better ways to instruct students for their future success”; “savvier when it comes to coding”; “more experience with engineering and other career paths”; and “I am the principal’s Swiss Army knife”
- Feelings of competence and satisfaction: “more ideas about things I can do in my classes”; “feels good to help students”; “loved every bit of the program”
- New experiences: “chance to learn something new”; “continual learning process”; “teacher was learning with the student”

## 6. Findings: Impact of the CS makerspace intervention on students

Sixty-two students in the participating schools were surveyed during the first 3 weeks and last 3 weeks of the semester the participated in the CS Makerspace classrooms. Assessment focused on students' opinions of the CS Makerspace project, and their view of the CS Makerspace as a tool to acquire 21<sup>st</sup> century skills (REFERENCE). Students' views of the CS Makerspace course were overall positive, with the creativity aspect of the class being the students' favorite aspect of the course. Notably, girls viewed the class as an environment that encouraged persistence, which suggests that the Makerspace intervention may be useful to engage their interest in the long term.

Students were asked, “*what did you like about working in the CS Makerspace?*” and given the opportunity to provide an open-ended response. Ninety-four percent (94%) of students provided a response, and responses were analyzed for emerging themes; each response was coded as consistent with a maximum of two themes. The theme that most often emerged (from 42% boys and 46% girls) was labeled *creativity*, and related to building, inventing, or creating new things (sample response: “*I liked to code and build things and make them move*”). The second theme that emerged (22% boys, 10% girls) was labeled *CS knowledge*, and related to the acquisition of concepts related to computing (sample response: “*what I liked about maker space is the algorithm*”). The third theme that emerged (10% boys, 19% girls) was labeled *class format*, and related to the type of instruction received in the makerspace (sample response: “*making codes and stuff with my teacher and answering questions*”). Other themes that emerged were *teamwork* (working in teams; 7% boys, 6% girls), and *persistence* (the makerspace serving to increase their work ethic or desire to succeed, 8% girls). Finally, some students answered the question stating that they liked *everything* about the makerspace (7% boys).

Students were also asked, “*what didn't you like about working in the CS Makerspace?*” Ninety-two percent (92%) of students provided a response, with the most common answer being that they disliked *nothing* about the makerspace (35% boys, 40% girls). A small percentage of students mentioned a *specific topic* as disliked (17% boys and girls), the *difficulty* of a specific assignment or task (13% boys, 15% girls), or the *time* involved in completing the assignments (13% boys, 3% girls). A small percentage of girls considered the pace of the course to be too slow (8%), or the electronic materials available to be inadequate (5%).

Students were asked 14 questions that referred to five constructs that align with 21<sup>st</sup> century skills: (1) CS content, (2) working in teams, (3) persistence, (4) creativity and problem solving, and (5) initiative and responsibility. Questions for each construct were worded as “How much do you feel you learned in this course about...” and “How much do classes other than the CS makerspace teach you about...” Overall, students viewed the CS Makerspace as superior than other classes with respect to acquisition of CS concepts, learning to work in teams, persistence, and taking initiative and responsibility. Although using creativity and problem solving skills did not reach statistical significance, the CS Makerspace was rated higher than other classes in this skill too.

The teacher interviews provided insights into the impact of the classes in the middle schools on the participating students. Teachers gave examples of their students' work:

- Micro-Pet – had to pet and feed their pet.
- Games: paper-rock-scissors; Simon Says.
- The traffic light project: This was the teacher's favorite project “because it didn't work and it took about three days to figure it out, but one or two figured it out and helped the others”.
- Working on robots in big groups: The teacher loved seeing students work together on the project. “Everybody was participating”; they were around the table and everybody was playing a role.
- Invented and improved games (one student invented a game with 10 levels in one week of classes; he wanted to be able to stump the teacher).

Teachers were able to give many examples of the impact of the project on their students. These are the common themes of their responses:

- Learned science/computer science/coding.
- Learned to think “outside the box”.
- Were able to solve problems “student initially didn't want to solve problems, then they solved problems with their projects and they transferred this ability to other areas”; “students learned to be self-directed”.
- Getting students out of their “comfort zone” / “their own bubble”.
- Learned how to “get along and work collaboratively” (e.g. “working collaborative on a goal-based project” instead of looking at their phone; “to work and get along with each other”).

Teachers were “very impressed with what the kids have done and how they have progressed”. One teacher described approaching a working group and just watching them work collaboratively, “rolling the dice, working with algorithms”. One teacher said, “The benefits for the children are

amazing”. This teacher thought it would impact the students in the future and their lives would be different in five or 10 years because of the class.

Teachers reported surprises in the impact of the project. “Students are interested because they are engaged”, even students who don’t start the class being interested or who were assigned to the class to fill an empty time slot in their schedule. Several teachers reported that behavior problems were minimized in the maker classroom, even with students who were “known trouble-makers”. “Some students are disruptive”, one teacher commented, “but get kids building and actively engaged, and their classroom behavior changes, even in other subjects”.

Teachers reported students coming to class early, staying late, and using study period to work on their maker projects. One student who started out “very unmotivated” became interested and took the lead in projects. The student expressed interest in a related career in the future. One teacher said the biggest success was “students eventually realizing that they are good at this”.

## 7. Summary

The CS Makerspace project developed successful Makerspaces in four middle-school classroom in Alabama. The project had a positive impact on both teachers and their students. Although the teachers varied greatly in their experience with and competency in computer science education and coding prior to the project, they were positive about their experiences with the project. They thought the Professional Development, although they stressed that it was very intensive, provided what they needed to work with their classes. They felt supported and encouraged by the project staff. Teachers reported confidence in their ability to learn the material and teach it to their students, and this confidence greatly increased after participation in the Professional Development and after they had begun implementation in their classrooms. Teachers were pleased with the responses of their students to the hands-on learning and were impressed with the Makerspace project impact on student behavior (very positive), interest (increased), and accomplishments. Teachers reported unexpected outcomes for students that included: self-direction; collaboration; minimizing behavior problems; “can’t tell low level students from high level students”; creativity; problem-solving; and stellar work of female students. The researchers conclude that the CS Makerspace can be used as a valuable tool not only for acquisition of course-specific content, for middle school students and can also build important 21<sup>st</sup> century skills.

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# DOES PARENTAL INVOLVEMENT REALLY MAKE A DIFFERENCE? A STUDY WITH PARENTS OF PRIMARY SCHOOL STUDENTS IN URBAN CONTEXT

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## Abstract

School and family are the closest and most powerful systems in child development. Previously, family is assumed as the main promoter of the child's education, who, inserted in this environment, became aware of social norms and culturally suitable behaviours. However, early family share their responsibility with several other educational entities, especially with the school. In fact, parental engagement in school and its role in the emotional and academic adjustment of children and adolescents has been the subject of multiple studies. Thus, parental engagement is seen as an important resource for the promotion of student learning and development, because it could be changeable, and it is one of the variables more susceptible to intervention, compared to other family characteristics, such as socioeconomic level or parental educational styles. So, the present study aims to explore not only the parental engagement of students in the 3rd year of primary school, but also analyse the relationship between parental engagement and their sociodemographic features. In this study, a sample of 556 Portuguese parents was used, from the Lisbon and Porto districts, whose children are at the 3rd year of the primary school. The data was collected through a sociodemographic questionnaire built within the scope of a largest research and the Parental Engagement Questionnaire (PEQ). PEQ is a self-report questionnaire that assesses parental engagement in the school context through four factors: parental engagement in school and volunteer activities, family engagement in home-based learning activities, school-family communication, and parental engagement in school activities, such as participation in parent-teacher meetings. The results seem to point out that participating parents perceive their engagement in the school context as relevant and high. The results also show the influence of the various forms of parental engagement, since parents who present higher values in one of the parental engagement subscales tend to present the same results in the others as well. The influence of several sociodemographic variables on parental engagement was also verified. The place of data collection (Porto or Lisbon) was also related to parental engagement in several analysed factors. The results attained will be discussed in the light of the most recent literature on educational psychology, and its practical and research implications are also discussed.

*Keywords:* School parental engagement, primary school, education, school success.

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## 1. Introduction

Family plays a fundamental role in social relationships and in the increasingly complex and challenging learning experiences that occur in children's lives, being consensual that children need a family that provides them with emotional, cognitive and material support, that enhances their development and allows them to grow healthily (Berger, 2000). So, the relationships established between parents and children are essential, since parents are the first agents of socialization of children, at the behavioural, emotional and cognitive levels (Piccinini, Frizzo, Alvarenga, Lopes & Tudge, 2007), being determinant for the success of children at various levels. The family, especially the parents, are engaged, in the various stages of their children's development, both in informal moments and activities, as in their process of schooling (Eccles & Harold, 1996). Parental engagement in school has warranted the attention of research as one of the variables of the family context with implications in children's academic success (Epstein, 1987; Hill & Tyson, 2009; Wilder, 2013). In truth, it encompasses various behaviours and attitudes of parents to provide educational resources to support the development and learning of their children (Grolnick & Slowiaczek, 1994). Currently, this construct is considered as important as other elements of the individual's educational process, since it can relate to several aspects related to schooling, both related to schools as physical spaces and also as spaces of fundamental interactions for the development of children and professionals (Bhering, 2003).

Parental engagement in education points to the understanding of the complex interactions between parenting motivation, existing family interaction, students' learning, the methods adopted by teachers at school, the school climate, and the intervention strategies. It is important to promote links between the family, the school and the community, since that, in addition to improving the entire school context, they can also help families communicate with each other and with their surrounding contexts. However, the main reason for promoting a partnership between family, school and community is to help children and young people achieve personal and school success, where parents and teachers should consider themselves partners in education and success promoters (Epstein, 2001).

Thus, the present study aims to characterize the parental involvement of students in the 3rd year of primary school, also analysing the relationship between established parental engagement and their personal and social traits.

## 2. Methodology

### 2.1. Participants

556 parents or guardians responsible for the child's education, whose children attend the 3rd year of primary school, participated in this study, from which 471 parents were mothers (84.7%), 70 were parents (12.6%) and 15 were another reference figure for the child (2.7%). The parents of the 556 students were aged between 24 and 65 ( $M = 40.90$ ,  $SD = 4.65$ ) and mothers between 20 and 56 years ( $M = 38.39$ ,  $SD = 6.00$ ), with a mean of 1.99 children ( $SD = 0.89$ ,  $Min = 1$ ,  $Max = 6$ ). The majority were families from the Porto district (64.7%), but 32.9% belonged to the district of Lisbon. On average, the children lived 3.96km away from the school they attended ( $SD = 19.41$ ,  $Min = 0$ ,  $Max = 100$ ).

### 2.2. Instruments

The sociodemographic data was obtained by filling out an individual identification form built in the scope of the present research. Parental engagement in the school context was evaluated through the parental version of the Parental Engagement Questionnaire [18]. This is a self-report questionnaire composed of 24 items answered on a 4-point Likert scale (from Totally Disagree to Totally Agree). This is an instrument made up of 4 factors or subscales.

The first factor consists of items belonging to the family engagement dimension in activities at school, being it designated by parental engagement in school activities and volunteering ( $\alpha = .83$ ). The items that make up this scale refer mainly to the availability and desire of the parents to participate actively and to organize different activities in the school space, assuming a more proactive rather than reactive engagement. The second factor consists of all the items of the family engagement dimension in home-based learning activities, entitled parental engagement in home-based learning activities ( $\alpha = .80$ ). The third factor refers to school-family communication ( $\alpha = .75$ ), especially to communication that derives from the parents' initiative. The fourth factor concerns parental engagement in school activities and participation in parent-teacher meetings ( $\alpha = .75$ ) and emphasizes the more traditional ways of parental engagement in school.

This questionnaire enables the delivery of 5 score results: an overall score, which is obtained from the sum of the 24 items of the questionnaire (ranging from 24 to 96 points) and concerns the overall parental engagement and 4 scores related to each of the subscales.

### 2.3. Procedures

This research obtained a positive opinion from the Ethics Committee of the Universities to which the authors affiliate and from the Directorate General for Education to carry out research in a school context.

A representative sample of 3rd year students from the primary school was selected to take part in the study and the National Confederation of Parents' Associations, the National Association of Directors of School Districts and Public Schools and the National Association of Teachers were established as research partners. After the first contact made by one of the research partners to the selected school districts, study aims were explained. Whenever a positive response was obtained, a second contact was made to all school districts by the researchers for a more detailed explanation of the aims of the study, sending an informed consent and scheduling of the data collections.

All parents or guardians responsible for the children's education were asked to fill in an informed consent. All school districts also filled in an informed consent.

Data was analysed using IBM SPSS, version 25.0 for Windows (IBM Corp. Released, 2015). The normality of the distribution of variables was verified, as well as the homogeneity of variances. When the assumptions for using the parametric tests were not assured, the statistical treatment of the data was performed using the corresponding non-parametric tests. However, once the results were concordant, it was decided to present the results of the parametric tests, following a recommendation by Fife-Schaw (2006).

### 3. Results and discussion

#### 3.1. School parental engagement characterization

Table 1 presents the descriptive measures of school parental engagement, as well as the correlations between these variables.

Table 1. Intercorrelations and descriptive measures of school parental engagement of participating parents.

	1	2	3	4	5
1. Parental engagement in school activities and volunteering	1				
2. Parental engagement in home-based learning activities	<b>.42**</b>	1			
3. School-family communication	<b>.44**</b>	<b>.73**</b>	1		
4. Parental engagement in school activities and participation in parent-teacher meetings	<b>.59**</b>	<b>.46*</b>	<b>.52**</b>	1	
5. Global parental engagement	<b>.79**</b>	<b>.78**</b>	<b>.80**</b>	<b>.74**</b>	1
<i>M (SD)</i>	2.33 (0.73)	3.54 (0.39)	3.45 (0.46)	3.22 (0.59)	75.44 (10.76)
Scale range	1.00 – 4.00	2.28 – 4.00	1.83 – 4.00	1.00 – 4.00	24.00 – 96.00

Note: \*  $p < .05$ ; \*\*  $p < .01$

The means obtained in the various factors of the questionnaire ranged from 2.33 (parental engagement in school activities and volunteering) and 3.54 (parental engagement in home-based learning activities), which seems to show that parents consider their role in the school more related to their contribution at home, to promote and stimulate the children's learning than to their contribution in the tasks that can be carried out at school. The results obtained in the global parental engagement result were quite high ( $M = 75.44$ ), which seems to highlight the importance that parents seem to attribute to their children's schooling and to themselves as agents that can also play a preponderant role in the academic life of their students.

It was also found that the various factors correlated significantly with each other in a moderate or strong way. The existence of these correlations seems to show that parents who tend to be more engaged in the academic life of their children seem to do so in all their dimensions, investing significantly in the various tasks that the parental engagement with the school implies.

#### 3.2. Relations between school parental engagement and their personal and social traits

Aiming to analyse the relationships between school parental engagement and the sociodemographic variables, mean differences and correlations between the factors evaluated and the different sociodemographic variables were performed.

It was verified, as shown in table 2, that there were significant differences related to the gender of the parent responsible for the child's education.

Table 2. Differences in school parental engagement associated to the gender of the parent responsible for the child's education.

	Mother	Father	<i>t</i>	<i>df</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
1. Parental engagement in school activities and volunteering	2.36 (0.72)	2.11 (0.72)	2.66**	539
2. Parental engagement in home-based learning activities	3.55 (0.40)	3.50 (0.41)	0.87	539
3. School-family communication	3.46 (0.45)	3.41 (0.51)	0.76	539
4. Parental engagement in school activities and participation in parent-teacher meetings	3.24 (0.58)	3.11 (0.66)	1.19	539
5. Global parental engagement	75.74 (10.80)	73.80 (10.38)	1.41	539

Note: \*\*  $p < .01$

When the mothers are the person responsible for the child's education, there seems to be a greater parental engagement in school activities and volunteering, compared to those in which the parent responsible were the fathers, and these differences are statistically significant. Mothers seem to be more available for the less traditional dimensions of parental engagement, such as participation in school trips, end of the year celebrations, when compared to fathers. These differences can be explained by the different social roles that men and women play in society, with women being generally more available and open to participation in education and child-care activities when compared to men, who focus more on their professional life. This may also explain the greater predominance of mothers as the person responsible for the child's education.

The correlation between the age of the mother and the father, the number of children and the distance from the school that children attend with their parental engagement were also analysed.

There was a significant correlation between the age of the father and the parental engagement factor in school activities and participation in parent-teacher meetings ( $r = 0.10, p < .005$ ). The same correlation was observed between the age of the mother and the same factor, parental engagement in school activities and participation in parent-teacher meetings ( $r = 0.15, p < .001$ ), which seems to demonstrate that the older the parents, the more they participate in school activities.

These results can be due to several reasons: on the one hand, older parents can be more available and, for this reason, find it easier to attend the activities; on the other hand, they can value more these face to face and more traditional activities of the parental engagement. These results and these explanations are further reinforced when there is a correlation between the age of the mothers and the overall engagement with the school ( $r = .13, p < .01$ ), that is, older mothers tend to become more engaged in the school.

The existence of some relationships between the number of children and parental engagement was also evidenced. The more children the participants had the less engagement there is in learning activities at home ( $r = -.10, p < .05$ ) and the lower school-family communication ( $r = -.12, p < .05$ ) was. These results may be due to the need for these participants to share their attention with more children, who may also attend the educational system, and also require the attention of their parents to these issues.

No relationship was found between distance to school and parental engagement.

Finally, we analysed the existence of significant differences between the factors evaluated and the place where the data collection took place (Porto or Lisbon). As can be seen in Table 3, there were significant differences between the parents' parental engagement, depending on whether they lived in Porto or in Lisbon.

Table 3. Differences in school parental engagement associated to the location of data collection.

	Porto	Lisbon	<i>t</i>	<i>df</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
1. Parental engagement in school activities and volunteering	2.33 (0.72)	2.27 (0.73)	1.04	541
2. Parental engagement in home-based learning activities	3.56 (0.39)	3.48 (0.41)	2.23*	541
3. School-family communication	3.49 (0.42)	3.36 (0.53)	3.17**	541
4. Parental engagement in school activities and participation in parent-teacher meetings	3.29 (0.53)	3.07 (0.68)	4.05***	541
5. Global parental engagement	76.38 (9.65)	72.91 (12.30)	3.60P***	541

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Parents from Porto are more engaged in learning activities at home, in school-family communication, in school activities in teacher-parent meetings and in school in a more general way, when compared to the parents of students in Lisbon.

This result is the most unexpected. All children attend public education, present similar contextual characteristics among themselves, and it is not possible to explain this result. Further research will be needed on the different variables that may interfere with parental engagement in the school context in order to explain this result.

#### 4. Conclusions

The purpose of this study was to characterize the parental engagement in the school context of parents of the 3rd year of primary school, as well as the exploration of the relationships between this parental engagement in the school context and their personal and social traits. For this purpose, a self-response questionnaire was used, which evaluates parental engagement through four factors: (a) parental engagement in school activities and volunteering, (b) parental engagement in home-based learning activities, (c) school-family communication, and (d) parental engagement in school activities and participation in parent-teacher meetings; and a summation of global parental engagement.

The results seem to show that participating parents perceive their engagement in the school context as relevant and high. The results also show the influence of the various forms of parental engagement, since parents who present higher values in one of the parental engagement subscales tend to present the same results in the others as well.

There was also a congruence between the results obtained in the present study and the results of the literature on the subject, in which the influence of sociodemographic variables is related to the presence of several relationships between the various sociodemographic variables and parental engagement. However, a surprising result was obtained, since the place of data collection (Porto or Lisbon) was related to the parental engagement in several factors analysed. Further research will be needed to better understand this result.

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## **TEACHER AND PEER FEEDBACK IN AN EFL WRITING COURSE: WHAT DO STUDENTS NEED?**

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### **Abstract**

Although teacher and peer feedback is essential in aiding students to progress in their writing skills and is encouraged in any writing class, some classroom circumstances may act to limit the feedback teachers and peers give or may make giving feedback impossible. Conditions that may limit feedback can include heavy teaching loads of teachers, large class sizes, insufficient language knowledge of peers, and cultural limits such as fear of causing loss-of-face or having a “kreng jai” attitude (fear of offending others). Taken together, these factors hinder straightforward feedback from both teachers and peers, impacting growth in student writing skills. This study aimed at finding out students’ needs towards teacher and peer feedback in an English Writing for Daily Life course. Research instruments utilized were a four-point Likert scale questionnaire and semi-structured interview. Participants were 119 mixed-ability third and fourth-year undergraduate students majoring in Business Administration (Management), Accounting, and Mechanical Engineering at a university in the northeastern region of Thailand. Findings revealed that the majority of students had problems with content (59.66%), vocabulary (53.78%), and organization (50.42%). Although these three aspects were their major problems in English writing, teachers emphasized giving feedback on mechanics (54.62%), language use (50.42%), and organization (48.74%), while peers gave feedback more on surface-level features, i.e., vocabulary (44.54%) and language use (41.18%), despite their limitation of language knowledge. Based on the findings, this paper concluded that there was a mismatch between students’ needs and feedback given by teachers and peers, where students needed sufficient feedback to improve their deep-level features, i.e., content and organization. Although students needed to receive more feedback to improve their content and organization, they also needed feedback on vocabulary, language use, and mechanics to improve the quality of their writing. Therefore, it is suggested that teachers give feedback focused on syntax to help students in terms of their language limitation, whereas peers should be trained to give feedback on content and organization to develop their critiquing skills.

**Keywords:** *Teacher feedback, peer feedback, EFL writing.*

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## **1. Introduction**

### **1.1. Background**

Feedback has long been used and given to students as it helps to improve their writing skills. It helps students to not only write better but also to develop their confidence, encouraging them to learn collaboratively (Rollinson, 2005; Weerathai, 2019; Yu & Hu, 2016). However, under some circumstances, teachers may limit to give feedback only on particular writing aspects such as language use and mechanics to save time due to their heavy teaching loads and large class sizes (Changpueng, 2009; Chinnawongs, 2001; Honsa, Jr., 2013) and leave out writing aspects that students may need, i.e., content and organization. On the other hand, students may give feedback on surface-level features to their peers such as vocabulary and language use, despite their language knowledge limitation, because this does not require skills to critique peers’ work so that they do not have to offend others (Weerathai & Arya, 2020). Regarding teaching and learning writing in the Thai context, these conditions make it challenging to alleviate the situation. Thus, this study would help teachers and educators to better understand students’ needs in terms of feedback that they need in their writing as well as suggest what to do to minimize such challenges when giving teacher and peer feedback.

## 1.2. Purpose of study

Although feedback is necessary to be given to students learning of writing, the given feedback, sometimes, does not cater to their needs due to the aforementioned classroom conditions. Hence, the purpose of this study was to find out the students' needs towards teacher and peer feedback in an English writing course so that it might help both teachers and peers to better give feedback that caters more to students' needs and to alleviate challenges in classroom.

## 2. Methods

### 2.1. Research design and participants

The design of this study was mixed-methods. A four-point Likert scale questionnaire and semi-structured interview were utilized as research instruments to find out students' attitudes towards teacher and peer feedback in an English Writing for Daily Life course in the first semester of the academic year 2019. Participants were 119 mixed-ability third and fourth-year undergraduate students majoring in Business Administration (Management), Accounting, and Mechanical Engineering at a university in the northeastern region of Thailand, aged 20-24 including male and female. The English writing proficiency of most students was at the intermediate and low levels.

### 2.2. Data collection

The questionnaire was distributed to 119 students towards the end of the course of study. It took about 10-15 minutes for the students to complete the questionnaires. All questionnaires were returned (100%). Moreover, the semi-structured interview was conducted with 18 students including 6 high, 6 intermediate, and 6 low-proficiency students. The interviewees were asked to report and elaborate their views in Thai regarding teacher and peer feedback. Each interview took about 10-15 minutes. All interviews were audio recorded.

### 2.3. Data analysis

The criteria of the questionnaire were set prior to the analysis to interpret the data. The data were interpreted as follows:

#### 1. Problem areas in writing

1 = not problematic at all (1.0-1.49)

2 = not very problematic (1.5-2.49)

3 = problematic (2.5-3.49)

4 = very problematic (3.5-4.0)

#### 2. Frequency of feedback given by teachers and peers

1 = not very often at all (1.0-1.49)

2 = not often (1.5-2.49)

3 = often (2.5-3.49)

4 = very often (3.5-4.0)

Data obtained from the questionnaires were calculated by using descriptive statistics. The statistical methods used to analyze the data were percentage, arithmetic mean, and standard deviation. The percentages reported in this paper showed only of Scale 3, i.e., problematic and often.

In addition, data gained from the semi-structured interviews were analyzed using content analysis. It was used to probe into two main areas: a need for teacher feedback and a need for peer feedback. After that, data were transcribed, tallied, and reported.

## 3. Results

Results from the questionnaire showed that many students had problems with writing clear topic sentences and relevant supporting details (59.66%), using appropriate and meaningful words and idioms (53.78%), and organizing and sequencing sentences within the paragraph (50.42%). Table 1 shows problem areas in writing of the students.

*Table 1. Problem areas in writing of the students.*

Aspects of writing	Mean	SD	Percentage
1. Content (e.g., thesis statement, topic sentence, and supporting ideas)	2.66	0.68	59.66
2. Organization (e.g., sentence/paragraph organization and sequencing)	2.58	0.71	50.42
3. Vocabulary (e.g., words and idioms)	2.65	0.78	53.78
4. Language use (e.g., grammar and structure)	2.87	0.87	49.58
5. Mechanics (e.g., spelling and punctuation)	2.55	0.71	49.58

Despite of the fact that many students had problems with content, vocabulary, and organization, teachers gave feedback more on spelling and punctuation (54.62%), grammar and structure (50.42%), and organizing and sequencing sentences (48.74%).

As for peers, despite having problems with content, vocabulary, organization, and language knowledge, they emphasized giving feedback on surface-level features, i.e., vocabulary (44.54%) and language use (41.18%). Tables 2 and 3 illustrate frequency of feedback given by teachers and peers on each writing aspect.

Table 2. Frequency of feedback given by teachers.

Aspects of writing	Feedback given by teachers		
	Mean	SD	Percentage
1. Content (e.g., thesis statement, topic sentence, and supporting ideas)	2.78	0.77	46.22
2. Organization (e.g., sentence/paragraph organization and sequencing)	2.79	0.75	48.74
3. Vocabulary (e.g., words and idioms)	2.88	0.77	47.06
4. Language use (e.g., grammar and structure)	2.86	0.76	50.42
5. Mechanics (e.g., spelling and punctuation)	2.72	0.71	54.62

Table 3. Frequency of feedback given by peers.

Aspects of writing	Feedback given by peers		
	Mean	SD	Percentage
1. Content (e.g., thesis statement, topic sentence, and supporting ideas)	2.35	0.78	36.97
2. Organization (e.g., sentence/paragraph organization and sequencing)	2.31	0.75	36.13
3. Vocabulary (e.g., words and idioms)	2.45	0.77	44.54
4. Language use (e.g., grammar and structure)	2.38	0.78	41.18
5. Mechanics (e.g., spelling and punctuation)	2.26	0.79	35.29

Regarding the results of the interviews, most of the students addressed that feedback was essential and should be given to students to aid them to progress in their writing, especially feedback given by teachers. This would help them see their strengths and weaknesses in their writing, which could improve their writing skills and make them feel confident to write.

In terms of a need for teacher feedback, many of the high-proficiency students revealed that they preferred teacher feedback to peer feedback. They viewed teacher feedback as reliable and useful, and that they could trust the feedback. They suggested that teachers give sufficient feedback on the areas that they had most difficulties with such as content and vocabulary. Although the high-proficiency students viewed the need for teacher feedback more on these areas than the other areas, they revealed that they also expected teachers to give feedback on grammar and structure because they did not know whether their peers could give correct feedback to them.

As for the intermediate and low-proficiency students, they revealed that they were satisfied with teacher feedback. Particularly the intermediate students, they felt that teacher feedback was useful and straightforward. Feedback given by teachers could benefit them more than peer feedback, especially that given on the areas of content and vocabulary. For the low-proficiency students, although having mentioned that they liked teacher feedback as well, they reported that feedback on content and organization was insufficient. More feedback in terms of examples on the areas of writing topic sentences and supporting sentences should have been given to the students. This would help them have more examples and sentence models to follow. The following are examples of the students' views on teacher feedback that represent the majority of each proficiency level.

*I think teacher feedback was useful and it should be given to students. I could see my strengths and weaknesses in my writing. However, the teacher should give more feedback on vocabulary and content. I think vocabulary was very important. If I knew more vocabulary, I would be able to write and understand the texts better. So, I think the teacher should give more feedback on vocabulary to expand our vocabulary knowledge. (Yaya – High)*

*I think teacher feedback was beneficial. When my partner could not see my writing problems, the teacher could clarify those problems, which helped me improve my work. However, I think the teacher did*

*not give enough feedback on content and vocabulary. It was quite difficult for me to write a clear topic sentence and choose the right words in my supporting sentences. (Barry – Intermediate)*

*Teacher feedback was useful, but I would like the teacher to provide more examples in terms of writing clear topic sentences, supporting sentences, and organizing paragraph. Sometimes I did not know what to write and revise my work because I did not have enough examples to follow. (Bella – Poor)*

In terms of a need for peer feedback, many of the high-proficiency students did not find it very useful. Since the majority of the students gave feedback on surface-level features, despite their language knowledge limitation, the high-proficiency students found it hard to trust such feedback. They suggested that teachers also give feedback on the aspect of syntax other than those on global aspect.

As for the intermediate and low-proficiency students, they reported that peer feedback was useful, especially those of low-proficiency level. They could learn writing collaboratively making them feel more confident to express their ideas and talk more openly with their friends. Although feedback was not very constructive when given on the aspect of syntax, they were still satisfied with having peer feedback employed in the classroom because it helped them learn with each other and did not find the classroom atmosphere too boring. The following are examples of the students' views on peer feedback that represent the majority of each proficiency level.

*I think peer feedback was not very useful. Although it allowed us to exchange ideas, the feedback was not clear. When I asked my friend about my minor supporting sentences whether they were relevant to the major supporting sentence, she said that she was not sure. Sometimes she gave me feedback on grammar and I asked her why it was wrong, she could not explain why. She said that she just felt it wrong. I think she did not really know the answers. (Lisa – High)*

*Peer feedback was good. It allowed us to discuss and share ideas more openly. However, the feedback was not constructive. My partner said that my grammar seemed wrong, but she could not tell me why. So, it was hard for me to revise my work. (Mario – Intermediate)*

*I think it was good. Sometimes the students were not brave enough to ask the teachers directly and peer feedback allowed us to communicate and exchange ideas easier and more openly. The classroom atmosphere was not so boring. (JJ – Low)*

In brief, teacher and peer feedback were useful methods to employ in this writing class. Although there was a mismatch between the students' needs and the feedback given by teachers and peer due to some classroom conditions, it was evident that the students were satisfied with teacher and peer feedback in general because it helped them to not only gradually improve their writing skills but also to boost their confidence to learn writing collaboratively.

## **4. Discussion**

This study explores the students' needs towards teacher and peer feedback in an EFL English writing course. Results from the questionnaire and interview indicate a mismatch between feedback given to the students and their needs. The following suggest possible areas when employing teacher and peer feedback in any EFL writing class.

### **4.1. Providing an explicit peer feedback training**

Regarding the results from the questionnaire where peers emphasized giving feedback on surface-level features, despite their limitation of language knowledge, suggest that an explicit peer feedback training is required to train students to give more feedback on deep-level features. Research (Min, 2016) on effect of teacher modeling and feedback on EFL students' peer feedback skills revealed that peer feedback training was very important and should be given sufficiently and repeatedly to students to train them on cognitive aspects. This could not only encourage them to think and critique their partners' work straightforwardly but also most cater to their needs for feedback.

### **4.2. Giving teacher feedback on the aspect of syntax**

Evidence from the interview where students, especially those of high and intermediate proficiency levels, revealed that feedback from peers on the aspect of syntax was not very constructive and useful. Studies (Dressler, Chu, Crossman & Hilman, 2019; Ekşi, 2012) on peer feedback in writing showed that students, without being exposed to explicit training, gave more feedback on surface-level features. However, the feedback was not constructive enough to help their peers to revise their work. It is suggested that teachers give feedback on the aspect of syntax to help students in terms of their language problems, and peers should be trained to give more feedback on the aspects of content and organization.

### 4.3. Providing sufficient reading input to students

Evidence from the interview where students reported that they needed the teachers to give more feedback on the areas of content and vocabulary suggests that students had insufficient vocabulary knowledge and wider outlook on world knowledge; hence, they depended more upon teacher support. Research (Weerathai & Arya, 2020) on the effectiveness of self-monitoring and peer feedback strategies implemented in an English essay writing class revealed a slight improvement on students' post-test writing due to providing insufficient reading input to the students. This suggests that providing sufficient reading input to students is necessary as it helps to expand their vocabulary knowledge and to expose them to a wider outlook on world knowledge so that they do not have to often depend upon teacher feedback and are able to learn from their peers.

## 5. Conclusion

This study shows that students appreciated the importance and benefits of both teacher and peer feedback. Although there was a mismatch of the needs for the given feedback between teachers and students, where both teachers and peers could have provided feedback more on deep-level features than those on surface-level features, it is recommended to give teacher and peer feedback in any writing course to facilitate students in learning writing, sharpening their critiquing skills, and exposing them to a broader outlook on world knowledge.

## 6. Limitations

This study was conducted over a period of one semester; hence, there were two major limitations as follows:

1. The students were not given sufficient and explicit peer feedback training. It might be the case that they gave feedback on writing aspects that they did not have to directly criticize and offend their peers, i.e., surface-level features.
2. The tasks that the students worked on were mostly about paragraph elements encompassing paragraph topic, topic sentence, supporting sentences, concluding sentence, transitions, and paragraph organization. It might be the case that the students correlated feedback components to the specific tasks rather than to writing in general.

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## WHEN IT RAINS WHILE THE SUN IS SHINING: SCHOOL CLIMATE AS AN ECHO OF THE (FUTURE) SOCIAL CLIMATE

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### Abstract

Considering that a society is a ‘particular grouping of humanity with shared customs, laws etc.’, school meets all these criteria and, given that, it may be called a society within a society, a miniature society that exists within a larger society. Schools provide a social context for a broader and more complex social world. Hence, school is more than a context for academic learning, it is also a place where children learn to build positive social relationships, gain independence and develop emotionally, behaviourally, and cognitively. School attendance involves navigating peer interaction, solving social problems, developing the socioemotional and relational skills essential to build and maintain relationships. What happens in the social life of children is central to the sense of comfort and safety in school and to participation in school tasks and their school results. The school climate involves the quality and consistency of interpersonal relationships, the sense of belonging to the school community and the perceived safety that the School conveys and seems to be reflected in the socio-emotional adjustment and mental health of children and young people. In addition, school and behavioural outcomes also appear to be associated with the school climate. There has been a significant and rising interest in improving the school climate in recent years. This is due to the following three factors. First, there is a growing number of empirical researches that support the notion that context is important. Second, there is an increasing perception that a better school climate supports the effective prevention of violence in general. Third, there is an upward interest in the promotion of transversal skills such as moral values, socio-emotional skills, mental health promotion efforts, and the promotion of citizenship through community engagement. This growing interest in research on the school climate has also been seen at the political level. This is considered an essential aspect in the development of programs to promote socio-emotional skills and to prevent behaviour problems. It is intended that school climate and safety can be non-academic indicators for classifying schools. The present study aims to analyse the school leaders’ perceptions about the school climate. It is intended to describe their conceptualizations about the subject, as well as their reflections on the utility and implications of the concept. Through content analysis it will be possible to reflect on the trends, challenges and implications of this concept, presenting the implications for practice and for research.

**Keywords:** *School climate, primary school, education, school success school leaders.*

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### 1. Introduction

The importance of school climate was already recognized over 100 years ago, when Arthur Perry published the *Management of a City School* (1908). Perry recognized the need to provide students with a quality learning environment. However, school climate didn’t take part in the field of empirical research until the early 1960s, when an instrument for assessing the organizational climate was developed. It was at that time that the effects of the school organizational climate on learning and students’ development began to be systematically studied. Over the past few decades, researchers and educators have realized that the initial conceptualization of school climate was overly simplistic, hence recognizing school climate as a multidimensional construct (Wang & Degol, 2016).

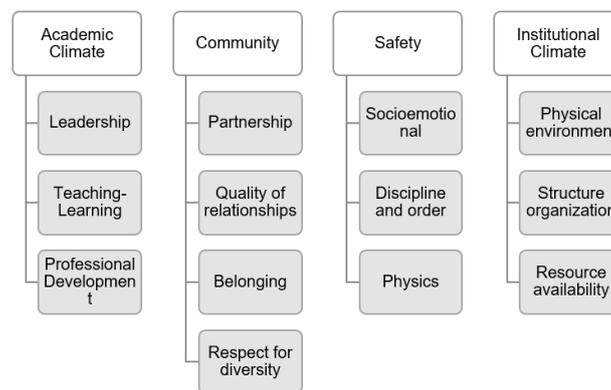
School climate brings together the social, emotional and physical features of the school community (Voight & Hanson, 2017). According to Cohen et al. (2009), the school climate is the “life’s school quality and character,” which includes “norms, values, and expectations that support people in feeling socially, emotionally, and physically safe” (p. 182). Metaphorically it is the heart and soul of the school (Bear et al., 2016).

All definitions of school climate include references to the importance of positive interpersonal relationships and a sense of belonging. Many even include the importance of students and professionals feeling safe in school (Bear et al., 2016).

It is, therefore, currently agreed that the school climate is multidimensional. The inclusion of multiple domains enriches research in this field and increases the likelihood of significant change through school reform initiatives that focus on multiple pathways to student success. The school climate can be a potentially promising target for intervention. More and more empirical research on school-wide interventions supports the premise that changing the social processes of the school climate will produce better outcomes for students in various fields.

Although there is agreement on the complexity of this construct, the authors greatly differ in the dimensions they include in the school climate. Wang and Degol (2016) elaborated a literature review, identifying and categorizing the multiple dimensions described in the literature into 4 domains, corresponding to 13 dimensions (see figure 1).

Figure 1. School's Climate Dimensions (Wang & Degol, 2016).



The multidimensionality of school climate is, however, represented in the literature, which defines the school climate in four ways: academic, community, security and institutional climate. These four broad categories provide one of the most comprehensive conceptions of school climate quality. The academic climate focuses on the overall quality of the academic atmosphere, including curricula, teaching-learning process, teacher training and their professional development. The community emphasizes the quality of interpersonal relationships within the school. Safety represents the degree of physical and emotional security provided by the school, as well as the presence of effective, consistent and fair disciplinary practices. Finally, the institutional environment reflects the organizational or structural characteristics of the school environment. Collectively, these four dimensions encompass almost all features of the school environment that affect students' cognitive, behavioural, and psychological development (Wang & Degol, 2016).

School climate has been shown to be predictive of students' academic, behavioural and psychological outcomes (Wang & Degol, 2016).

A broad set of studies has shown that a more positive school climate is associated with greater academic success. The most consistent results demonstrate the importance of the academic and community dimensions in promoting school success. Schools that set high academic standards, have effective leadership, emphasize learning goal orientation and have students who demonstrate higher academic performance. Similarly, community characteristics such as close teacher-student relationships, regular communication between parents and schools, and valuing diversity evoke an academic environment that is conducive to learning and promotes motivation and school success among students. Institutional and safety factors, on the other hand, appear to be less consistently associated with academic achievement, with effects that often disappear when other school climate factors are controlled (Wang & Degol, 2016).

Regarding the academic climate, the quality of an academic environment has been widely documented as an important predictor of student achievement in primary and secondary school samples (Lee, Smith, Perry & Smylei, 1999). The best performing schools tend to emphasize the importance of commitment to high academic standards and are characterized by the effective leadership of teachers and leaders. On the other hand, schools characterized by high quality interpersonal relationships, communication, cohesion and feelings of belonging to the school community are better able to support students' psychological needs and promote optimal development in academic fields. Positive relationships

with teachers and between students have been shown to have a positive relationship with standardized test scores (Esposito, 1999) and students' motivation to learn (Patrick, Ryan & Koplan, 2007).

Research has also shown the importance of the school climate in reducing student behaviour problems. The school climate dimensions related to community resources and safety perception are those that seem to be most associated with students' behavioural differences (Wang & Degol, 2016).

The results of several studies have shown that there is a connection between the quality of interpersonal relationships in the school environment and the experiences of bullying, aggression and delinquency. Students' perceptions of cohesion in the school community and their sense of belonging to this community are associated with a lower risk of victimization and involvement in bullying (Zaykowski & Gunter, 2012) and less violent behaviour. Similarly, students are more willing to intervene or report risk behaviours when they realize that the school environment has a strong sense of solidarity and community belonging (Syvertsen, Flanagan, & Stout, 2009).

Similarly, quality peer relationships have been associated with a reduction in aggression, victimization, and behaviour problems (Elsaesser, Gorman-Smith, & Henry, 2013). Pupils attending schools where their peers are attentive or helpful, have experienced better adaptation to the school. This favourable adaptation also predicted better health and fewer psychosomatic symptoms (Hendron & Kearney, 2016).

Research has shown that community characteristics that emphasize school belonging, respect for students' opinions and social supportive relationships are essential determinants of psychological functioning. For example, in a study with a large transnational sample, adolescents in schools characterized by a more distant social environment (for example, students who reported not feeling they belonged to school) reported worse emotional adjustment results when compared to adolescents in schools characterized by a higher relational quality (Freeman et al., 2009). Positive interpersonal relationships have been consistently linked to more positive adjustment and lower prevalence of psychopathology (Way, Reddy, & Rhodes, 2007). In fact, more positive interpersonal relationships between students and also between students and teachers, as well as greater parental involvement in school, have been associated with greater life satisfaction (Suldo, Thalju-Raitano, Hasemeyer, Gelley, & Hoy, 2013), better coping strategies, higher self-esteem and optimistic attitudes toward school (Ruus et al., 2007). These results demonstrate that the quality of interpersonal relationships within the school is one of the most robust predictors of psychological adjustment (Wang & Degol, 2016).

In terms of safety's perception, a recent meta-analysis of social and emotional learning interventions, aimed at improving school safety and reducing problem behaviours, found evidence of the impact of these interventions on social and emotional skills, on the attitudes towards oneself and school and positive social behaviours (Durlak, Wessberg, Dymnicki, Taylor, & Schellinger, 2011). It was also possible to observe a decrease in behavioural problems and emotional distress when compared with the control group, giving empirical support to the importance of improving school safety in promoting psychological adjustment. In the same line of thought, students' perceptions of fairness of classroom rules, discipline, and overall school safety are negatively associated with psychological distress, including loneliness, anxiety, and depression (Hendron & Kearney, 2016), as well as a decrease in internalization and externalization symptoms (Suldo, McMahan, Chappel, & Loker, 2012). A study led by the University of Tallinn on dropout prevention has shown that the school climate perceived by students, especially the school's value system and teachers' attitudes towards students influences the students' upbeat acceptance about life, its physiological well-being and consequently its academic success (Ruus et al., 2007). These results suggest that the school climate may have moderating effects on student well-being (Voight & Hanson, 2017). Considering climate effect relevance, this study aims to analyse the perceptions of school leaders about the school climate. It is intended to describe their conceptualizations about the subject, as well as their reflections on the utility and implications of the concept.

## 2. Methodology

### 2.1. Participants

10 leaders of 10 primary school partook the present study: 6 (60%) female and 4 (40%) male, aged between 38 and 61 years ( $M = 47.90$ ,  $SD = 7.80$ ). All primary school leaders had a bachelor's degree and belonged to school staff, working as teachers on average for 22.70 years ( $SD = 7.53$ ,  $Min = 14$ ,  $Max = 38$ ). They have worked in the current school, on average, 17.20 years ( $SD = 6.53$ ,  $Min = 9$ ,  $Max = 31$ ) and belonged to the school board, on average, for 14.60 years ( $SD = 7.55$ ,  $Min = 2$ ,  $Max = 30$ ). Most of the primary school leaders (60%,  $n = 6$ ) belonged to the Porto district and 40% ( $n = 4$ ) to the Lisbon district.

## 2.2. Instruments

Sociodemographic data was collected by completing an individual identification form constructed within the scope of this research. Participants' perceptions of school climate were assessed by a questionnaire constructed also within the scope of the present study, in which participants answered on a 5-point likert scale where 1 meant very bad and 5 very good.

## 2.3. Procedures

The present study obtained a positive opinion from the Ethics Committee of the Universities to which the authors affiliate and from the Directorate General for Education to carry out research in school context.

A representative sample of 3rd year students from the primary school was selected to take part in the study and the National Confederation of Parents' Associations, the National Association of Directors of School Districts and Public Schools and the National Association of Teachers were established as research partners. After the first contact made by one of the research partners to the selected school districts, study aims were explained. Whenever a positive response was obtained, a second contact was made to all school districts by the researchers for a more detailed explanation of the aims of the study, sending an informed consent and scheduling of the data collections.

All participants and school districts filled in an informed agreement.

Data was analysed using IBM SPSS, version 25.0 for Windows.

## 3. Results and discussion

### 3.1. School's climate characterization

Table 1 presents the descriptive measures of school climate.

*Table 1. Descriptive measures of school climate.*

	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>SD</i>
School climate among students	4	5	4.50	0.53
School climate among teachers	4	5	4.30	0.48
School climate between students and teachers	4	5	4.40	0.52
School climate between teachers and school management	4	5	4.60	0.52
School climate between parents and teachers	4	5	4.50	0.53
School climate between parents and school management	4	5	4.60	0.52

The results show that the participants consider that there is an extremely positive school climate in their schools, in several features, considering that the averages obtained were above 4 and the answers ranged from 4 to 5. Bearing in mind the number of participants and the proximity of averages obtained, no tests were performed to understand if there were differences in averages associated with different aspects of school climate. However, it would be important to increase the number of participants, in order to understand if the response tendency remains with the increase of participants and clarify which characteristics the school leaders consider to contribute to better and worse school climate. Only this clarification could allow to intervene preventively or to remedy such dimensions that they consider to be more negative, and fostering the ones which they recognized as promoters of the well-being of all students and all educational agents.

## 4. Conclusions

The present study aimed to characterize the school climate according to the perception of primary school principals, who was been consulted to evaluate their perceptions and opinions. To do that, it was used a self-answer questionnaire built in the scope of the present research.

In fact, all participants consider that there is a positive school climate in their schools, approaching the answers obtained to the maximum values. They also found that this positive school climate is transverse to various dimensions of this construct, especially the school climate between school management and teachers and parents. Although the number of school principals to be relatively small, it cannot be overlooked that they seem to see themselves as the main promoters of a positive school climate. In fact, the highest evaluations are observed precisely when the school climate is assessed among the principals themselves and other educational agents. On the other hand, and although the evaluations are still high, it is noted that the school climate among teachers and between them and students are the aspects of the school climate with the lowest evaluations, in the school principals' opinion.

However, in order to allow the generalization of results and to define intervention strategies that promote a better school climate, it would be necessary to increase the number of the sample that would allow more robust statistical analysis.

It would be equally important to understand what variables related to school, students and their families and teachers contribute to the development of a positive school climate.

In fact, research studies focus in the school climate are particularly interesting and needed because it is believed that school climate could be an echo of the (future) social climate.

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## DIGITAL ENGINES AT WORK: PROMOTING RESEARCH SKILLS IN STUDENTS

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### Abstract

The paper focuses on the digital teaching and research practices which make an indispensable integral component of upscale education. The authors compare traditional approaches to education against the much demanded by the society, promising approaches which heavily rely on the digital engines. Most relevant – education-wise – features of centennials / millennials, also referred to as “digital natives”, are taken into account. The digital teaching practices and digital research practices that can be used in teaching are outlined; teaching potential of some digital engines is examined.

**Keywords:** *Education, digital, teaching, research, experiment.*

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### 1. Introduction

In the digital-age renaissance educators prepare learners with essential digital-age research skills, and integrate powerful digital tools (DT) into classes.

The authors focus on linguistic research in didactic perspective.

Key ideas what we focus on are:

1) ever growing awareness in the academic circles that research should make the integral indispensable component of upscale education;

2) in the ever changing environment many approaches to education are “stillborn” and rapidly grow outdated;

3) living in the digital age inhabited by centennials / millennials, also referred to as “digital natives”, calls for new approaches in education;

4) what digital teaching practices and digital research practices can be used in teaching.

The ideas we are going to promote here are: the world is rapidly changing towards digital global transatlantic happiness; it is to be taken into account in the education as it is the teachers’ responsibility to prepare young people to cope with it – through using DT for academic and research purposes, the research being one of the key education components.

### 2. Academic environment

Let us focus on the research as the integral indispensable component of upscale education. It is an open secret that the education is getting more and more practically oriented, still – fortunately – the academic community persists in promoting research skills in students as it is the methodology and research techniques and methods that shape a modern specialist who is able to find solutions to the challenges the world offers today. In fact, research skills – in the broad sense – are the cornerstone in all kinds of human activity. The first researchers are newly born babies doing research all day long learning to survive in our world. The research competence is explicitly declared in the operating EMT (European Master’s in Translation) standard as the leading reference standard for translator training, to be in effect until the year 2024.

The EMT standard specifies 35 crucial competences, which must be mastered by prospective specialists. Let us focus on some of them, and research-related ones among them, and reword some of the competences in a wider perspective – in addition to EMT requirement, or instead, he/she has to be able to edit the text, we would say, **process** the text in different formats with different purposes as the final requirement a translator / interpreter or a linguist is to meet is to generate a text – ideally in Queen’s English, at least (providing there are no special stylistic requirements). We have to admit, however, that

this competence is often seriously underestimated and even neglected (regularly by the so called innocent translators, with no specialized education). Then a would-be linguist is to be able to explain and justify the translation choice. It implies that the translator should be on good terms with the linguistic and translation theories.

### 3. To cope with the ever changing world

Our next point is that the world nowadays is an ever changing environment in which we have to teach students correspondingly, while many running approaches to education are practically “stillborn” and rapidly grow outdated. We have to deal today with a New Learner who emerged some 15 years ago – it is IGeneration, Millenials, or Generation Y. M. Prensky admits: “Our students have changed radically. Today’s students are no longer the people educational system was designed to teach”, referring to them as digital natives, digital immigrants (Prensky, 2001).

What makes the issue extremely complicated is that the world has, quite recently, started changing and whirling as fast as it never had before. The problem is, as many scientists claim, that the traditional institutions are not as flexible as we want them to be. It refers to education as well. Evolving educational landscape is getting less and less recognizable.

It is enough just to look around and see how rapidly it flip flops our traditional perceptions of time, finance, gender, even space which is getting, all of a sudden, unbearably and painfully global.

We are facing a dynamic combination of changing mindset, behaviors and skills – how to cope with this?

Greater access to the abundant information resources changes the learning trajectory focus from memorizing and listening to arming the learner with the tools that help get oriented in the information oceans.

E. Sheninger claims: “Students are engaged in their digital worlds, and they are learning without us” (Sheninger, 2014).

Maybe they no longer need us? Or we should reconsider our roles and learn to navigate and pilot them through this digital world, domesticate that digital monster?

We argue, though, that it is still professors who can explain the basic points, the theoretical background and arm the students with the methods and methodology, teach them how to learn, how to extract info from and through search engines and pilot them towards the goal.

So, we are not going to be extinct, at least for some 100 years. If we cope with the changes. There are lots of strategies suggested for meeting the challenges of the changing world, to mention one of them.

The general strategy on how not to lag behind the learners, or to get “change savvy” (Herold & Fedor, 2008) involves:

- careful entry into the new suggested setting;
- listening to and learning from those (students included) who have been there or been at it longer;
- being enthusiastic, genuine and sincere about the changing circumstances – obtaining support for what needs to be fixed;
- developing a credible plan for making a fix or improvement.

We do not reproduce here the full list the author suggested, though the message is clear – the present-day professor must be open to changes. The point is that it refers to general principles while does not offer a tangible tool arming us, professors, with the practical guide to be used in class.

For example, today delivering lectures in the traditional way as *a sage on stage* makes little or no sense at all. Why?

1) Students are not motivated enough as they are only too well aware of the fact that they can refer (and actually **must** be sent) to abundant information resources at their disposal. The teachers’ responsibility here is to arm them with the routes, where to go and how to find what they need.

2) In the pragmatism world which we live in now, students are practically oriented – they need practical skills and knowledge on which they expect to survive in their professional life – *Do not give me fish teach me how to fish*, – as the old adage goes.

One of the practical tools of change which we tested with our students is Project-Based Learning (PBL) (Suleimanova, Yaremenko, & Vodyanitskaya, 2018), directly relating to the discipline students are studying, instead of the end-of-the-term exams – it is the strongest motivator for a student, as well as for professors. PBL adds to the teambuilding, students learn to exercise the team spirit, they solve a practical problem, learn how to manage the research data. Besides – what is essential – practice public speaking, fight the stage fright, not to mention student satisfaction after invariably successful presentation of the project.

Pascal Finett (from Google) says that we live in “a culture of participation plus technologies plus networks” that will in his opinion change the course of human history. It means teambuilding nowadays is one of priorities, to be promoted in education.

Another tool that changes the teaching practices is analytical interpretation – e.g., in teaching Theory of linguistics (which is not the most exciting discipline for sophomores), we may offer students a research object – e.g. a cluster of synonyms and ask them to analyse the research route within the frame of different linguistic paradigms: it is actually a traditional “what if” exercise applied in a new perspective. Students toy with research object in the cognitive / semantic, discourse or theory of speech acts or psycholinguistic or sociolinguistic perspective, then they are to elaborate corresponding research routes.

Now they know how to handle research in a variety of linguistic schools and approaches and, if needed, they will be able to draw data from different sources to prove their ideas. They grow multidisciplinary.

We also tried to delegate simple descriptive topics to students: they were asked (teamwork format) to prepare team presentations and in this way we may “kill quite a few rabbits”: students did search, arranged the information and delivered a presentation working as a team (instead of a boring professor drifting along the theme). There is also some competition between the teams and students are listening to each other with much greater interest than to a monotonous professor. In this way we delegate much work and creativity (quite a powerful motivator) to the students, and try to cope with “the wind of change”.

#### 4. Digital natives

The digital learner prefers to network simultaneously with others, processes pictures, sounds, colors and video before texts; learns what is relevant, active, instantly useful and fun (Sheninger, 2014).

Today’s kids are born digital-born into a media-rich, networked world of infinite possibilities. But their digital lifestyle is about more than just cool gadgets; it’s about engagement, self-directed learning, creativity and empowerment (Sheninger, 2014).

We are immersed into this world whether we like it or not, we live in the digital-age renaissance and have to be in tune with the real world.

It is amazing how dramatically digital we are getting. Educators are learning (life-long learning – one more new popular concept) to be the catalysts for change and prepare learners with essential digital-age research skills, and integrate powerful digital tools into classes.

Let us look at the concept of a digital learner against a traditional educator. Digital learner prefers:

- to access information quickly from multi-media sources (educators prefer slow release of info from limited sources);
- parallel processing & multitasking (educators prefer linear processing, single tasks or limited multitasking);
- random access to hyper-linked multimedia information (educators prefer to provide information linearly, logically, and sequentially);
- to learn “just in time” (educators – “just in case”);
- instant gratification & immediate rewards (educators – deferred gratification & delayed rewards);
- **to network simultaneously with others** (educators – students to work independently before they network and interact);
- processing pictures, sounds, colors & video before texts (educators – text before others);
- **learning that is relevant, active, instantly useful & fun** (educators – feel compelled to teach memorization of the content in the curriculum guide) (bold type is added) (Sheninger, 2014).

As we can see, teamwork (=working simultaneously with others) and being practical and fun are emphasized. We are tasked with preparing students for success in a world that is becoming more dependent on technology, whether we like it or not. The good side to it is that it transforms universities into vibrant learning communities.

#### 5. Digital teaching practices & digital research practices

Digital engines can facilitate and substantiate the research results, not to mention the teaching practice where they make edutainment possible. Digital engines may be divided into **search** engine vs **research** tool: text analysis and linguistic experiment.

As a **search** engine Google and other big data resources, e.g. text corpora are used as a source of linguistic data which are time and resource efficient data acquisition and preliminary processing tools – through them functional style, discourse analysis can be effected.

What remains dramatically underestimated in teaching theory practice is the **research** potential: we can analyze the texts in a variety of perspectives, e.g.: *SentiStrength* which focuses on *Sentiment Analysis / Opinion Mining*, the system searches for emotionally charged vocabulary in the text (on the basis of the dictionary data) and evaluates the negative vs positive tone of the text. Applicable in analyzing social networks communication; ranging along the intensiveness scale; compares the original vs translated texts as regards their emotional and evaluation contents. Another tool is *VAAL-mini* which evaluates subconscious emotional impact of phonosemantic structure of the text on recipient, predicts emotional response of the audience and exploits it when compiling the texts with the desired effect. Applicable in advertising (naming, slogans), analyzing individual speech characteristics, mass media texts.

*Tropes* system specializes in content-analysis and defines stylistic register, chronology, communicators, parts of speech (frequency); key episodes, logical steps, modality, etc.; is applied in advertising, persuasive discourse potential, academic discourse, mass media news, fiction.

These powerful digital instruments empower the researcher with the means of analyzing “ready” text.

What is more appealing in digital tools is that they offer research resources for **experimental** methods: in psycholinguistics, sociolinguistics, and semantics. They challenge traditional polling psycholinguistic practices: e.g. associative experiment, via Mentimeter, the system processing polls online, representing immediately the results in a variety of graphic formats. Its VAT is that it is attractive with the younger generation as it is operated by the telephones.

We can also verify semantic hypotheses, registering the number of acceptable phrases (instead of polling native speakers). We may also use Google, Yandex and other search engines’ research potential for cultural-linguistic research, for example, analyze the word order in the attributive group to show that it is indicative of the national cultural practices (see (Suleimanova & Petrova, 2018)). Digital engines do reshape research methodologies. Actually, they are a challenge to the traditional polling psycholinguistic practices: e.g. associative experiment. Let us see how it works in the Mentimeter (MM). MM is the system that can process the polls online and represent immediately the results in a variety of graphic formats (about 10). Its VAT is that it is attractive with the younger generation (edutainment – students enjoy it at first when asked to use their telephones, they look puzzled as, normally, telephones are discouraged in class). See (Sheninger, 2014) for more digital tools (Twitter, Wordle, VoiceThread, etc.) used in the classroom.

## 6. Conclusion

The modern pedagogy emphasizes priorities, among those are accepting this “brave new world” of digital environment, be open to fast changes in the world. Living or rather surviving in the digital ambience, and enjoying it, an individual has no choice except mastering / fostering / befriending digital tools of all kinds. Digital engines reshape research methodologies as well as teaching research to the students.

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## OLD TECHNIQUES, NEW COMPETENCES: REBUILDING HISTORICAL INSTRUMENTS TO TEACH AND LEARN PHYSICS

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### Abstract

Experimental activities and the History of Science are one of the possibilities to enhance Science teaching and learning through the Historical-Investigative approach (HI). From this perspective, the HI approach focuses primarily on the use of historical case studies to explore the methodological, epistemological and conceptual aspects of scientific endeavor. Nevertheless, very little attention has been paid to the role of the required competences to the teacher who aims at applying it. In this paper, we discuss the competences that are necessary and developed by teachers and students when using the HI approach. We use a case study example which comprises the rebuilding of a 18th century instrument (Volta's pile) and its use in a Physics class based on the HI approach. Two different realities integrate the case study: a university research group environment and a high school Physics class. As part of the research group activities, an in-training teacher rebuilt that historical instrument based on the original source and designed a didactic proposal. Founded on Volta's report, he noticed some subtleties related to the 18th century knowledge on materials and procedures that were neither explicit in the report nor evident in modern piles. Furthermore, he observed that Volta's instrument was not suitable for educational use, because it required an 18th century expertise for stacking and connecting metal plates. Thus, he built two additional versions of Volta's pile for conciliating the historical report to the educational proposal. During the development of the didactic proposal, the students perceived the complexity of the scientific content on electricity. They noticed that it was impossible to rebuild Volta's pile without his report, and even when it was applied it would require to make new assumptions due to the use of new materials. To accomplish that, it was imperative the participation of the teacher showing the historical context and relating it to Volta's pile. The challenges the teacher faced to rebuild Volta's pile prepared him to deal with the students' theoretical and experimental difficulties. Moreover, they helped him foreseeing both their previous knowledge and future queries. Our research findings suggest that the success of the HI approach depends on the teacher's participation throughout the process, ranging from the reconstruction of the historical instrument to the planning of the didactic proposal. Finally, the in-training teacher can only learn and teach the methodological, epistemological and conceptual aspects of the scientific endeavor when he participates in the process.

**Keywords:** *Historical experiments, history of science, teacher training, physics teaching.*

### 1. Introduction

Contemporary literature on Science Education has emphasized the need to promote an inquiry-based learning to develop argumentative competences. The Historical-Investigative (HI) approach addresses this research program associating experimental activities and history and philosophy of Science contents (Batista; Silva, 2019; Heering; Höttecke, 2014). In the HI approach, historical case studies, which evolve experiments or instruments, are used as part of an inquiry-based lesson plan to explore the methodological, epistemological and conceptual aspects of scientific endeavor.

Some proposals based on the HI approach foresee that the rebuilding of an experiment or instrument during the classroom could lead students to explore many of their abilities and competences (Heering; Wittje, 2011; Cavicchi; 2008; Heering, 2000). However, very little attention has been paid to the role of the teacher's required competences at applying it. Among the authors who address this issue, we refer to Batista and Silva (2019) and Höttecke and Silva (2011), who argue that teachers' professional preparation is one of the biggest challenges to the effectiveness of the HI approach in a classroom. Some

of the competences to be developed to their effectiveness are related to the deep knowledge on the historical case study and to the capacity of dealing with students' questions. In particular, teachers should be open to different possibilities of experiments and students' results, stimulating them to think about the phenomena, rather than only on the results (Pinto; Silva; Pinto, 2018; Silva; Pinto; Ferreira, 2018).

In this work, we present an empirical case study that analyses the obtained competences of an in-training teacher during the process of rebuilding and planning an inquiry-based lesson plan based on the HI approach. During the process of rebuilding an instrument to use in his classrooms, the in-training teacher presented many considerations about the historical knowledge and on how students could understand and reproduce it. All the considerations were taken to a research group, allowing it - and the teacher - to follow and observe the required competences to the lesson plan effectiveness.

## 2. The historical case study: Alessandro Volta's pile

At the end of the 18<sup>th</sup> century, many natural philosophers, astonished with the new specimens, like the electrical fish (called torpedo), searched for a relation among animal electrical phenomena, shocks and sparks. Electricity produced by the electrical machine caused shocks and sparks; animal electricity also caused shocks. Would be both electricity from the same nature? Could animal be an electrical machine? These questions, together with the Enlightenment atmosphere, promoted an exciting research environment on electricity around Europe (Pancaldi, 2003, p. 178; Martins, 2001; Martins, 1999; Mertens, 1998; Kipnis, 1987).

In 1791, Luigi Galvani (1737-1798), from the University of Bologna, published his experiments to understand frog muscle contractions. From his experiments, he presumed that animals had an intrinsic electricity (Martins, 1999). Alessandro Volta (1745-1827), from the University of Pavia, who had known about Galvani's experiments, reproduced them, but without attributing the electricity as produced by animal. As an alternative to understand the role of metals and fluids to produce and conduct electricity, Volta was led to the construction of the pile or battery<sup>1</sup>.

Volta describes his procedures to construct the battery (the apparatus) in a letter he wrote to Sir Joseph Banks, from the Royal Society, in June 26, 1800, which is partly reproduced below:

It [the apparatus] consists of a long series of an alternate succession of three conducting substances, either copper, tin and water; or, what is much preferable, silver, zinc, and a solution of any neutral or alkaline salt. The mode of combining these substances consists in placing horizontally, first, a plate or disk of silver (half-a-crown, for instance,) next a plate of zinc of the same dimensions; and, lastly, a similar piece of a spongy matter, such as pasteboard or leather, fully impregnated with the saline solution. This set of three-fold layers is to be repeated thirty or forty times, forming thus what the author calls his *columnar machine*. It is to be observed, that the metals must always be in the same order, that is, if the silver is the lowermost in the first pair of metallic plates, it is to be so in all the successive ones, but that the effects will be the same if this order be inverted in all the pairs. As the fluid, either water or the saline solution, and not the spongy layer impregnated with it, is the substance that contributes to the effect, it follows that as soon as these layers are dry, no effect will be produced. (Volta, 1800, p. 27)

In the same letter, Volta observes that this apparatus gives small shocks and sparks, similarly to the torpedo and the Leyden<sup>2</sup> jar. Nevertheless, even making it work, Volta did not know the nature of the electricity produced by the pile (Kipnis, 2001; Martins, 1999; Kipnis, 1987). This fact did not prevent the Volta's pile to be well known throughout Europe. Mertens (1998) argues that many other aspects boosted the Volta's pile, such as the scientific context of the Enlightenment and the influences of the politics, since his pile was presented to Napoleon Bonaparte during the invasion of Italy.

The preceding short history about the pile demonstrates how this subject addresses many aspects related to the scientific endeavor. Volta's description allows us discussing methodological and conceptual aspects; the controversy with Galvani and the scientific and political contexts includes epistemological aspects, as the temporary character of Science and the influences it receives from society. This was the reason why the historical case study about the pile was used for the didactical proposal reported in this paper.

<sup>1</sup> To a complete history of the battery and Galvanism during the 18th century, we suggest the reading of following works: Pancaldi (2003), Kipnis (2001), Martins (1999), and Kipnis (1987).

<sup>2</sup> The Leyden jar was widely known among the natural philosophers at the end of the 18th century (SILVA; HEERING, 2018).

### 3. Rebuilding and learning physics

Our research group (Research Group of Science History and Teaching<sup>3</sup>) has employed the rebuilding of historical instruments and experiments to teaching in-training teachers about Science, History of Science and on Science. Historical experiments reconstruction has been explored by numerous Science historians and educators as the primary source for understanding conceptual, methodological and epistemological aspects of scientific practice (Fors; Principe; Sibum, 2016; Heering; Wittje, 2011). In this regard, the 18<sup>th</sup> century experiments about electricity play an important role from an educational perspective, because they have many issues to be examined. The association of these experiments with an inquiry-based laboratory, as the HI approach presupposition, enable to tackle conceptual, methodological and epistemological aspects, thus contributing to the scientific literacy and understanding aspects of the nature of Science (Heering; Hötecke, 2014; Cavicchi, 2008; Volkmann; Abell, 2003).

Based on the HI approach and the designed-based research (Hoadley, 2003), we have created an educational investigative environment inside our research group following the steps: (1) an in-training teacher chooses a historical case study to rebuild the experiment; (2) an in-training teacher plans a didactical proposal using his own experiment and creates a new didactical experimental kit; (3) an in-training teacher goes to a classroom (usually a High School classroom) to implement his lesson plan. All these steps are previously discussed by the group, which is formed by professors, undergraduate Physics students and Master of Science graduate students. After each class using his proposal, the in-training teacher gives his feedback to the group, and new discussions and modifications take place as needs arise.

Regarding the case reported in this paper, the in-training teacher<sup>4</sup> chose Volta's pile historical case study. Following the previous steps, he rebuilt the pile according to Volta's report<sup>5</sup> (Volta, 1800). He interpreted that it should have an axis to fit the copper, zinc and wool plates (as shown in Figure 1), even if that was not explicit in Volta's report. He built the pile as seen in the figure below, and then he took it to his first Physics class experience. Notwithstanding, during the class experience with that model he noticed that the axis was a problem, as the wet plates oxidized it and it was hard to his students to set the pile up. Furthermore, they asked him to make the pile work. Therefore, the in-training teacher had two new problems to be solved: a practical one, related to his interpretation on the historical source; and a conceptual problem, related to the increase of electrical effect.

Figure 1. First pile built: inside the wood frame, there is a metal axis where the plates are fitted. Source: the authors.



As part of the electrical phenomena investigation evolved through the pile, the in-training teacher made new tests and concluded that a higher electric current could be produced if the plates had a larger surface. Moreover, he returned his attention to Volta's report and, after a more careful reading, noticed that the axis was not really necessary. Then, he concluded that he only needed to keep the plates as a pile and put a metal connector up and down. Based on these new considerations, he built a second model (as can be seen in Figure 2) that could light up a LED.

Using the second model, he designed a new lesson plan and implemented it in his second Physics class. Now, students had no difficulty to stack the plates up and to make the pile work. The in-training teacher explained to his students the difference between the concepts of electric tension and electric current and the phenomena of oxidation-reduction. However, he was not satisfied, because the new model

<sup>3</sup> <https://ghcenuepb.wixsite.com/ghcen>

<sup>4</sup> The in-training teacher is the fourth author of this paper.

<sup>5</sup> The source we used (MAGNAGHI; ASSIS, 2008) was translated into Portuguese.

was far from the historical images from the 18<sup>th</sup> century pile. Thus, he concluded that the historical apparatus should both use more plates (and generate a higher electric current) and be more delicate than the second model. These new conclusions took him to build the third model (as shown in Figure 3). By using more plates but without the central axis, he could get higher electric current and, at the same time, make the pile easier to be understood and reproduced by the students. Then, he used the third model in a third implementation of a better designed Physics class lesson plan, attracting the students' attention and motivation to the investigative activity and comprehension of the Physics concepts.

During the process of building and rebuilding the pile, the in-training teacher tested the models with the research group members and in the classroom activities. The research group members and students' queries helped him to rethink the instrument and the electric phenomena, almost simulating the 18<sup>th</sup> century scientific academy. As in Volta's case study, the in-training teacher was able to understand that the electric phenomena were due to the metal properties, and that the wet wool worked as a medium. Therefore, improving implied the need to increase the plates either regarding to their number or surface. At the same time, it was necessary to keep the pile stable with all the plates in contact (which is the function of the wood wall and the screw thread).

*Figure 2. Second pile built: the plates are larger than in the first pile. A wood wall and a screw thread help to keep the plates aligned. Source: the authors.*



*Figure 3. Third pile built: the apparatus is more similar to historical images, and it is able to light up a LED. A screw thread and a thin wood wall keep the plates as a pile. Source: the authors.*



#### 4. Conclusions

The investigation of historical case studies to explore the methodological, epistemological and conceptual aspects of scientific endeavor helped the in-training teacher to plan the first version of his didactical proposal. When he started to implement it, the group members and students' difficulties and queries led him to rethink the historical apparatus, as it happened in the Galvani-Volta controversy.

The whole process, which took place in three experiences in Physics classes, was over a year long, ranging from the first model to the final version of the didactical proposal. During that period, the participation in the research group helped the in-training teacher to improve his abilities and acquire new competences related to the investigation. As part of the process, he learned to question the historical sources and to understand that the scientific knowledge is more complex than simply reproducing ready results. As he investigated the conceptual phenomena involved in the pile to answer the students' queries, he became more self-confident to teach and to deal with new challenges in the classroom.

In brief, based on our findings, we would like to highlight that, to the effectiveness of the HI approach, it is essential the in-training teacher's participation throughout the process, ranging from the reconstruction of the historical instrument to the planning of the didactic proposal, as we strongly believe that it is during this process that the teacher learns how to deal with the challenges of the HI approach and to improve his Science teaching and learning.

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# A SYSTEMATIC LITERATURE REVIEW OF METHODOLOGIES USED FOR THE DESIGN OF SERIOUS GAMES. A COMPARATIVE ANALYSIS

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## Abstract

This article of systematic literature review presents the analysis of a series of methodological proposals, suggested for the design of educational video games. Nine different methodologies are analyzed. As part of the analysis, criteria are defined to describe and compare them, linked with the possibilities they have for the design of serious games. Criteria include: requirements elicitation and specification, pedagogical intention, pedagogical and ludic objectives definition, educational level and target public, roles identification, feedback type, user experiences analysis, objectives and methodologies validation. Main results indicate the following. 1) It is of vital importance, in the initial phase of a methodology design to incorporate the requirements elicitation and specification, as well as to define and assign roles of the different parties involved in the game production, all of this jointly and by consensus. 2) The definition of pedagogical objectives is closely related to the context use and it is important that it be done in the initial stage and then assess the game quality in the final stage. 3) It is important to incorporate the definition of pedagogical elements in the design. They will be helpful to assess the efficiency, learning and the user experience in relation with the interaction with the game. In addition, these pedagogical elements will facilitate the development of a quantitative record of learning to know the process and its quality by the user. It is concluded that the set of methodologies analyzed provide information in regards to the considerations when proposing a methodology for the design of a serious games. As a future work, there will be a methodological proposal, which will facilitate the integration of the aspects identified through the revision of the methodologies analyzed to guide systematically the design process of a serious game, specifically targeted to the teaching of digital competencies.

**Keywords:** *Serious game, serious games design, methodologies, comparative analysis, higher education.*

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## 1. Introduction

Serious games are software pieces designed with a focus beyond entertainment or amusement, to include an explicit educational purpose and to be used in teaching and behavior change in different knowledge areas, health, government, NGOs, economy, military training, education and skills and competencies development (Michael & Chen, 2006). Due to their playful and pedagogical component they have become more important in the academic field (Boyle et al., 2016). In this context, this work analyses a series of methodologies designed to guide the software development for educational serious games to identify representative characteristics that contribute to the development of a methodology oriented to create serious games.

The results of this investigation contribute to define methodologies oriented to the design of serious games in general and of educational games in particular. The article is organized as follows. Section 2: Background; Section 3: methodology, which includes the analysis criteria and the methodologies selected for the study; Section 4: main results obtained after applying the assessment criteria, and finally Section 5: main conclusions and future work.

## 2. Background

It was 1970 when the concept of *serious games* was first mentioned by Abt (1970). Lately, the term as well as the author have been referenced in different investigations (Marcano, 2008; Michael & Chen, 2006; Sandí, 2019; Sandí & Bazán, 2019), among others. *Serious games* offer a variety of possibilities to form and/or acquire new skills in different knowledge areas through games, instruction, simulation, training or education and mainly facilitate pleasure and motivation (Sandí & Sanz, 2020).

In this context, serious games could be used to maximize training processes due to their characteristics related to the educational field in regards to motivation, interactivity, active students and teacher's participation, where the playful and pedagogical elements promote learning based on *feedback* (Boyle et al., 2016). The definition of serious games adopted for this investigation is: *A serious game could be defined as that one that focuses not only on entertainment or amusement, but also on an explicit educational purpose and carefully thought. It can be used to maximize different areas of knowledge, facilitate learning, support instruction processes, promote attitude or behavior changes, generate emotions, maximize skills and/or competencies acquisition, among others. Its main characteristic is that it is attractive, interactive, entertaining-dynamic, motivator, challenging, easy to use, it stimulates cooperation, reasoning and critical thinking.*

### 3. Methodology

The investigation was developed through descriptive design and with a qualitative methodological approach through a systematic revision of literature, following the protocol proposed by Kitchenham et al. (2009). To comply with the study objective, 3 investigation questions were defined: IQ1. How is the concept of serious games defined? IQ2. What methodologies have been used for the design of serious games? What antecedents exist in this regard? IQ3. What methodological aspects are considered in the literature to develop serious games? IQ's were defined as a guide to contextualize and define the concept of serious games and to identify methodologies that have been developed to design educational serious games, following the investigation criteria detailed ahead. The search strategy used to find the primary studies related to serious games and development methodologies consisted of inquiries in different databases of scientific and academic data, such as *IEEE Xplore Digital Library*, *ScienceDirect* and *SCOPUS*, which were selected due to their availability and access to the information required. Then, key words were defined and then search strings which facilitated the location of primary studies. Then, the analysis criteria were defined and the methodologies compilation and description were done. Lastly, results were given based on the criteria applied.

#### 3.1. Definition of analysis criteria

Literature revision evidences the use of different types of methodologies/processes for the design of serious games which vary depending on the author or investigator who presents them and depending also on the objective of each investigation. Considering this, criteria were defined to focus the analysis homogeneously among a group of methodologies. Criteria selection was based on (Cano, 2016; Cano, Muñoz, Collazos, González, & Zapata, 2016) and the study objective aims at describing methodologies that have been used for the design of serious games, paying special attention to aspects (distinctive features) that have to be considered for their design. To describe and analyze the methodologies or processes, 4 categories were defined with different criteria analysis each: A) **General aspects** – Criteria in this category coincide with the methodologies to be analyzed. Indicators facilitate identifying country of origin and educational level. B) **Design aspects** – Criteria in this category are used to analyze the ways in which the aspects of methodologies/processes design are defined. The purpose is to identify the basis of the proposals, if an elicitation is done and users requirements are defined, to know if roles definition is included, software reuse and prototypes design. C) **Methodological-Pedagogical aspects** – Criteria in this category allow identification of addressees, pedagogical intention and definition of pedagogical/playful objectives of the methodology. D) **Analysis aspects** – This category includes the criteria which analyze the methodology development activity. Since this is a methodological proposal or of processes for the design of serious educational games, the purpose is to know the process or method used to validate the objectives of the proposal, as well as the assessment of the user experiences, and finally the use of quantifiable results to assess the quality of learning of the user.

#### 3.2. Methodology collection

Literature revision allowed the identification of a group of methodologies for the design of serious games. Nine of them have been selected for the analysis. Following each of them are briefly described:

- **EMERGO** (Nadolski et al., 2008) includes 5 stages (analysis, design, development, implementation and assessment) and tools as a guide for the design of serious games based on scenarios.
- **EDoS** (Environment for the Design of Serious Games) (Tran, George, & Marfisi-schottman, 2010) environment mainly used in the design stage and part of it during the production stage of serious games. It is used after the stage of user requirements definition and it offers as a final product a structured and formal scenario to be executed by the game motor in the final stage. It includes 3 models (pedagogical objectives, pedagogical scenarios and CTT

(Concur Task Tree) tasks) which offer a series of interactive tools to facilitate users performing tasks in a visual and easy way.

- **LEGADEE** (LEarning GAME DESign Environment) (Marfisi-Schottman, 2012; Marfisi-Schottman, George, & Tarpin-Bernard, 2010). Its purpose is to serve as a guide to develop serious games to maximize the training of professional skills. It consists of 7 stages (pedagogical objectives, game model selection, general description of the scenario and virtual environment, reusable software, scenario description, pedagogical quality control and subcontractor specification).
- **SAVIE** (Sauvé, 2009) interactive pedagogical design model to develop generic serious games to maximize on line learning. It includes 5 stages (analysis, design, technical development, formative assessment of the generic game, summarized assessment of the games created with the generic Shell of the game). Teachers can create different serious games using the same base or structure which can be accessed by students through Internet. For instance, it was used to modify the original structure of the game “Parcheesi” to change some of the rules of the game to make it easier to use and to add more learning activities. Also, Parcheesi was used to develop another game on line in which the player can acquire knowledge related with asthma prevention.
- **DODDEL** (Document-Oriented Design and Development of Experiential Learning) (McMahon, 2009). It is used by designers and developers. It can be documented and guides can be developed to help with the design and development of serious games. It includes 4 development stages (situation analysis, design proposal, documentation design and production documentation) and a level of assessment (prototypes creation) to balance games designs.
- **VGSL** (Video Game - Supported Collaborative Learning) (Padilla-Zea, 2011). It proposes a process to develop educational videogames including a balance between 3 factors: learning, amusement and collaborative learning activities. The methodology was designed from a model based approach to execute explicit abstractions of independent systems of the subsequent implementation to facilitate flexibility which will make it easier to maintain and reuse the system as well as the information stored in these models. It was used to develop the game “*Nutri-Galaxy*” which helps high School students (11 to 12 years) maximize collaborative learning.
- **MECONESIS** (MEtología para la CONcepción de juEgos Serios para niños con discapacidad auditive-Methodology to Conceive Serious Games for Hearing Impaired Children) (Cano, 2016). It proposed the development of serious games by adapting different models and tools. It is structured in 4 stages (Analysis, Pre-production, Production and Post-production) and 7 models (analysis, user, adaptation, pedagogical objectives, tasks, scenarios and validation). It was used to develop the serious game “*Lectoescritura con Fitzgerald*” (*Literacy with Fitzgerald*) to help high school hearing impaired students (12 to 15 years) maximize learning (literacy).
- **MPIu+a** (Modelo de Proceso de la Ingeniería de la Usabilidad y de la Accesibilidad - Usability and Accessibility Engineering Process Model) (Granollers, 2004). It is used to design interactive systems focused on the user, integrating software engineering with the principles of usability and accessibility to guide in the implementation of interactive systems. It includes 6 stages (requirements analysis, design, implementation, launching, prototyping and assessment). It was used to develop different types of prototypes (low-fidelity or high fidelity).
- **MPDSG** (Modelo de Proceso de Desarrollo para *Serious Games* – Development Process Model for *Serious Games*) (Evans, Spinelli, Zaporain, Massa, & Soriano, 2016). It proposes a processes model to guarantee the quality of the game, playability and player immersion. It uses a combination of 3 aspects: pedagogical, game and software. The methodology was designed for the development of serious games that maximize the acquisition of competencies for the XXI Century. It was used to develop the game “*Power Down the Zombies*” in which high school students (Fourth year) assess the environmental and social impact of the technological use of energy while critically reflecting on the natural resources use.

## 4. Results analysis based on assessment criteria

### 4.1. General Aspects

The **country in which the investigation is developed** shows that the development of methodological proposals has focused on Europe with a 56%, followed by America with a 33%, and last

by Asia with a 11%. Regarding the **educational level** criteria, 56% of the methodologies are mainly used in higher education/university and 44% in high school.

#### 4.2. Design aspects

Sixty-seven per cent of the methodologies analyzed consider that the final user has a leading role during the design due to the characteristics of the serious games (pedagogical and playful). In this context, the methodological proposal should be grounded through the **user-centered design**. Forty-four percent of the methodologies reviewed show that it is important to incorporate the **elicitation and user requirements specification** in the initial stage of the methodology design. Fifty-six percent of the methodologies consider **definition and role assignment** of the different actors involved in the game design, highlighting the role of the teacher (pedagogical expert). Also, 56% consider important to include the role of the final user. It is recommended to implement them jointly and by consensus among the different actors involved. Fifty-six percent of the methodologies consider important to include in the methodology design **components flexibility and reuse** (software reuse). Sixty-seven percent of the methodologies consider important to include in the methodological design the creation of **prototypes** because they facilitate reduction and correction of possible mistakes that could occur during the game development.

#### 4.3. Methodological-Pedagogical aspects

**Addressee** analysis shows that 78% of the methodologies reviewed prove that they were designed to be used by higher education faculty to maximize different skills and/or competencies in students. **Pedagogical intention:** the most important result is related with the total of methodologies investigated which focus on maximizing learning, as well as the development of specific competencies and/or skills: cognitive, professional, generic, among others. **Pedagogical-playful objectives** analysis shows that the total of methodologies analyzed agree that this aspect has to be included in the design proposals. Objectives clearly defined favor the definition of competencies and learning to be obtained or maximized in the final user, as well as to verify its compliance (Cano, 2016).

#### 4.4. Aspects of analysis

Seventy-eight percent of the methodologies consider important to include **objectives validation** during all the development stages of the serious game. This task has been developed through data entry tests, monitoring to validate the learning process and questionnaires. Sixty-seven percent of the methodologies analyzed consider important to include the assessment of the **user experiences** during the design of serious games. This activity is done in the methodologies studied through prototypes, feedback analysis, interviews and questionnaires. **Quantifiable results:** 78% of the methodologies studied do not consider them; however, the other 22% do it through interviews and questionnaires to obtain qualitative and quantitative results.

### 5. Conclusions and future work

The purpose of this article is to do a comparative analysis of the different methodologies developed to design serious educational games to identify distinctive characteristics that contribute to the design of a methodology oriented to the development of serious games. The study is part of a doctoral research related to the design of a methodological and architectural proposal to guide step by step the design of serious games oriented to the training of technological competencies.

The investigation made it evident that there are efforts to consolidate methodologies oriented to the development of educational serious games; however, the results obtained verify that the methodologies analyzed focus only in offering different recommendations related with the design of a serious game (Cano, 2016; Padilla-Zea, 2011). Literature revision does not allow to specifically identify a methodological proposal to guide step by step the process to develop educational serious games and particularly oriented to maximize technological competencies. Nevertheless, it is concluded that the group of methodologies analyzed constitute a good support and contribute to the task of analyzing the distinctive characteristics that a methodological proposal should include for the design of serious games oriented to maximize technological competencies.

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# INVESTIGATING FACTORS HINDERING THE IMPLEMENTATION OF E-LEARNING AT MOTHEO TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) COLLEGE: A CASE STUDY OF THE NATIONAL VOCATIONAL CERTIFICATE (NCV) PROGRAMME

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## Abstract

This study investigated factors that hinder the effective implementation of e-learning at Motheo Technical and Vocational Education and Training (TVET) College, NCV Faculty Bloemfontein Campus by staff members. The study population was all academic staff in the National Vocational Certificate (NCV) Faculty. A purposive sample comprising four Information Technology personnel, two academic management for the Faculty, campus manager and the head of e-learning department was selected. Qualitative data collected through interviews were categorised into themes. The study identified amongst others, factors that hinders the effective implementation of e-learning at Faculty level. These included lack of Information and Communications Technology (ICT) policy and strategic plan, slow internet connectivity, old software, inadequate ICT/compatible resources for e-learning, lack of training of personnel, motivation of staff, ICT skills, and administrative and technical support. The implementation of e-learning could be effective through policy consideration that favor e-learning, motivation among the Faculty, using open source software/updated software, skills development and training, management support, resources accessibility and availability.

**Keywords:** *NCV, TVET, e-learning.*

## 1. Introduction

Education has been identified as a vital tool for any form of development in any country, companies or individuals. However, teaching is becoming one of the most challenging professions today because of the need of knowledge acquisition and dissemination. This has seen the emergences and expansion of Information and Communication Technology (ICT) tools in education as teaching and learning tools. E-learning is an ICT tool which offers learners with the ability to fit learning around their lifestyles by sharing materials of all kinds. For example, videos, slideshows, word documents and PDFs (Gamdi and Samarji, 2016). It allows even the busiest person (the working class) to further a career and gain new qualifications in Technical and Vocational Education and Training (TVET). It can play a crucial role in bringing education closer to people and developing a lifelong learning culture by TVET. Meanwhile the benefits of ICT have not been fully utilized by the Motheo Technical and Vocational Education and Training (TVET) College.

## 2. Background

Motheo Technical and Vocational Education and Training (TVET) College is one of the 50 institutions that were formed after merging of different delivery sites in South Africa. It was formed because of the amalgamation of Bloemfontein College, Hillside View College, Thaba 'Nchu College and Kagisong Teachers' College. These delivery sites (campuses) are located at different places. Although they offer the same qualifications, it has been discovered that there are many challenges related to curriculum, administration, and assessment as lectures experience changes in communication as a results of the uncontrollable development of e-learning (Igberadia, 2015; Konayuma, 2015); un-networked campuses that cannot allow resource sharing(hardware, software, media for collection, storage, processing,

transmission and presentation of information), failure of students to access any type of information such as date of registration, the rules and regulations of the college. Duplication of resources is also a concern at Motheo TVET. For example, information is stored in numerous modes of expression (blackboard; overhead projectors; interactive white board Academic Support Technologies (AST) Tutor). Like students, lecturers do not also have access to backup and sharing capabilities that can assist in classifying and organizing; summarizing and synthesizing; analysing and evaluating; speculating and predicting the gathered and identified information.

The rapid change of ICT tool, e-learning has affected the teaching and learning process. This change has expanded to new learning opportunities and access to educational resources beyond those traditionally available. The expansion to new learning has had an impact on curriculum development and delivery. These impacts pose new challenges for education and training systems Draft White Paper on e-Education (2003:6).

As outlined in Draft White Paper on e-Education (2003:22) e-learning (learning using ICT) is about delivering philosophies and methodologies in the learning environment. Having e-learning as an ICT delivery tool, takes the learners and teachers through the process of exploring what can be done with ICT, how ICT can be used to supplement normal processes or resources. Lastly the way ICT can support new way of teaching and learning. Draft White Paper on e-Education (2003:22) makes it clear that e-learning is not to replace lectures, but to enhance the quality of teaching and reduce the time spend on administrative chores.

## **2.1. Objectives of the study**

The following are the objectives of this study:

- To identify the current/existing status of e-learning at Motheo TVET College Bloemfontein Campus NCV Faculty.
- To identify the barriers (if any) that plays a major role in the successful implementation of e-learning at Motheo TVET College Bloemfontein Campus NCV Faculty.
- To formulate strategies for addressing barriers (if any) in implementation of e- learning at Motheo TVET College Bloemfontein Campus NCV Faculty.

## **2.2. Research objectives and questions**

The study sought to answer the following questions:

- How is e-learning implemented at Motheo TVET College in Bloemfontein Campus NCV Faculty?
- What are the major barriers for implementing e-learning successfully at Motheo TVET College in Bloemfontein Campus NCV Faculty?
- In what way can the identified barriers to the implementing e-learning in Motheo TVET College in Bloemfontein Campus NCV Faculty be addressed?

## **3. Method**

### **3.1. Research design**

This is an exploratory case study.

### **3.2. Participants and sample**

Purposive sampling technique was used. The sample comprised 26 academic staff, IT personnel, two academic management for the Faculty, campus manager and the head of e-learning department of Motheo TVET College.

### **3.3. Data collection**

Data were collected by means of observations and focus group discussions. The study population comprised 41 academic staff, one IT personnel, five academic management for the Faculty, campus manager and the head of e-learning department of Motheo TVET College. All interviews were recorded, transcribed, coded and themes were identified (Leedy and Ormod, 2014; Maree, 2014).

### **3.4. Results and discussions**

In response to the question on e-learning initiatives available at the institution, all participants indicated that there was a laptop initiative. One participant quoted verbatim stated that: *“It started a few years back when the College started with e-learning and some lecturers where given laptops, were also data projectors installed in different faculties including NCV Faculty so that they can be use in class”*.

Another participant said, “it happened about 4-5 years ago and since then no laptop have been allocated”. Another one stated that “not all lecturers received the laptops and that data projectors were installed with brackets on but were stolen”. Only ten data projectors are allocated to NCV Faculty which is totally inadequate.

Regarding factors which are barriers for the implementation of e-learning at Motheo TVET College, a participant indicated that: “As a computer Lecturer I suggest that computer software at my college be upgraded, serviced to ensure efficient teaching and learning. Adequate training to staff be provided timeously and properly. Monitoring of resources should be conducted at least once a month to ensure proper running and development”.

Another response was: “lectures need training in e-learning (blackboard, etc.). Networks (e.g. internet access) is restricted and Coltech is not reliable”. Internet is very slow. Wi-Fi is needed in classrooms. Server is not functioning needs to be replaced”.

The results identified several factors which are barriers for e-learning to work effectively at Motheo TVET College NCV Faculty Bloemfontein Campus. These include unavailability of working computers (very old computers are being used), lower Internet connectivity, unimproved/expired licensed software, both staff and 90% of the interviewee not knowing about the appropriate policies favoring e-learning, lack of technical support for e-learning and lack of training for lecturers on e-learning in all levels. The study showed that all staff members were aware, but as for training, concentration was on few lecturers, mainly the ones who were lecturing ICT component (Gamdi and Samarji, 2016). Even though there is no specific institutional ICT policy at work, there is a draft policy.

The findings of this study also indicated that major barriers for adopting e-learning at Motheo TVET College NCV Faculty Bloemfontein Campus were mainly: the lack of training facilities for staff members, lack of ICT skill, lack of motivation and awareness only on those who lecture ICT component, lack of management support, technical support and resistance of individuals to change

As indicated by the participants, to ensure proper implementation of e-learning the following need to be attended to: networking of the e-learning labs, availability of hardware, faster Internet connectivity, improved software, provision of technical support for e-learning.

#### 4. Conclusion

The study revealed that lecturing staff are not using the new technology due to a combination of socio-cultural, person logical related factor and the exposure to new technologies. The other barriers which are very essential for a successful implementation of e-learning were lack of administrative management and technical support, lack of management or negligence on controlling the progress on the usage of e-learning and lack of funds on technical supports like equipping the labs with new working computers and continuous maintenance. Such conditions create problems hence the academic staff being demotivated. The implementation of e-learning could be effective through policy consideration that favor e-learning, motivation among the Faculty, using open source software/updated software, skills development and training, management support, resources accessibility and availability.

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# THE EFFECTS OF DRINKING AND SMOKING AMONG UNDERGRADUATES ON ACADEMIC PERFORMANCE AND TRANSITION TO EMPLOYMENT

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## Abstract

Alcohol consumption and smoking have various effects on college students' daily life as well as school life. Undergraduates' academic performance is also supposed to be affected by drinking and smoking. Studies, however, on the impacts of drinking and smoking on undergraduates' academic performance and the transition to the labor market is sparse, in Korea. The purpose of this study is to understand the effects of drinking and smoking among college students on school performance and the transition to work after graduation. The 2016 Graduates Occupational Mobility Survey (2016GOMS) was used for this study, which is the largest short-term panel survey of a representative sample of Korean Graduates. A total of 18,199 graduates were used as a sample data: 4,507 graduates from 2- to 3-year colleges, 139 from colleges of Education, and 13,553 from 4-year colleges or higher education institutions. Multiple regression analysis was performed, using Stata 14. The findings revealed that generally, as the frequency of smoking increases, alcohol consumption increases as well, that drinking more than one time per week decreased students' academic performance more than drinking less than one time per week, and that as the frequency of smoking increased the overall academic performance decreased. However, the finding of the study suggested that the higher the frequency of drinking and smoking, the higher the possibility of employment and wage. These results are consistent with those of previous studies that drinking and smoking have been an obstacle to academic learning but can help with employment transition in Korea. This result implies that socializing with colleagues can be an important factor to maintain one's job. Limitations of the study and further studies are discussed.

**Keywords:** *Drinking and academic performance, smoking and academic performance, transition from college to the labor market, college students.*

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## 1. Introduction

Alcohol has been with human life for as long as there was a record of brewing wine in the Mesopotamia region, 5000 BC. According to the past studies on alcohol, moderate levels of alcohol consumption contribute to better health and daily vitality. In addition, drinking alcohol increases social interaction and reduces cardiovascular-related disease than no alcohol at all (Lee & Jeon, 2015). Past studies, however, also revealed that drinking not only increases the risk of one's loss of health but also causes much social harm, such as alcoholism and traffic accidents (Oh & Lee, 2007). Despite the continuous public advertisements that smoking is dangerous to health across the countries, tobacco and cigarettes are greatly consumed in many countries in the world. Korea is not an exception. Because of the wide range of smoking, research on smoking and its effects have been widely conducted (Choi, 2016). As of the year 2017, the daily smoking rate for Koreans was 18.1%, but the annual smoking rate for men, in particular, was 32.7% (3.6% for women) (Ministry of Health and Welfare, 2017). The gender gap is large, and the smoking rate among middle-aged people is relatively higher than in other age groups in Korea. The gap in the smoking rates between men in their 40s (40.4%) and women in their 40s (4.0%) is sharp. Harmful effects on the health of the public have been well known, charging the burden of more than 1 trillion won (about 840,222,000 USD) per year on Korean health insurance (Lee & Jeon, 2015). Studies conducted in other countries have revealed that drinking and smoking have negative effects on school performance (Balsa, Giuliano, & French, 2011; Witkiewitz et al., 2012). Appropriate drinking for a social helped an individual get higher wages than non-drinkers, but excessive drinking lowered one's wage compared to that of appropriate drinking (Hamilton & Hamilton, 1997). In the Netherlands, cigarette smokers got paid 10% lower than non-smokers, but alcohol consumers for social purposes got

paid more than non-alcohol consumers. However, women's wages were not directly affected by drinking or smoking (Ours, 2004). It was revealed that in the United States, smoking lowered wage levels during and after smoking. Wage reduction has been significantly affected by smoking, particularly for men and for individuals with less than 13 years of education (Du & Leigh, 2015). Even though there have been many studies on the effects of drinking smoking on various factors in many countries, studies on the effects of college students' drinking and smoking on their school academic performance and transition to the world of work are sparse in Korea. Thus, this study was to examine the effects of college students' drinking and smoking on their academic performances and the transition from school to work. The findings of this study can contribute to improving college students' perception of smoking and alcohol consumption and suggest new policies and students' codes of conduct at colleges in Korea.

## 2. Method

### 2.1. Sample

The 2016 Graduates Occupational Mobility Survey (2016GOMS) was used for this study, which is the largest short-term panel survey of a representative sample of Korean Graduates and uses graduates of 2- to 3-year colleges or higher education institutions as its population. The GOMS aims to provide extensive reliable labor supply and demand information on youths' labor market behavior and educational experience to policymakers and researchers so that they investigate characteristics of the transition that the youths make from school to the labor market. A total of 18,199 graduates were used as a sample data: 4,507 graduates from 2- to 3-year colleges, 139 from colleges of Education, and 13,553 from 4-year colleges or higher education institutions.

### 2.2. Measures

**Academic performance.** To measure participants' academic performance, one of the outcome variables of this study, their final GPA was used. Since the grading system of GPA across colleges and universities, participants' GPAs were recoded into a scale (1=100% of GPA).

**Transition from college to work.** To measure the quality of transition from college to the labor market, one item was used: *Are you a full-time tenured employee at the current workplace?*, and participants can respond, *Yes* or *No*.

**Alcohol consumption.** To measure the amount of alcohol consumption of college students, one item was used: *How often do you drink alcohol?* Participants can rate from level 1 to 6 (1=Not drink at all, 2=once or twice per year, 3=one or twice per month, 4=once or twice per week, 5= three or four times per week, and 6= almost every day). The number of participants who selected 6=*almost every day* was less than 30, so the group was deselected.

**Smoking.** To measure participants' degree of smoking, two items were used. The first items asked, *Do you smoke?* and for the respondents who answered "yes" to the first question, the second question asked a respondent to type in the number of the cigarettes they smoke per day. The number of participants who selected *smoking 21 cigarettes or more per day* was less than 30, so the group was deselected.

**Control variables.** The amount of time spent on exercise per week, the average time of sleeping per day, disabilities, any limitations of physical activities, and disabilities for job performance were used as control variables.

### 2.3. Data analysis

General regression analysis and ordered logistic regression (Brant, 1990; McCullagh, 1980) were performed to analyze the effects of the predicting variables on the outcome variables, using Stata 14.

## 3. Findings

**Alcohol consumption and academic performance.** The result indicates that as drinking once or twice per week increases by one unit, college students' final GPA decreases by 0.006 units and as drinking three or four times per week increases by one unit, their final GPA decreases by 0.01 units.

**Smoking and academic performance.** Regardless of the number of cigarettes they smoke, smoking decreases college students' final GPA. For example, as smoking one to five cigarettes per day, college students' final GPA decreases by 0.021 units.

Table 1. Ordered Logistic Regression Analyses Predicting Academic Performance from Drinking and Smoking (n=16,671).

Predicting variable	All sample		2-3 year community college (n=3,994)		4 year college (n=12,677)		
	B	S.E	B	S.E	B	S.E	
Drinking	yearly 1-2 times	-0.004	0.003	-0.001	0.006	-0.005	0.003
	monthly 1-2 times	-0.004	0.002	-0.011**	0.005	-0.001	0.002
	weekly 1-2 times	-0.006***	0.002	-0.016***	0.005	-0.003	0.002
	weekly 3-4 time	-0.010***	0.004	-0.019**	0.008	-0.009**	0.004
Smoking	1-5 pieces per day	-0.021***	0.004	-0.017**	0.008	-0.023***	0.004
	6-10 pieces per day	-0.016***	0.003	-0.013**	0.005	-0.017***	0.003
	11-15 pieces per day	-0.024***	0.004	-0.015*	0.008	-0.029***	0.005
	16-20 pieces per day	-0.024***	0.004	-0.011	0.008	-0.031***	0.005
Constant	0.851***	0.008	0.846***	0.016	0.836***	0.010	
R <sup>2</sup>	.11		.10		.11		

\*\* means  $p < .05$  and \*\*\* means  $p < .001$ .

**Alcohol consumption and the transition from college to the labor market.** The result indicates that as drinking regardless of the number times they drink increases by one unit, college graduates' employment increases except for the case of once or twice per year, which decreased their employment. For example, as drinking three or four times per week increases by one unit, college graduates' employment increases by 0.63 units.

**Smoking and the transition from college to the labor market.** The result indicates that as smoking regardless of the number of cigarettes they smoke increases by one unit, college graduates' employment increases. For example, as smoking 16-20 cigarettes per day increases by one unit, college graduates' employment increases by 0.236 units. The effect of drinking on male participants' employment is higher than female participants', but the effect of smoking is vice versa. All of these interpretations are true only if the effects of control variables are held constant.

Table 2. Ordered Logistic Regression Analyses Predicting Transition from College to the Labor Market from Drinking and Smoking (n=16,671).

Predicting variable	All sample		Male (n=9,116)		Female (n=7,555)		
	B	SE	B	SE	B	SE	
Drinking	yearly 1-2 times	-0.070***	0.014	0.284***	0.016	0.287***	0.013
	monthly 1-2 times	0.280***	0.010	0.581***	0.016	0.395***	0.014
	weekly 1-2 times	0.498***	0.011	0.758***	0.026	0.417***	0.028
	weekly 3-4 time	0.630***	0.019	0.455***	0.050	0.230***	0.059
Smoking	1-5 pieces per day	0.199***	0.021	0.167***	0.026	0.286***	0.034
	6-10 pieces per day	0.076***	0.013	0.098***	0.014	-0.217***	0.039
	11-15 pieces per day	-0.109***	0.021	-0.079***	0.023	-0.919***	0.092
	16-20 pieces per day	0.236***	0.022	0.205***	0.023	0.047	0.113
Constant	0.851***	0.008	0.846***	0.016	0.836***	0.010	
Pseudo R <sup>2</sup>	.17		.20		.16		

\*\* means  $p < .05$  and \*\*\* means  $p < .001$ .

#### 4. Conclusions and discussion

The results of the study that alcohol consumption and smoking as college students have had negative impacts on their academic performance, but have contributed to increasing possibilities of employment. Specifically, it is interesting that the effects of heavy drinking and smoking have also been contributed to the transition from college to the labor market. This result is different from those from the past studies in other countries that only appropriate drinking has a positive effect on employment and drinking had generally negative effects on employment and wage (Du & Leigh, 2015; Hamilton & Hamilton, 1997). This result may reflect the Korean culture that employees' promotions and

performance evaluations in companies tend to rely on social relationships and good rapports between supervisors and workers rather than the criteria are based on the fair evaluations of employees' products, outcomes, accomplishments, and abilities. This result can explain why there are many social meetings after work in the evenings in Korea and many employees cannot but participate in such socials even though they do not want to. This practice is one of the practices that companies and institutions should avoid to grow healthy companies (Park & Hill, 2016). The result also implies that Koreans have quite generous perspectives on drinking. This generous view on drinking has led to a soft transition to the labor market. It may encourage college students and employees to drink back. However, drinking generally deteriorates the ability to work and causes substantial social costs such as drunken drivers leading to accidents and deaths as well as the subsequent insurance costs and tax (Yang & Yang, 2012).

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# THE TOILING SINGLE MOTHER: DOES HER EDUCATION ATTAINMENT LEVEL MATTER IN A LEARNER'S ACADEMIC PERFORMANCE? EVIDENCE FROM SOME SOUTH AFRICAN HIGH SCHOOLS

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## Abstract

This paper is part of a larger project that investigated perceived effects of single mother parenting on learners' academic performance in selected high schools in Free State, South Africa. The study is informed by Weiner's attribution theory. The research question that was formulated read: How does a single mother's level of education affect the academic performance of the learners? The quantitative method and the descriptive survey design were employed in this study. A questionnaire was used to obtain data from the respondents. A sample of 160 respondents (learners between grades 9 and 12 from single mother and both parent homes) was selected using simple random sampling technique. The data obtained was analysed using the Statistical Package for the Social Sciences (SPSS). The findings indicate that the level of education of a single mother has no significant effect on the perceived academic performance of the learner child, since  $p=0.985$  which is higher than the standard level of significance (0.05). Finally, the level of education of a both parents' family also has no significant effect on the perceived academic performance of the learner child, since  $p=0.133$  which is higher than the standard level of significance (0.05). Based on the findings of this study, it is recommended that, government should intensify and/or introduce education management skill sessions and the provision of free counselling services in supporting single mothers to instil some confidence in their support efforts. Establishing an education management agency to train and motivate young single mothers to ensure that their children realise their potential.

**Keywords:** *Single mothers, parenting, academic performance, learners, South-Africa.*

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## 1. Introduction

Education is a fundamental component for developing, improving and stimulating human lives (Samuel, 2015). Hence, mother's education is a keystone for facilitating better academic performance in learners (Malik, 2015; Amuda and Ali, 2016). Maternal education was found to have the most consistent direct influence on children's cognitive and behavioural outcomes through a cognitively stimulating home environment (Faize and Dahar, 2011). Researchers affirm this by stating that mothers level of education is a motivational factor for mothers' support and involvement in learners' academic performance (Nyarko, 2011; Maphoso and Dikeledi, 2014; Fingerman, 2017). The legacy of apartheid in South Africa has caused lasting separation between employment and family to many black South Africans because the fathers need to migrate from their families to find work, thus living behind school going children under the sole care of their mothers (Richter and Morell, 2006; Madhavan, Townsend and Garey, 2008). It was estimated that, out of 18.6 million children in South Africa in 2013, 7.3 million stayed with their female parents while 3.3% resided with their male parents as a result of migration (Statistics South Africa, 2014; Meintjes, Hall and Sambu, 2015). Further observations state that 4.1 million of the female-parent raised children never stayed with either parent on different premises (Meintjes, *et al.* 2015). In addition, 71% of children who do not finish school come from fatherless homes (single mother homes) (Statistics South Africa 2011; Fathers for life, 2013). These grim statistics begged for further interrogation focusing on the link between hitherto under-researched constructs: single mother parenting and their children's academic performance in South Africa.

## 2. Literature review

Education plays a crucial role in the building of individuals' characters and is a basic tool used for the transmission of societal values (Rana, Nadeem and Sama, 2015; Samuel, 2015). Researchers affirm that mother's level of education influences adolescents' educational outcomes (Thompson, Alexendar and Entwisle, 1988; Asikhia, 2010). Rana, *et al.* (2015) point out that there is a positive relationship between parents' educational level and their children's academic performance. Nyandwi (2014) and Makura (2016) also established that learners whose parents are well educated get higher positions than those whose parents are not educated because educated parents help their children in schoolwork activities and provide best home environments that enhance academic success for their children. Similarly, mothers with higher socio-economic statuses provide more financial assistance to their children (Fingerman, Kim, Davis, Furstenberg, Birditt and Zarit, 2015). They also give their time to support and give advice and emotional support to their children when needed (Fingerman, 2017). In yet another study, Isidore, Mary, Ernest, and Victor (2014) examined the moderating effect of self-motivation on the relationship between parents' socioeconomic background on their children's academic performance at Nigerian Universities. A sample of 150 final year students from the 2012/2013 academic session registered in Business Faculties in the North, East and West regions of Nigeria were given questionnaires to provide the sought data. The authors found out that students' self-motivation (hard work) and a rich parental socio-economic background contributed to achieving academic success. In a similar vein, Ogbugo-Ololube (2016) investigated the impact of parental background on the academic performance of secondary school students in the Obio/Akpor Local Government Area of Rivers State, Nigeria. A sample size of 1,426 senior secondary school two and three (SSS 2 and 3) students was randomly selected from a population of 4,752 respondents and a structured questionnaire used to obtain data from the respondents. The findings revealed that a significant relationship existed between parents' socioeconomic and educational background, the level of income, students' family size and the students' academic performance scores.

In contrast, Ogunshola and Adewale (2012) studied the effect of parental socioeconomic status on the academic performance of students at selected high schools in the Edu Local Government Area of Kwara State, Nigeria. The study, based on a randomly selected sample of 180 students from three secondary schools, responded to a questionnaire. The study considered four factors: parental socio-economic background, parental educational background, parental educational qualification and students' health statuses. From a statistical perspective, data revealed that parental socioeconomic statuses and parental educational background have no significant effect on the academic performance of students. Similarly, Amuda and Ali (2016) examined parents' level of education as predictors of academic performance of 1200 NCE 2 and 3 students in the North-eastern states of Nigeria using a survey design. The findings revealed that, parents' level of education did not significantly predict students' academic performance.

It is generally assumed that learners' academic performance may not depend on the quality of schools and teachers. Some studies demonstrated that the extent of parental involvement based on their level of education has a vital role to play in the academic performance of their kids (Nyarko, 2011; Hafis, Tehsin, Malik, Saleem and Ali, 2013; Maphoso and Dikeledi, 2014). Maphoso and Dikeledi (2014) investigated the relationship between parental involvement and academic performance and the differences in academic performance between boarding and non-boarding (Day) school grade 12 students from the Capricorn District in the Limpopo Province of South Africa. The study sample was derived from 51 schools from six areas within the district, where 10 schools had boarding facilities, while a questionnaire was used for collecting data. The findings revealed that parents' involvement in their children's academic activities is influenced by their interest, socio-economic status and level of education. The authors opined that most parents who sent their children to boarding schools have a high level of education and a good financial background to afford the fees of such schools.

## 3. Research question

How does a single mother's level of education affect the academic performance of the learners?

### 3.1. Objective

To establish the effect of the level of a single mothers' education on the learners' academic performance.

### 3.2. Methods

This study adopted quantitative approach and guided by positivism paradigm. Descriptive survey design was employed. Questionnaire was used to obtain data from the respondents. A sample of 160 respondents, 80 learners from single mother homes, and 80 learners from both parent homes (grade 9 to 12) were selected for the study using simple random sampling technique. The data obtained was analysed using Scientific Package for Social Sciences (SPSS).

## 4. Results and discussion

### 4.1. Relationship between the level of education of a single mother and the perceived academic performance of learner child

The relationship between the level of education of single mothers and the perceived academic performance of their children was examined using a variance analysis. The hypothesis guiding the variance analysis is presented below with the results thereof shown in table below.

#### Hypothesis:

H<sub>0</sub>: The level of education of a single mother has no significant effect on perceived academic performance of the learner child.

Table 1. ANOVA Perceived Academic Performance Levels of the Learners.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.019	2	.010	.015	.985
Within Groups	69.662	110	.633		
Total	69.681	112			

The Table draws on a one-way ANOVA test performed at 5% level of significance to assess whether the level of education of a single mother has a significant effect on the perceived academic performance of the learner child. The perceived academic performance of the learner child was put into three levels – low, medium and high. An analysis of the presentation of variance analysis results in the above table shows that the level of education of a single mother has no significant effect on the perceived academic performance of the learner child, since  $p=0.985$  is greater than  $0.05$  [ $F(2,110)= 0.015, p=0.985$ ]. Thus, the null hypothesis (H<sub>0</sub>) is accepted at 5% level of significance in favour of the alternative hypothesis (H<sub>1</sub>).

### 4.2. Relationship between the level of education of a both parents' family and perceived academic performance of learner child

The variance analysis, was carried out to evaluate the relationship between the level of education of a both parents' family and the perceived academic performance of their child. The hypothesis, guiding this analysis, is presented below, while the results from the analysis are shown in the table below.

H<sub>0</sub>: The level of education of a both parents' family has no significant effect on perceived academic performance of the learner child.

Table 2. ANOVA Test on the Level of Education of Both Parents and Perceived Academic Performance of the Learner Child.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.241	2	1.120	2.097	.133
Within Groups	28.313	53	.534		
Total	30.55	55			

A one-way ANOVA test performed at 5% level of significance to determine whether the level of education of a both parents' family has a significant effect on the perceived academic performance of the learner child, was carried. The perceived academic performance of the learner child was put into three levels – low, medium and high. The results from the analysis are presented in the above table and they indicate that the level of education of a both parents family has no significant effect on the perceived academic performance of the learner child, since  $p=0.133$  is greater than  $0.05$  [ $F(2,53)= 2.097, p=0.133$ ]. Thus, the null hypothesis (H<sub>0</sub>) is accepted at 5% level of significance in favour of the alternative hypothesis.

## 5. Discussion

The findings revealed herein show that there is no significant relationship between a single mother's level of education and its effect on the learners' academic performance. The Chi-square was used in to check the indicators with regards to the relationship between the mother's level of education and the child's academic performance. The results of the Chi-square test confirmed that the level of education of the parent had no significant effect on the perceived academic performance of the learner child, since  $p=0.292$  and higher than the standard level of significance (0.05). The findings also indicate that the level of education of a single mother has no significant effect on the perceived academic performance of the learner child, since  $p=0.985$  which is higher than the standard level of significance (0.05). Finally, the level of education of a both parents' family also has no significant effect on the perceived academic performance of the learner child, since  $p=0.133$  which is higher than the standard level of significance (0.05). The above findings contrast with the findings from previous studies (Rana, *et al.* 2015; Ogbugo-Ololube, 2016). According to Rana, *et al.* (2015) high level educated parents have, to a certain extent, more influence on their children's positive achievements and performances in their studies at secondary school level. Ogbugo-Ololube (2016) reveals that a significant relationship exists between parents' socioeconomic and educational background, the level of income, students' family size and students' academic achievement scores.

However, this study corroborates the findings of Ogunshola and Adewale (2012) and Amuda and Ali (2016). Ogunshola and Adewale (2012) report that parental socioeconomic status and parental educational background have no significant effect on students' academic performance. In addition, Amuda and Ali (2016) conclude that fathers and mothers' level of education are not significant predictors of academic performance of students registered at Colleges of Education in the North-Eastern States of Nigeria.

## 6. Conclusion

Based on the findings, we concluded that, the level of education of a single mother has no significant effect on the academic performance of the learner.

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# AN EFFECTIVE METHOD OF TEACHING ENGLISH TENSE AND ASPECT THROUGH TIME ADVERBS

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## Abstract

The English tense and aspect system is difficult for Japanese learners of English, partly due to the effect of Language Transfer and the difference in tense and aspect in the two languages: the Japanese inflectional ending ‘*teiru*’ can mark progressive, stative, and perfective meanings, and Japanese does not have a form corresponding to the English present perfect. We hypothesized that understanding the English time adverbs ‘yet,’ ‘still,’ and ‘already’ would help Japanese learners acquire the English tense and aspect system. We conducted an experimental lesson with Japanese university students using moving pictures to teach these adverbs. We found that these lessons resulted in a significant improvement compared to a control group.

**Keywords:** *English tense, English aspect, English time adverb, SLA.*

## 1. Introduction

In this paper, we aim to discover whether English time adverbs help Japanese adult learners of English understand the English aspectual systems. The difference between the aspectual systems in English and Japanese seems to hinder Japanese learners of English from acquiring the English aspect. English has three aspects: simple, progressive, and perfective, and the verb’s inflection shows its aspect. In addition, Vendler (1967)<sup>1</sup> proposes that the semantic nature of each verb influences its inflectional form. On the other hand, Japanese aspect is semantically ambiguous. Verbs with the inflectional morpheme ‘*teiru*’ can be interpreted as progressive, past perfect, or present tense (see Teramura (1984) among others).

The purpose of our study is to prove the effectiveness of our material for English time adverbs both statistically and qualitatively. We adopted three time adverbs ‘still,’ ‘already,’ and ‘yet,’ as these adverbs are often confused by Japanese learners of English. We hypothesize that if the students can discriminate these time adverbs properly, their understanding of English aspect will improve.

## 2. Previous studies

According to Moriya & Horie (2002), ‘still’ expresses ‘a continuation of a situation’ (1a). ‘Already’ indicates ‘completion of an action’ (1b). The adverb ‘yet’ and ‘not’ show that ‘an expected change has not come at the present time’ (1c).

- (1)
- a. It is still raining.
  - b. I have already finished today’s homework.
  - c. We don’t know yet how many people were killed.

The adverb ‘still’ goes well with the English progressive construction as both express that something is underway. In the sentence (1a), the continuous sense of ‘still’ plays a role of emphasizing the continuity of raining. In the case of (1b), the completed meaning can be understandable without ‘already.’ Adding this adverb, the writer or the speaker can clarify the sense of completion. The adverb ‘yet’ in (1c) indicates that “We should have known how many people were killed at the time of the speech.” Therefore, these three time adverbs play an important role to clarify or emphasize different English aspects.

<sup>1</sup> Vendler (1967) categorized English verbs into four types: activity verbs, stative verbs, achievement verbs, and accomplishment verbs. Activity verbs such as *play* and *build* do not have a starting point nor endpoint and indicate a change of state, therefore they can appear in progressive sentences. On the other hand, stative verbs such as *like* and *know* usually cannot appear in progressive forms as they show the continuation of a state. Achievement verbs, such as *reach*, focus on the endpoint. Their progressive forms indicate ‘toward the end.’

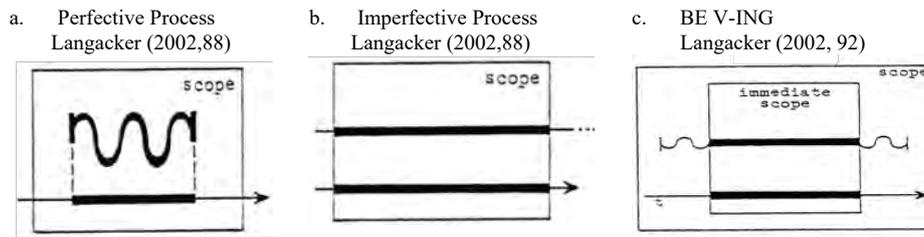
Cognitive Linguistics (CL) analyzes grammatical structures with diagrams of the items' core meanings. Langacker (2002) claims the core meaning of English progressive is "in the middle of something," as seen in (2), and proposes three types of progressive figures, as (3) shows.

(2) With respect to the perfective process *V*, the composite expression *be V-ing* defines a higher-order process that is limited to some internal portion of *V*, and construes the profiled states at a level of schematicity which renders them effectively identical.

Langacker (2002: 92)

(3) Langacker's Diagrams

Figure 1. Two Types of Process and Progressive.



According to Langacker, the wavy line of the perfective process indicates 'change through time' (3a), while the straight line of the imperfective process represents 'constancy through time' (3b) (ll.34-36, p.87). As the above diagrams reveal, the immediate scope (IS) of the progressive construction resembles the imperfective process, as (3b) shows, since the *be V-ing* construction focuses some internal part of *V*, as (3c) depicts. Therefore, the core meaning of 'still,' 'a continuation of a situation,' goes quite well with the progressive and imperfective process, including simple aspect. On the other hand, 'already' and 'yet' are used to emphasize the perfective process since the key to the both adverbs is 'the completion of an action.'

Although these three time adverbs play an important role in understanding English aspects, Japanese learners of English often confuse them. Several researchers attribute such confusion to a different semantic domain between English and Japanese (Somiya 2007; Terashima & Goto 2010). As for 'already' and 'yet,' the same Japanese word '*mou*' can express both meanings. Another Japanese word '*mada*' can be translated into 'still' or 'yet' depending on whether the sentence is affirmative or negative. If the sentence is affirmative, 'still' is used, while 'not yet' is used for a negative sentence. From the syntactic perspective, the Japanese inflectional ending '*teiru*' can mark progressive, stative, and perfective meanings. Moreover, Japanese does not have a form corresponding to the English present perfect. This is another confusing factor for Japanese learners.

### 3. Our research

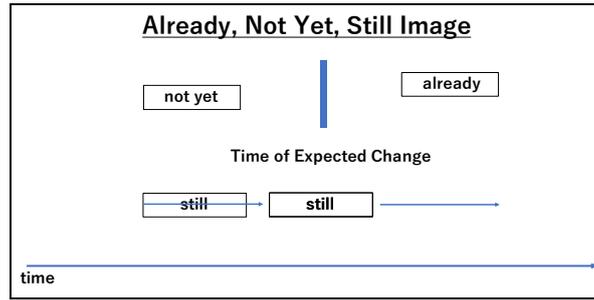
We created teaching materials for 'still,' 'already,' and 'yet' and conducted an experimental lesson to prove the effectiveness of our material. The participants are students enrolled in two Japanese universities. We divided them into two groups, the experimental group (28 students) and the control group (18 students). To the experimental group students we presented our original material (Figure 2), a moving picture showing the diagram representing a time arrow, the time of expected change, and the three time adverbs, each with their own movements. After presenting the material and a few explanations, we asked our students to answer questions later. We presented stories describing 12 situations and asked our research participants to choose the best sentence representing the whole situation out of four choices, each including one of the above time adverbs, 'still,' 'already,' or 'yet.' This quiz is web-based, so that the students are allowed to answer the questions in their free time. To the control group students, we mentioned the dictionary definition of each time adverb. Later, we asked them to answer the same web-based questions as the experimental group students. Both students are also required to fill in why they choose the sentences.

#### 3.1. Moving picture diagram

Figure 2 is the diagram of our teaching material. 'Not yet' does not reach the expected change, while 'already' has passed the line faster than expected. 'Still' moves throughout the time.

(5) Teaching Material

Figure 2. Moving Picture Diagram.



3.2. Questionnaire

The research participants were presented with 12 questions of the following form and required to choose one sentence matching the given situation.

(6) Sample of the questionnaire

My favorite place to go on the weekend is a bookstore with a nice cafe next door. Today is Saturday, so I hope to have time to go there and buy a new book about gardening. However, first I have to clean the house and write a letter to my grandmother.

- ① I am going to the bookstore already.
- ② I am not going to the bookstore yet.
- ③ I am still going to the bookstore.
- ④ I am not going to the bookstore anymore.

4. Results

First, we compared the grammatical competence of the two groups, based on the results of a TOEIC-style English test. According to the F-test to confirm the equal dispersion between the experimental group and the control group, the F-value is 0.22, which is higher than significance level, 0.05. That is, the two group’s distribution is the same statistically. So, we can proceed with the t-test based on the two groups with the equal dispersion, as table 1 shows.

(7) Results of F-test

Table 1. Comparison of English Competence between the Two Groups.

	Experimental Group	Control Group
Average	7.2962963	4.64705882
Variance	3.06267806	4.24264706
Number of obs.	28	18
Degree of freedom	26	16
F-value	0.72187906	
P(F<=f): one-sided	0.22358041	

4.1. Test results

In order to confirm the effectiveness of our material, we conducted a t-test. According to the t-test, we obtain the t-value, 0.00043, which is lower than the level of significance, 0.05. So, the null hypothesis that the average of the two groups are not different, can be rejected. In other words, the average of the experimental group is higher than that of control group.

(8) Result of t-test

Table 2. Comparison of the Test Results between the Two Groups

	Experimental Group	Control Group
Average	7.2962963	4.64705882
Variance	3.06267806	4.24264706
Number of obs.	28	18
Pooled variance	3.51219006	
degree of freedom	42	
t-value	4.56574749	
P(T<=t) :one-sided	0.0000215	

## 4.2. Descriptive analysis

Based on the test results and students' written explanations, we categorized student's comments on each question into four types: (A) correct answer with understanding of time adverbs; (B) incorrect answer with understanding of time adverbs; (C) correct answer without understanding of time adverbs; and (D) incorrect answer without understanding of time adverbs. We judged whether the participants understand time adverbs correctly from their writing. If their writing includes the proper time adverb(s) that are key to solving the question, we counted it as 'understanding time adverbs.' If the time adverb is not appropriate, we did not count it at all.

**4.2.1. Overall results.** 27.08% of the experimental group students arrived at their answers using their knowledge of time adverbs (table 3) while 7.87% of control group students utilized their knowledge to answer the questions (table 4). Among the experimental group students, 78.02% of those who understand time adverbs answered correctly. On the other hand, 58.82% with the knowledge of time adverbs arrived at the correct answers in the case of the control group.

### (9) Overall Result

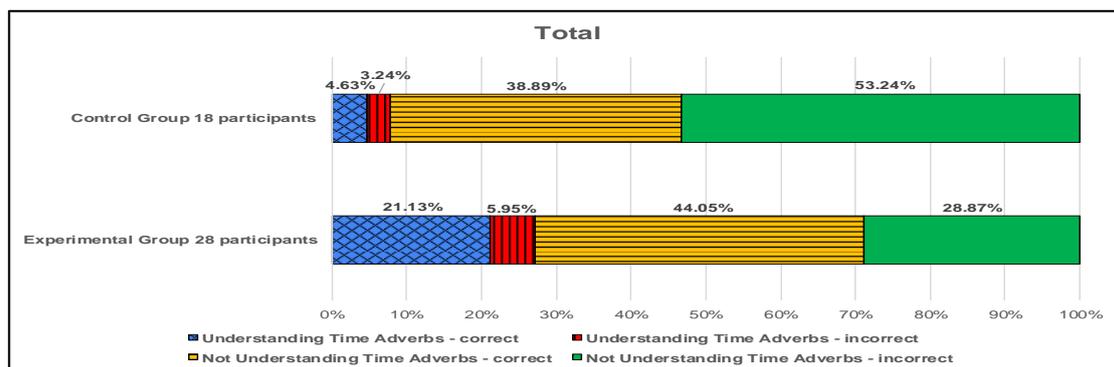
Table 3. Experimental Group (28 participants).

Total	Understanding Time Adverbs		Not Understanding Time Adverbs	
	91		245	
	27.08%		72.92%	
	Correct	Incorrect	Correct	Incorrect
	71	20	148	97
	78.02%	21.98%	60.41%	39.59%

Table 4. Control Group (18 participants).

Total	Understanding Time Adverbs		Not Understanding Time Adverbs	
	17		199	
	7.87%		92.13%	
	Correct	Incorrect	Correct	Incorrect
	10	7	84	115
	58.82%	41.18%	42.21%	57.79%

Figure 3. Comparison of the Performances in Total.



**4.2.2. Individual cases.** While the experimental group outperformed the control group in their understanding of time adverbs, in both groups, the majority apparently did so without using their knowledge of time adverbs. We believe that this can be attributed to properties of certain experimental items. In Q3, there are cues to the correct answer in the tenses: Mary *was* promoted, but an announcement *will* be made, suggesting that Mary got a promotion but the announcement has not yet been made public. In Q11, the correct answer, 2, is the only one with a positive meaning and can therefore be linked to the positive meaning of the passage.

[3] For many years Mary has worked for a large railroad company. The company has never had a woman president. This week, Mary was promoted to president. Her promotion will not be made public until next month. Many reporters will want to write about the first woman president of the company, so she wants time to prepare for interviews.

1. Although she is still president, it has not yet been announced.
2. Although she has not yet become president, it has been announced.
3. Although she has finally become president, it has not yet been announced.
4. Although she is not yet president, it has not yet been announced.

[11] Some people in the US argue that libraries are a thing of the past and need to change or else get less government funding. They believe that students need to learn to use computers and that books are less important than they once were. However, many libraries offer free use of computers. They also have classes that teach students how to do research online.

1. Libraries are already out of date.
2. Libraries are already helping students develop skills.
3. Libraries are still stuck in the past.
4. Libraries are not yet changing with the times.

## (11) Results of Individual Cases

Table 5. Results of Q3.

Experimental Group				Control Group							
Q3	Understanding Time Adverbs		Not Understanding Time Adverbs		Q3	Understanding Time Adverbs		Not Understanding Time Adverbs			
	10		18			2		16			
	35.71%		64.29%			11.11%		88.89%			
	Correct	Incorrect	Correct	Incorrect		Correct	Incorrect	Correct	Incorrect		
	3	7	10	8		1	1	9	7		
30.00%		70.00%		50.00%		50.00%		56.25%		43.75%	

Table 6. Results of Q 11.

Experimental Group				Control Group							
Q11	Understanding Time Adverbs		Not Understanding Time Adverbs		Q11	Understanding Time Adverbs		Not Understanding Time Adverbs			
	2		26			0		18			
	7.14%		92.86%			0.00%		100.00%			
	Correct	Incorrect	Correct	Incorrect		Correct	Incorrect	Correct	Incorrect		
	1	1	15	11		0	0	9	9		
50.00%		50.00%		57.69%		42.31%		50.00%		50.00%	

## 5. Discussion and concluding remarks

In our research, we tried to investigate whether English time adverbs will help Japanese learners of English understand the English aspectual system. We compared the performance of two groups: the experimental group and the control group. The statistical analysis reveals that the experimental group students outperform the control group students in terms of the test results. The overall descriptive analysis from their writings indicates the experimental group understands time adverbs better. However, the majority of the answers fall into the category 'correct answer without understanding time adverbs.' The individual cases reveal that the students used other cues to answer the questions, such as tense, or positive or negative connotations.

### Acknowledgements

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## THE INFLUENCE OF MOTHER TONGUE IN SECOND LANGUAGE LEARNING IN PRIMARY SCHOOL

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### Abstract

The role of mother tongue in second language learning has been the topic of much recent debates and controversies. This study explores the use of first language (L1) in learning teaching of English as second language (L2) in primary school. The main aim of this article is to establish to what extent and in which instances first language (L1) is used and response of second language educators when they hear first language (L1) in their classroom. Most educators feel that the use of First Language (L1) should be minimised and they feel guilty if they use it a lot. When challenged they find it difficult to say why. Against the use of First Language (L1), it is the general assumption that English should be learned through English, just as you learn your mother tongue using your mother tongue. On the other side, the idea that the learner should learn English like a native speaker does, or tries to 'think in English', is an inappropriate and unachievable thought. The data obtained showed that Second Language (L2) teachers used L1 mainly to provide feedback; teach new vocabulary; explain grammar; build rapport; manage the class; give individual help to learners and save time in lengthy task explanations.

**Keywords:** *Acquisition, second language, first language, linguistic.*

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### 1. Introduction

There have always been opposing opinions about the mother tongue use in second language (L2) classes. Two sides of the story are always narrated when coming to the teaching and learning of second language using mother tongue or first language (L1). There is a claim by some educators that first language (L1) is a valuable influence in the process of teaching and learning of English as the second language, and on the other hand, others avers that first language (L1) should be barred from the process of learning and teaching. This issue can be by no means be abandoned, since the language used in the class substantially influences the acquisition of the target language.

#### 1.1. The impact of first language use in English learning classroom

Certain scholars like Atkinson (1987), Harbord (1992), or Scrivener (2005) believe that first language (L1) if it is used accordingly, it can bear positive fruits on the English language teaching and learning process. On the other hand, scholars in the field such as Phillipson (1992), Seligson (1997) or Bonangeune (2009) embrace a different view, and to a certain extent criticize the use of L1. It appears that the use of the L1 is a debatable topic, and the exact role and appropriate extent of the use of L1 has not been clearly defined. It is therefore looks reasonable to assume that a balanced approach which carefully uses L1 to facilitate and enhance the learning absorption of L2 might be the solution to the issue along with adjusting that balance to meet the needs and levels of individual learners.

#### 1.2. The positive arguments for using L1 in a L2 classroom

Authors like Deller and Rinvuluceri (2002), Briggs (2001); Galali and Cinkara (2017) believe that L1 play an important role in second language learning in a classroom. According to Seftiawan (2018), mother tongue can help six-year-old learners to study second language and master vocabularies through translation. Hanáková and Metruk (2017) observed that L1 can also be used to explain a certain vocabulary, grammar, instructions, organisation purposes and to monitor learners' comprehension. This view is also shared by Alshehri (2017) who observed that L1 in a second language classroom develops good rapport with students.

### 1.3. The negative arguments against using L1 in a L2 classroom

Regardless of many advantages of using L1 in the L2 classroom there are also some disadvantages of using or overusing L1 in the classroom that may happen. According to Auerbach (1993:5) ‘the more the learners are exposed to English, the more quickly they will learn’, and for them to be able to learn it, they should be ‘forced to use it’. Cook (2001) identifies two reasons for those who support only L2 use in L2 classes. Firstly, the L2 learning process is like the process of L1 learning. Secondly, Cook (2001) states that the acquisition processes of L1 and L2 are completely separate.

Zha and Macaro (2014) state that the call for L1 avoidance in L2 classrooms can be based on Krashen’s input hypothesis and Long’s interaction hypothesis. Krashen (1992) avers that the exposure to comprehensible input increases the learner’s opportunity to acquire the language. He adds that comprehensible input should be accompanied by facilitative affective factors like high motivation and self-confidence, language acquisition to take place. Long’s interaction hypothesis maintains that the negotiation of meaning in L2 enhances L2 acquisition (Lightbrown and Spada, 2006). Kim and Elder (2008:167) maintain that because the success of the lesson depends on the manner in which the educator uses L2. Learners must be given ‘optimal chances’ for using L2 in a meaningful way.

### 1.4. Arguments on striking the balance in the use of L1 in L2 classroom

There are many arguments for and against the use of L1 in the process of teaching English or any other language as a second language. Some scholars like Nation (2003) and Harmer (2007) propose a balanced approach which maximizes the use of L2 but at the same time does recognize the importance of L1 in the classroom. Harmer (2007: 178 -179) also provides ideas on how to reduce the amount of L1 by observing the class during activities and, in his own words, ‘even pleading with learners to use English - and offering assistance if necessary’ as well as making it clear in the classroom that only English is to be used. Harmer (2001: 132) also indicated that four factors need to be taken into consideration: learners’ level of development, previous experience, the stage of the subject, and stage of the lesson. Harbord (1992: 354) maintains that despite L1 being needed to a certain level such as checking comprehension, presenting new structures should be, in his view, done in L2. He believed that educators should be able to communicate meaning of structure without using mother tongue as an option.

Willis (1991:1-2) proposes various ways for convenient L2 use. These techniques include the use of gestures, tone of voice, and demonstration to assist learners understand instruction better, which is, besides a way of reducing the amount of L1 interference, also a source of real-life L2 exposure. According to Hanáková and Metruk (2017) there are no “instant recipes”, as every learner and every educator is different, and each classroom conditions and settings are unique. To sum this discussion, it is always up to the educator to know their class and the context in which the English language is to be learned. In view of the opinions of many scholars in the field, it can be said that a balance approach is inevitable when it comes to using L1 in the classroom.

## 2. Research methodology

### 2.1. Research background

The aim of this research is to establish to what extent L1 is used in the English language classrooms at primary school level. Furthermore, the instances in which L1 is used, and the educators’ reactions are explored too.

Three research questions were formulated:

*What are the most frequent instances in which L1 is used during English language classes?*

*What is the average time spent on using L1 during English language lessons?*

*How do the educators react to the use of L1?*

### 2.2. Research sample

A total of 15 regular English lessons were observed at “Makgulo Primary school, Motheo district, in South Africa. The observation was performed at a primary school which involved learners from 09 - 11 years of age and two educators who are labelled as “X” and “Y”. Both the educators and learners were formed by males and females.

### 2.3. Instruments and procedure

A total of 15 English classes were observed with the focus on the time and instances in which L1 was used. Moreover, the educator’s reactions to the learners’ L1 use were scrutinized. Finally, an informal discussion with the educators after the lessons was held.

### 3. Research results

#### 3.1. Observation

Tables 1 contain the results obtained from observation

*Table 1. Observation Primary School.*

Class	Educator	Number of L1 occurrences	Time	Total time
1	X	L: 4 times L: 3 times	L: Several seconds L: Several seconds	Several seconds
2	X	E: 2 times L: 1 time	E: Several seconds L: Several seconds	Several seconds
3	X	L: 1 time L: 1 time	L: Several seconds L: Several seconds	Several seconds
4	X	E: 1 time L: 1 time	E: Several seconds L: Several seconds	Several seconds
5	Y	E: 9 times L: 1 time	E: 16 min L: 2 min	18 min
6	X	E: 1 time L: 2 times	E: 1 min L: 1 min	2 min
7	X	L: 2 times L: 3 times	L: Several seconds L: 1 min	Several seconds
8	Y	E: 4 times L: 1 time	E: 11 min L: 1 min	12 min
9	Y	E: 4 times L: 1 time	E: 1 min L: 1 min	2 min
10	Y	E: 8 times L: 2 times	E: 10 min L: 2 min	12 min
11	Y	E: 5 times L: 2 times	E: 4 min L: 3 min	7 min
12	X	E: 5 times L: 2 times	E: 7 min L: 2 min	9 min
13	Y	L: 1 time	L: Several seconds	Several seconds
14	Y	L: 2 times E: 5 times	L: 1 min E: 9 min	10 min
15	X	E: 1 time	E: Several seconds	Several seconds

E = Educator L = learner

The observation table above display the following results: The overall average time spent on using L1 in all 15 classes was 8.4 min per one lesson, which accounts for 19% of the lesson. The duration of one lesson was 45 min. The average time of learners' use of L1 was 1.7 min per one lesson, which comprises 4% of the lesson. The average time of educators' use of L1 was 6.7 min per one lesson, which makes up 15% of the lesson. The observation results show that each observed lesson involved at least some usage of L1. In other words, a lesson in which L1 would not be used at all did not occur during the observation. The average time spent on using L1 (educators + learners) during the observation of 15 classes was 4.8 min per one lesson, which accounts for 11% of the lesson. The average time of educators' use of L1 during one lesson was 4 min per one lesson, which makes up 9% of the lesson. As already mentioned, the two educators who were observed were labelled as "X" and "Y". Individual evaluations of each teacher reveal that there are significant differences between the educators in terms of using L1. In the classes of educator "X", L1 was used only for a several seconds, and the observation results demonstrate that the learners of this educator are used to using L2, and only use L1 when needed. In the classes of educator "Y", however, L1 was used frequently; the average time was 4.7 min per one lesson, which makes up more than 10 % of the lesson. In the classes of educator "Y", L1 was used similarly often, around 4.7 min per one lesson, which accounts for 10 % of the lesson. It is obvious that in some cases, L1 was barely used, and, in other lessons, L1 was spoken for 12 or 18 min. This clearly reveals that although these were the classes spent on new grammar, the particular educators did not provide their learners with enough space for the use of L2. It can be perhaps concluded that the lessons did not contain a communicative component.

Another feature which was the focus of attention during the observation was the amount of L1 occurrences. The results show that during the observation of 15 classes, the learners used L1 32 times, and

the educators used L1 45 times. The most frequent instances in which L1 was used were specific vocabulary – in this case, the learners were usually asking for a meaning or a translation of an unknown word, explaining grammar, giving instructions, organisation purposes, and checking understanding. While in some cases, e.g. when an unknown word appeared, the learners asked the educator for a translation which usually led to an explanation in L1 that lasted for several seconds. However, the educators occasionally spent a minute or two explaining the meaning of a word or an expression in L1. When explaining a new grammar component, the educators usually used L1, sometimes to point out the differences, but occasionally, a long explanation of grammar in L1 happened. In a few cases, the educators provided materials, for example a test, in which learners were supposed to translate language items from L1 into L2. The educators' response was, in the majority of occurrences, the continuation in L2 so the learners' L1 was not paid attention. The educators were sometimes "pretending" they did not hear the learners' L1 use, which was probably an attempt to make the learner realize they did something undesired. Another very common response to the use of L1 was requesting the use of L2 instead of L1 from the learners, after which the learner remained quiet or explained in L1 that he or she is not able to provide a sentence or a question in L2. It should be noted that in some cases, the atmosphere in class became rather stressful, especially when the learners were using too much L1 and their educator asked them to use L2. It was, therefore, startling when the same educator used L1 during that lesson without any apparent reason. It is important to point out that sometimes, when the learners were asked for a specific word translation or explanation of a grammatical feature, the educators did not always provide them with an answer only in L1 or L2, but very often a mixture of L1 and L2 was used. Even though the educators required their learners to use L2, the educators themselves sometimes used the mixture of L1 and L2. This seemed rather baffling for the learners, and it might be the result of absencing rules for the L1 use in the class. Finally, it is worth mentioning that although in the majority of classes, the use of L1 did not exceed 15 min, there were four classes in which the use of L1 exceeded 15 min. This accounts for one third of the lesson duration. The average time of L1 use, which was 8.4 min, appears to be affected by the fact that while in some lessons, the use of L1 did not exceed a minute amount of time (several seconds), in other lessons, L1 was used for more than 15 min.

#### 4. Discussion

The research results demonstrate that L1 is always present in the L2 lessons. The average time spent on using L1 accounts for 19% of the lesson.

As far as the instances in which L1 is most commonly used, it was observed that the most frequent cases in which L1 was used were specific vocabulary, explaining grammar, instructions, organisation purposes, and checking understanding. During the discussions with the educators, which took place after the lessons in the form of an informal dialogue, the study reveals that there are various reasons for using L1 such as saving time, avoiding misunderstandings, and attempting to point out the differences between certain elements such as grammar issues in L1 and L2. In the majority of cases, the teachers' response to the learners' use of L1 was continuation in L2, and hence the learners' L1 was usually not recognized. Instead, the educators "pretended" not to notice the learners' L1 use as well and they requested the learners to say or ask the same thing in L2. It should be emphasized that during the observation, it was sometimes rather obvious that the teachers had not established rules for the usage of L1 in their lessons. This fact often seemed to generate uncertainty because sometimes the learners' use of L1, especially in unnecessary instances when L1 was not needed such as for the clarification of understanding etc., was ignored by the educators, while in other cases, the educators urged the learners to use L2. This seems to be rather misleading for learners in general, and L2 educators should always set clear rules about the use of L1 in classes at the beginning of a school year.

#### 5. Conclusion

This paper focused on the use of the mother tongue in the process of teaching and learning English at Primary school in South Africa. The language used in the classroom cannot be disregarded since it directly and greatly influences the acquisition of L2. The central aim of this study was to determine to what extent L1 is used in the English language classrooms, in which instances it is used, and what the educator's responses to the use of L1 are. Firstly, it was observed that the average time spent on using L1 during English language classes is 8.4 min per one lesson, which accounts for 19% of the lesson. Secondly, the most frequent instances in which L1 is used during English language classes were specific vocabulary, explaining grammar, instructions, organisation purposes, and checking understanding. Finally, it was observed that the teachers' reactions are, in the majority of cases, continuation in L2, "pretending" not to hear the student's L1 use and requesting the use of L2 instead of L1 from the learners. The research results

indicate that L1 is always present in the classes. This is an interesting finding since using adequate amount of L2 in EFL classes could be regarded as a main goal in L2 classes. To summarize, the language used in the classroom plays a major role in the process of L2 teaching as it directly influences the acquisition of L2. Therefore, the teachers ought to always set clear rules about the use of L1 in their classes.

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# INVESTIGATION ON TEACHING CRITICAL THINKING IN ENGLISH COURSE TO YOUNG ESL LEARNERS IN CHINA

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## Abstract

In the past five years in China, critical thinking has been mentioned more and more, especially in English courses to young ESL learners. The lessons which are said to lead to development of critical thinking are becoming very popular among modern parents in China.

Critical thinking involves “evaluating the accuracy, credibility and worth of information and lines of reasoning. Critical thinking is reflective, logical, evidence-based, and has a purposeful quality to it” (Ormrod, 2012). Critical thinking always goes hand in hand with Bloom’s Taxonomy. It is always recognized as a process that can be taught (Cole & McGuire, 2012). But it also takes time.

In the autumn and winter of 2019, from observing English lessons given to young ESL learners in Beijing, China, the author collected the data about whether there is training or developing critical thinking in the lessons. The results show critical thinking development in lessons to different ages of students, and the differences between language skills lessons and language knowledge lessons. This study was an attempt to explore the reasons behind this phenomenon and it tried to find some practical ways to improve teaching critical thinking in ESL courses to young learners.

**Keywords:** *Critical thinking, Bloom’s taxonomy, young learners, second language.*

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## 1. Introduction

The importance of developing the ability for students to think critically is widely acknowledged by teachers and educators around the world at present. In 21<sup>st</sup> Century Skills Framework, critical thinking is the first skill mentioned in the area of Learning & Innovation skills. In the latest understanding of 21<sup>st</sup> Century skills, critical thinking skill is for everyone. (OCED, 2008).

“Critical thinking means making reasoned judgements that are logical and well-thought out. It is a way of thinking in which you don’t simply accept all arguments and conclusions you are exposed to but rather have an attitude involving questioning such arguments and conclusions. It requires wanting to see what evidence is involved to support a particular argument or conclusion (Delece, 2014).” “Critical thinking is a fundamental skill that develops early learning exercises and activities attractive...(Florea & Hurjui, 2015)”

In recent years in China, critical thinking has been mentioned a lot in various education fields. English courses to young ESL learners are not an exemption. Many ESL courses to young learners declared that they have covered critical thinking development in their course design. They are popular among modern parents in China.

Thinking is a complex cognitive process closely linked with the language (Florea & Hurjui, 2015). We believe that students can benefit a lot if they are led to develop critical thinking skills in ESL class. If everything has been on the right way, the perspective would be ideal. However, how are the processes carried out in practice? The situation is not so optimistic.

The investigation in this paper is based on observation of teaching. We can see that critical thinking development for young learners is not implemented ideally as desired in every lesson. The phenomenon is analysed and the reasons are discussed.

This paper is organized as follows: Methods will be introduced in Section 2. Results and discussions will be explained in Section 3. In the last section, conclusion and future perspectives will be stated.

## 2. Methods

The research is mainly based on quantitative analysis.

From September to December in 2019, 48 ELT lessons for young learners were observed. All the lessons were given by different teachers.

The target students in the classes observed are between 4 to 12 years old. We put them into three groups: Age 4-5, age 6-7 and age 8-12. The grouping is consistent with our course curriculum. Age 4-5 is at the stage of “Start”, age 6-7 is at the stage of “Grow” and age 8-12 is at the stage of “Develop”. Based on the age of the students and their learning habits, different groups of young learners are also using different series of course book to learn English as their second language.

The lessons were randomly selected. All of them were on weekends because weekends are the peak time for young learners to go to English language schools in China.

There is a common form to fill after the observation of each lesson. In the form, whether there were procedures for developing critical thinking abilities of the students is a required field. There are only two choices to fill this part, “Yes” or “No”.

Based on observation records, the numbers and percentage are calculated and compared.

## 3. Results and discussions

Table 1. Percentage of lessons to different student groups in lessons with or without critical thinking.

Target Students	Procedures for developing critical thinking shown		No Procedures for developing critical thinking	
	Numbers	Percentage	Numbers	Percentage
Age 8-12 (Develop)	16	69.57%	8	32.00%
Age 6-7 (Grow)	4	17.39%	13	52.00%
Age 4-5(Start)	3	13.04%	4	16.00%
Total	23	100%	25	100%

Based on the statistics from *Table 1*, we can see that in classes where teacher tried to develop critical thinking of students, lessons to 8-12 years-old students were the majority (69.57%). From the highest percentage to the lowest percentage, the ranking is age 8-12 (69.57%), age 6-7 (17.39%) and then age 4-5 (13.04%). While in classes where teacher didn’t have teaching procedures to develop critical thinking of the students, the majority (52%) were not those classes with the youngest students, but the middle group with students at the age of 6-7 (*Table 1*).

If we take a close look at constituent ratios of lessons in different age groups (see *Table 2*), it is indicated that in two thirds of lessons for age 8-12, teacher tried to develop critical thinking of students. But for age 6-7 students, teachers did so in only 23.53% of the lessons. The ratio is less than one third. However, in classes for age 4-5, nearly 50% of the lessons included critical thinking development as a part of the teaching.

Table 2. Constituent ratios of lessons with or without critical thinking in different age groups of students.

Target Students	Whether there were procedures for developing Critical thinking in class								
	Age 8-12 (Develop)			Age 6-7 (Grow)			Age 4-5 (Start)		
Yes/No	Yes	No	Total	Yes	No	Total	Yes	No	Total
Numbers	16	8	24	4	13	17	3	4	7
Percentage	66.67%	33.33%	100%	23.53%	76.47%	100%	42.86%	57.14%	100%

In Bloom’s taxonomy, the highest levels require critical thinking (Cole & McGuire, 2012). That is why it is always believed that the younger the students are, the more difficult it is to implement critical thinking training in class. But why is it that the result shows us that the lowest percentage comes from the middle age group in the three groups of students, but not the youngest?

Further exploration might answer this question (See *Table 3*). Among the four lessons which implemented critical thinking development in age 6-7 group, three of them are reading skill lessons. Only one is language knowledge lessons which emphasizes more on vocabulary, grammar and pronunciation. While among the thirteen lessons which showed no procedures for developing critical thinking, ten of them are language knowledge lessons. In the reading skill lessons, teachers were using leveled readers. It seemed that by using literature in ELS classes, teachers have more tendency to lead young learners to think critically. It “makes people think and that means teachers as well as children” (Ellison, 2010).

Table 3. Comparison between different lesson types in group of Age6-7.

Target Students		Procedures for developing critical thinking shown			No Procedures for developing critical thinking		
Age 6-7 (Grow)	Lesson types	Skills lesson	Knowledge lesson	Total	Skills lesson	Knowledge lesson	Total
	Numbers	3	1	4	3	10	13
	Percentage	75%	25%	100%	23.08%	76.92%	100%

Every time we talk about critical thinking, Bloom's Taxonomy can never be ignored. They always go hand in hand. Critical thinking can be seen as a line-through of Bloom's Taxonomy. There are six levels in Bloom's Taxonomy (Bloom, 1956). The bottom level "Remember" is usually recognized as LOTS (Lower-Order Thinking Skills). However, to remember something may also inspire you to recall or identify, to analyze or interpret, to compare, match and so forth, which also involves critical thinking. Therefore, to implement development of critical thinking in knowledge lessons is achievable and practical.

Critical thinking is a skill, but it does not mean only in language skills lessons can we help students to develop it. While learning grammar rules, word-building or phonics, students can also develop their critical thinking.

Using literature in ESL classes has a positive effect on young learners' critical thinking development, but it still needs teachers' efforts. "Young learners will engage in critical thinking and purposeful decision-making when they feel affectively involved or connected to a problem or decision point (Cole & McGuire, 2012)." To make education more thinking-centred, teachers need to better prepare themselves (Ellison, 2010).

#### 4. Conclusion

Educators emphasized a lot on critical thinking for its importance in the process of growth and development of children. Critical thinking is a process that can be taught (Cole & McGuire, 2012). But children can only be taught to be creative with rich environments provided, where they are able to explore and can ask questions, make hypothesis and develop their thinking (French, 2007).

To develop the critical thinking of young learners has already been on the schedule of ESL course design in China. But the awareness of its significance is not enough, whether and how teachers implement critical thinking into their lessons is also an important and crucial factor to the development of critical thinking of children. Differences among teachers are obvious. Some teachers have included this in their lesson plans, some may have the awareness but do not know what to do to engage young learners in critical thinking. Meanwhile, there are some teachers who may need training to better understand what critical thinking is and then to make it a part of their lessons.

Critical thinking can be taught. But it takes time. Also it is a complicated project. It is a process of cooperation which requires efforts from educators, course designers, teachers, parents and students themselves. Young learners may need more support from teachers and parents. Their interests can be aroused, and their enthusiasm and potential can be inspired if we use the right and appropriate ways.

Development of critical thinking is not only a slogan. There are lots to be considered and more efforts are needed to make it play the right role in children's learning process. "Helping children to become better thinkers does not mean a huge change in what we change. It means a change in the way we think about it (Ellison, 2010)." Only if the teachers are on the right path, can children become critical thinkers.

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## EXPLORING STUDENT TEACHERS' LEARNING STRATEGIES AND THE RELATIONSHIP WITH ACADEMIC ACHIEVEMENT AND DEMOGRAPHIC VARIABLES

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### Abstract

Diversity in Higher Education implies being able as teachers to meet students' needs and preferences to motivate them and facilitate their development and learning. This diversity derives, among others, from students' learning styles and strategies which can determine their academic success or failure. The purpose of this study was to examine student teachers' learning strategies and to determine whether these strategies differ according to some demographic variables (i.e. gender, Bachelor's degree, year of study) and students' academic performance. To this end, a cross-sectional survey design was conducted, and a convenience sample of 141 student teachers (20 males and 121 females) participated in the study. Students were enrolled in the first and second year of two Bachelor's degrees in Education: Early Education ( $n = 75$ ) and Elementary Education ( $n = 66$ ). Participants' age ranged between 18 and 42 years old ( $M = 19.88$ ,  $SD = 2.73$ ). The 5-point Likert scale questionnaire CEVEAPEU (Gargallo, Suárez-Rodríguez, & Pérez-Pérez, 2009) was administered during class time and descriptive and inferential analyses were conducted. Overall, student teachers report high intrinsic motivation, task value and internal attributions, as well as high levels of self-efficacy and expectations. Concerning strategies related to information processing, students highlighted the elaboration, transfer and use of information. Female students showed greater intrinsic motivation and anxiety control than males and used more strategies related to information elaboration, organization and transfer. Early education student teachers scored higher than elementary education student teachers in motivational, affective and information search and selection strategies. Second-year students showed greater motivational strategies than first-year students. They also scored higher in metacognitive strategies such as planning and in information processing and use strategies. Unexpectedly, students with lower academic performance, reported greater use of planning strategies and other strategies related to information processing, compared to those with average academic achievement. Differences in students' learning strategies highlight the need for accommodating the teaching styles to the characteristics of university students and also the development of programs oriented towards the improvement of students' strategic learning.

**Keywords:** *Learning strategies, academic achievement, gender, student teachers, higher education.*

### 1. Introduction

Research in learning strategies has aroused a growing interest in Higher Education since it is considered to be an important factor in university students' development and academic success (Amir, Jelas, & Rahman, 2011; Bahamón, Vianchá, Alarcón, & Bohórquez, 2013). Students not only differ in their interests, expectations, previous experiences or abilities, but also in the way they learn, and these differences in their strategic learning may have an impact on their academic achievement (Mohammadi, Thaghinejad, Suhrabi, & Tavan, 2017; Renzulli, 2015).

Learning strategies are a multidimensional construct that has been conceptualized differently depending on the theoretical framework and the subsequent instrument used to evaluate them. This lack of consensus has generated confusion and has hindered understanding and generalization in the educational context (Valadez Huizar, 2009). However, there is agreement that, from a constructivist perspective of learning in which a series of cognitive processes and mental operations are carried out to acquire, encode and retrieve information (Ausubel, Novak, & Hanesian, 1998; Bandura, 1987; Flavell, 1996; Gagné, 1970), students need to use skills and processes that also analyze, transform and apply that information to succeed in learning. Overall, the construct of learning strategies includes not only cognitive (i.e. information processing organization and management) and metacognitive elements (i.e. self-regulation in the learning process) but also socio-affective and motivational components (i.e. disposition for learning). Therefore, the learning strategies can be understood as an organized,

conscious and intentional set of skills and actions that the learner carries out to effectively achieve a learning goal in a given social context (Gargallo et al., 2009).

Research has shown that the use of different learning strategies is associated to students' academic performance and other background characteristics (e.g. Camarero, Martín del Buey, & Herrero Díez, 2000; Juárez, Rodríguez Hernández, Escoto, & Luna, 2016). Overall, university students use strategies related to codification, learning support and learning skills (Bahamón et al., 2013; Rossi Casé, Neer, Doná, & Lopetegui, 2010). However, differences in students' use of learning strategies can be found. For instance, Gargallo (2006) and Juárez et al. (2016) concluded that students with higher academic performance use more learning strategies, especially those related to information search, selection and processing, and metacognitive and context control strategies. Likewise, research has shown that students enrolled in different degree programs seem to use different learning strategies (Camarero et al., 2000; Gargallo, 2006) and they use more effective strategies throughout the years of study (Camarero et al., 2000; Gargallo, Almerich, Suárez-Rodríguez, & García-Félix, 2012). Other studies have found differences in the strategic learning of male and female students (Ghiasvand, 2010; Rossi Casé et al., 2010). These findings suggest that university students differ in the way they learn and may result in different levels of academic success.

Further research is needed to establish the factors that may affect students' academic performance and, among these factors, the learning strategies seem to be crucial. By determining the way students learn and their characteristics, we will be able to accommodate the teaching styles and practices, and carry out interventions oriented to improve students' strategic learning and, subsequently, their academic performance.

## 2. Objectives

The purpose of this study was to identify student teachers' use of learning strategies. It also aimed to determine the relationship between these strategies and students' academic performance, gender, degree program and year of study.

## 3. Methods

### 3.1. Participants

A convenience sample of 141 students enrolled in two undergraduate degree programs in Education of a Spanish university participated in the study. The majority were female students ( $n = 121$ , 86%) with an average age of 19.88 years old ( $SD = 2.73$ ). In terms of degree programs, 75 students were enrolled in Early Childhood Education (53%) and 66 in Primary School Education (47%). Concerning the year of study, 97 students were in their first year (69%) and 44 in their second year (31%).

### 3.2. Instruments

The CEVEAPEU questionnaire developed by Gargallo et al. (2009) was used for this study. The instrument measures the learning strategies used by university students and comprises 25 strategies organized in two scales and six subscales. Participants had to respond to 88 items in a 5-point-Likert scale (1 = *totally disagree*, 5 = *totally agree*). The questionnaire showed good internal consistency for the total scale ( $\alpha = .97$ ) and for each the scales: Affective, support and control strategies ( $\alpha = .95$ ) and Information processing strategies ( $\alpha = .94$ ). The *alpha* values for the six subscales ranged between .67 and .94.

Demographic information (i.e. gender, age, degree program, year of study) was also included in the questionnaire. To collect information about the academic performance, first-year students were asked to provide the grade obtained in the University Access Exam. Second-year students had to provide the grades obtained in six compulsory subjects studied the year before.

### 3.3. Procedure

A descriptive and comparative study was carried out based on a survey design. The study guaranteed the ethical standards in research through the anonymization of the questionnaires and the request for the informed consent of all participants. Students were asked to complete the online version of the questionnaire during class time and the time required to complete it was 15-20 minutes.

### 3.4. Data analyses

Descriptive analyses were performed to identify the use of learning strategies by student teachers. Differences between students' level of academic achievement were analysed using a one-way ANOVA. To compare the use of learning strategies concerning the gender, degree program and year of study a series of independent samples t-test were used.

## 4. Results

### 4.1. Student teachers' use of learning strategies

Overall, student teachers use both affective, support and control strategies ( $M = 3.55$ ,  $SD = 0.55$ ) and information processing related strategies ( $M = 3.54$ ,  $SD = 0.69$ ) moderately. Participants rated high motivational strategies such as intrinsic motivation ( $M = 4.06$ ,  $SD = 0.82$ ), task value ( $M = 4.25$ ,  $SD = 0.81$ ), task persistence ( $M = 3.98$ ,  $SD = 0.82$ ) and self-efficacy and expectations ( $M = 3.92$ ,  $SD = 0.79$ ) as well as strategies related to processing and use of information like elaboration ( $M = 3.16$ ,  $SD = 0.92$ ) and information transfer ( $M = 3.91$ ,  $SD = 0.86$ ). Other strategies such as extrinsic motivation ( $M = 2.24$ ,  $SD = 0.99$ ), attributions ( $M = 2.67$ ,  $SD = 0.86$ ) and simple repetition ( $M = 2.97$ ,  $SD = 1.06$ ) were poorly rated.

### 4.2. Comparing learning strategies and academic performance

Significant differences were found concerning the use of learning strategies by student teachers and their academic performance. The group of students with low academic performance stated that they used the metacognitive strategy of planning ( $M = 3.03$ ,  $SD = 0.69$ ) more than the medium academic group ( $M = 2.58$ ,  $SD = 0.57$ ), while the latter used this strategy less than high achievers ( $M = 2.90$ ,  $SD = 0.64$ ,  $F(2, 138) = 6.148$ ,  $p = .003$ ).

In addition, low achievers used some information processing related strategies more often than medium and high achievers. For instance, they declared they had more knowledge of sources and information search ( $M = 3.34$ ,  $SD = 0.69$ ) than medium achievers ( $M = 2.93$ ,  $SD = 0.80$ ,  $F(2, 137) = 3.994$ ,  $p = .021$ ). They also used more strategies for information acquisition (low achievers:  $M = 3.45$ ,  $SD = .89$ ; medium achievers:  $M = 2.91$ ,  $SD = 0.89$ ,  $F(2, 137) = 4.52$ ,  $p = .012$ ), organization (low achievers:  $M = 4.04$ ,  $SD = .69$ ; medium achievers:  $M = 3.60$ ,  $SD = 1.01$ , high achievers:  $M = 3.57$ ,  $SD = 0.93$ ,  $F(2, 138) = 4.33$ ,  $p = .015$ ) and resource management (low achievers:  $M = 3.88$ ,  $SD = .90$ ; high achievers:  $M = 3.43$ ,  $SD = 0.83$ ,  $F(2, 138) = 4.52$ ,  $p = .012$ ).

### 4.3. Comparing student teachers' learning strategies and background characteristics

Significant differences were found concerning student teachers' gender, degree program and year of study ( $p < .05$ ). Details are displayed in Table 1.

Overall, female students showed more intrinsic motivation and anxiety control than male students. They also used more information processing strategies such as elaboration, organization, transfer, and resource management.

Likewise, students enrolled in the Early Childhood Education program showed greater task value, anxiety control, knowledge of sources and information search, and information acquisition than students enrolled in the Primary School Education program.

Finally, second-year students used greater motivational strategies like intrinsic motivation, task value and self-efficacy and expectations compared to first-year students. They also scored higher in the metacognitive strategy of planning and information processing strategies like organization, transfer and resource management.

Table 1. Differences in student teachers' use of learning strategies concerning background characteristics.

Strategy	Gender					Degree program					Year of study				
	Male		Female		<i>t</i> (139)	Early Childhood Education		Primary School Education		<i>t</i> (139)	First year		Second year		<i>t</i> (139)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Intrinsic motivation	3.56	0.89	4.15	0.78	3.03**						3.97	0.90	4.28	0.55	2.08*
Task value						4.39	0.73	4.08	0.86	2.32*	4.12	0.89	4.53	0.47	2.87**
Anxiety control	2.91	0.79	3.26	0.68	2.08*	3.38	0.76	3.39	0.84	3.11**					
Self-efficacy and expectation											3.83	0.85	4.11	0.58	2.01*
Knowledge of sources and information search						3.23	0.69	2.95	0.82	2.16*					
Planning											2.77	0.67	3.02	0.60	2.11*
Information acquisition						3.33	0.85	2.96	0.97	2.39*					
Elaboration	3.57	1.10	4.12	0.80	2.67*										
Organization	3.28	0.99	3.83	0.86	2.58*						3.64	0.93	3.99	0.78	2.17*
Transfer	3.48	0.98	3.99	0.82	2.47*						3.78	0.92	4.21	0.63	2.83**
Resource management	3.10	.094	3.71	0.88	2.86**						3.48	0.93	3.94	0.80	2.77**

Significant at \* $p < .05$ , \*\* $p < .01$

## 5. Discussion and conclusions

This study aimed to explore student teachers use of learning strategies and determine whether the use of these strategies differ depending on their academic performance and other background characteristics (i.e. gender, degree program, year of study). Findings showed some contradictory results about students' academic achievement. While previous studies report greater and more complex use of learning strategies by students with high academic performance (e.g. Bahamón et al., 2013; Juárez et al., 2016; Salazar & Heredia, 2019), the present study barely found differences between high, medium and low achievers in line with other previous research (e.g. Martínez & Galán, 2000; Rossi Casé et al., 2010; Trelles, Alvarado, & Montánchez, 2018). Unexpectedly, when differences were identified, student teachers with low performance stated greater use of those strategies compared to medium achievers (i.e. planning, information acquisition, organization) and high achievers (i.e. information organization and resource management). Further research is needed to better understand the factors that underlie these findings.

Concerning student teachers' background characteristics, differences between groups were found. In line with Ghiasvand's work (2010), female students use more learning strategies than male students, specifically, intrinsic motivation, anxiety control and information processing strategies. Additionally, students from different degree programs differ in the way they use some learning strategies. Research had already highlighted this issue (Camarero et al., 2000; Gargallo, 2006) and further investigation should include other degree programs to confirm this pattern. Finally, as Gargallo (2012) and Salazar & Heredia (2019) had already pointed out, the use of learning strategies evolves throughout the years. The present study showed greater use of learning strategies by second-year students compared to first-year students. These findings suggest that students learn more efficiently as they gain experience during their training. A longitudinal study that explores the evolution of students' use of learning strategies would help to identify the initial needs of university students and set the supports and interventions to improve their strategic learning.

This research presents several limitations. In the first place, the cross-sectional nature of this study and the size of the sample do not allow the generalization of the results to the population of student teachers. This study only reflects the perceptions of a group of students and may not coincide with those of other institutions. Secondly, participants' responses may not reflect their actual use of learning strategies since they may have indicated biased or socially desirable responses (e.g. low achievement students).

Nevertheless, and in light of these findings, we can conclude that (a) high and low achievers do not necessarily use different learning strategies, (b) female students are better strategic learners, (c) different degree programs may require different learning strategies, and (d) students become more effective in their strategic learning throughout the years of study. Differences in the way students learn highlight the need for accommodating the teaching styles to the characteristics of university students and the degree program they are enrolled in as well as the development of interventions oriented to improve students' strategic learning.

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## NATURE OF SCIENCE INTERDISCIPLINARY TEACHING BASED ON SYMMETRY AND THE SEARCH OF INVARIANTS

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### Abstract

The project is situated in the field of teaching physics, generally speaking science education, and aims at studying the interplay between physics and mathematics. Although mathematics has always been closely related to physics, the two disciplines are different in objects, aims, methods and tools. Nevertheless, mathematics provides physics with the language it needs. The result is that students are more concerned with the mathematical machinery rather than with a proper understanding of the physical situation. Remarkable studies (Boniolo, G., Budinich, P. and Trobok, M. (2005); Fuson, K. C., Kalchman, M., & Bransford, J. D. (2005)) have been devoted to the problem of teaching together mathematical and science contents. In addition, the language of mathematics makes sense of a wide range of natural phenomena. Despite the fact that mathematical proficiency is highly relevant in and to the research fields, mathematics education is failing to support interdisciplinary and educational connections to physics. The main focus of our study is on how to grasp the challenges of an interdisciplinary approach based on symmetry and invariance. Symmetry and searching of invariants can be employed in interdisciplinary perspective because of its crosscutting character and its historico-epistemological value. In order to test the positive effect of introducing the modern concept of symmetry viewed as sameness within change, we designed and implemented a teaching learning sequence (TLS) according to the didactical framework created by the Claus Michelsen (Michelsen C. 2015). On our side we also introduced interdisciplinary modules in history of physics and education, typically of Nature of Science (NoS) modelling. The materials have been implemented to 96 pupils of primary school in Italy. The data analysis shows that the pupils were in the regime of competence for grasping the changed view of symmetry linked to the search for invariance. It also provides ways for further research.

**Keywords:** *Teaching science, NoS, symmetry, invariants in science education.*

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## 1. Introduction

### 1.1. Background

Remarkable studies (Pisano; Matthews, Boniolo, G., Budinich, P. and Trobok, M. (2005); Fuson, K. C., Kalchman, M., & Bransford, J. D. (2005)) have been devoted to the problem of teaching together mathematical and science contents. In addition, the language of mathematics makes sense of a wide range of natural phenomena.

Despite the fact that mathematical proficiency is highly relevant in and to the research fields, mathematics education is failing to support interdisciplinary and educational connections to physics. In fact, sometimes from students' prospective, mathematics, physics and biology typically appear as separate subjects with few interconnections (cf. Redish, E. F. and Kuo, 2015).

This compartmentalization generates many theoretical misunderstandings in the process of learning certain important concepts (cf. Meltzer, D. E. 2002; Buick, J. M., 2007). For instance, students showing adequate computational skills still lack the ability to apply these skills in a meaningful way. It means that students focus their attention more on basic comprehension and memorization of concepts and formulas than on critical thinking. In this sense, a key aspect of educational innovation is to promote creative and flexible frameworks for integrating productive ideas across disciplines.

### 1.2. Focus of the study and literature review

Our project aims at contributing to the research in the field of Nature of Science Teaching regarding the interplay between physics and mathematics (cf. Pisano; Doran Y. J. (2017); Wigner, E. P. (1960)) within an interdisciplinary approach based on symmetry and invariance. Symmetry and searching

of invariants can be employed in interdisciplinary perspective because of its crosscutting character and its historico-epistemological value (cf. Dirac, P. A. M. (1939); Feynman, R. (1964-1965); Galileo, G., *Il Saggiatore* (1623)). The possibility of widening the fields of application in which to choose the rules to be considered from time to time offers the starting point for reflections on the relationships of equality and more generally of equivalence, on the relativity of the concept of equality, of form as a physical system that is preserved (cf. Rosen, J. and P. Copie' (1982); Weyl, H. (1928); Wigner, E. P. (1967)).

The processes of change or modelling of a rule are themselves subject to a principle of legality that guarantees compatibility and consistency with those already in existence: in physics, this set of binding conditions is represented by the principles of symmetry. The symmetry perceived with the meaning of the invariance of a form undergoing a change becomes a powerful tool of inter-disciplinary knowledge included applied sciences both into history and in society (e.g., micro devices and their technology); (Pisano R (2019); Pisano R (2011)).

The essential idea is to extend symmetry starting from line symmetry and aesthetic qualities with the search for regularity to more general and interdisciplinary aspect of dynamic principles of transformation (cf. Leikin R., Bernan A., Zaslavsky O. 2000). In fact, the figures that have characteristics in common to our eye from different points of view somehow refer to the concept of invariant to the sameness within change (cf. Thyssen P. and Ceulemans A. (2017); Weyl, H. (1952)).

The search for invariants is inherent in the description of reality, introducing dynamic principles of transformation that give meaning to the modern concept of symmetry in science. In other words, a system is said to possess a symmetry if one can make a change (a transformation) in the system so that, after the change, the thing appears exactly the same (is invariant) as before (cf. Lederman L. M. and Hill C. T. (2000)).

### 1.3. Theoretical framework

For modelling activities, centred around symmetry, we are inspired by Michelsen's model (Michelsen C. 2015). It consists of an educational framework for coordination and mutual interaction between mathematics and science. It is operative by two phases: horizontal connection and vertical structuring. In the horizontal phase, thematic integration is established to connect concept and process skills of mathematics and science.

The horizontal linking is characterized by process of modelling activities in an interdisciplinary context. In the vertical phase, conceptual anchoring of the concepts and process skills from the horizontal phase is used to create languages and symbol systems that allow the pupils to move about logically and analytically within mathematics and science.

According to this model, the teaching learning progression (TLS) is formed both by an incremental vertical way represented by the development of the concept of symmetry and by a transversal way represented by the ability to use the sameness within change to interpret different material and aspects of these contexts. The vertical and horizontal progression occurs from iterative improvements in which pupils develop the habit of using different articulations of ideas to understand the behaviour of and changes in materials.

Once the concepts and skills in the search of invariants are conceptually anchored in the respective subjects, they can evolve in a new interdisciplinary context, as part of a horizontal linkage. In this way we expect to identify pupils' conceptions and the persistence of these conceptions and to focus the attention on difficulties that children might have in mathematizing physical situations.

## 2. Experiment design

A sample of 96 pupils meaning that all fifth grade classes (10 years) of the primary school in Italy participated in the study.

Table 1.

Classes	N° Pupils	Gender	Pre-Course Test	Course	Post-Course Test
V A	16	6 F – 10 M	No	Yes	Yes
V C	19	7 F – 12 M	No	Yes	Yes
V D	20	8 F – 12 M	No	Yes	Yes
V F	20	11 F – 9 M	Yes	Yes	Yes
V G	21	10 F – 11 M	Yes	Yes	Yes

The VF and VG classes, in total 41 pupils, were making up the check group that had to answer the same questionnaire at the beginning and at the end of learning and teaching sequence. The inquiry also concerned all the mathematics teachers, who were in charge of answering pre-course and post-course questionnaires and keeping the logbook of the whole experiment.

### 2.1. Activities and materials

The structure of 5 activities is divided into three stages of 2 hours in sequence. In total the duration is 6 hours where the researcher proposes various activities and the teachers participate in the lessons as observers. The main activity is centered on the task game consisting of closing cardboard boxes, which pupils have to create from the distributed models, and filling out the questionnaire of the task game. This approach implies emphasis on laboratory activities.

Table 2. Series of Activity in TLS.

Activity	Type	Title	Duration
A1	Brainstorming - Writing - Drawing	"If I say the word "symmetry", what are you thinking about?"	2 h
A2	Solving Problems	"Boxes and lids"	1 h
A3	Listening - Watching	"Lesson"	1 h
A4	Task Game in group	"Strange boxes and lids"	2 h
A5	Homework task	"Hunting for symmetries".	/

The questionnaire is made up of four questions of increasing difficulty, linked with the activities carried on during the teaching learning course in order to help the students to propose more accurate and precise answers.

Table 3. Questionnaire.

Question	Type	Aim
Q1	Dichotomous Choice Open Justification	To verify the way the concept of symmetry is perceived in the adopted didactical frame.
Q2	8 Items Text	To evaluate and measure the level of knowledge and ability of the tasks and/or specific scopes of the learning unit.
Q3	Narrative Text	D1: Emotional and affective dimension. D2: Cognitive dimension of learning. D3: Possible presence of a cognitive conflict
Q4	A Task Open Justification	To verify to what extent the students are controlling the skills in a (task) exercise of higher cognitive difficulty.

The logical order of the questions is also aimed at stimulating the students in thinking about the whole personal formative process. By asking them to justify their answers, one follows what appears to be the purpose reached and the skills to be acquired, such as they are indicated in the National Guidelines for the Curriculum of the first cycle of education. The time at disposal for answering is of about 45 minutes and it cannot exceed one hour.

## 3. Methods

### 3.1. Research questions

Several notable studies point out that the concepts and the principles of the application of the modern concept of symmetry can be taught and understood at the high school and early college level (Bertozzi E., Levirini O., Rodriguez M (2014)). Our experimental project tries to answer the following General Research Question (GRQ):

*How can we use symmetry and the search of invariants as bridging concepts in science education for fifth grade pupils?*

These aims lead to the following Specific Research Questions:

SRQ1 *What is the effect of this change of paradigm on the students' understanding and skill development?*

SRQ2 *What is the effect of this change of paradigm on the didactical framework of linking teaching in Mathematics and Physics?*

### 3.2. Findings

In order to answer SRQ1, the analysis of the data shows that the great majority (about 70%) of the students in the sample has chosen the modern concept of symmetry. As for the students of the check group, they too have preferred the modern concept of symmetry (about 80%) in the final questionnaire while having chosen the line symmetry in the initial test (about 83%).

The experiment seems therefore to have a very positive effect in changing the view of symmetry linked to the search for invariance in the geometric transformations. However, these results are of little relevance if one doesn't ask the question how students have interpreted, experienced and assimilated the new concept during the course of the teaching-learning unit. In order to make a qualitative comparison, we give here some relevant examples of answers proposed by the pupils of the VF-VG classes at the beginning and at the end of the cycle of lessons.

Pupil VG17, at the beginning, answers the question Q1<sup>1</sup> in the following way: *"I have chosen the (a) option because it is the most simple and right way to make the Little Prince understand what symmetry is."* In the final questionnaire he offers the following reason of his choice, which at this stage is b: *"I have chosen the (b) option because if one observes his surroundings, one can see that although there are plenty of symmetries, if you turn them it sometimes happens that it is as you wouldn't have."*

Pupil VG19 answers as follows at the beginning: *"I choose (a) because it is clearer than (b)."* She answers at the end *"I choose (b) because if for instance I take a square and I turn it in different ways, the figure remains always the same"*.

Pupil VF16 at the beginning: *"I made this choice (a) because it offers a simple and right explanation that makes the Little Prince understand what symmetry is."* At the final test: *"I have chosen (b) because it is true that there exist so many symmetries, as the rotation, that transform a figure, and this transformed figure is really coincident with the original one."*

In order to answer SRQ2, we have picked out the most frequent keywords, the most recurrent and significant arguments that appear in the justifications in order to classify them in thematic groups according to the aims of the TLS. The expressions "many symmetries", "movements", "transformations", "palindrome", "coincidence with the original" occurring in the answers to the final questionnaire are almost absent in the answers to the initial one.

This result means that the TLS helped the students to take an active part in acquiring a new lexicon and also that they became able to cognitively elaborate, at least to some extent, the new concepts, and to review the concepts they had already acquired. The ability of some pupils to shape the experience can sometimes result in metacognitive skills developing original and unexpected explanations. Very interesting is the answer of VF4, which shows the ability to extend the meaning of symmetry because VF4 interprets the palindromic characteristic of the short film entitled "Palindromic Film" by association of thought with the argument a certain symmetry of time.

### 4. Conclusions

The data analysis shows that the pupils were in the regime of competence for grasping the changed view of symmetry linked to the search for invariance. Nevertheless it does not permit to evaluate how deeply the students have elaborated the contents nor how conscious they were of the whole process. For this reason we plan to carry on with the project in relation with the results of the present work.

<sup>1</sup> Q1) If you were the "Rose" trying to explain symmetry to the "Little Prince", which of the following sentences would you use?

a) *There is symmetry when you can see that, if a line divides a figure in two parts, these parts reflect each other like in a mirror.*

b) *Among the many symmetries that exist there are also the movements that transform a figure so that the resulting figure coincides with the original.*

Write the reason of your choice.

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# AN ASSESSMENT OF CURRICULUM-SPECIFIC LEARNING DIFFICULTIES IN NATURAL SCIENCES WITHIN THE SOUTH AFRICAN CONTEXT

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## Abstract

Some of the identified difficulties across science subjects are universal and have seen education researchers advocate for several reforms in science curricula globally. Internationally and in South Africa, several science concepts within chemistry and physics have been associated with abstraction, representational complexities and the use of scientific terminology. This study reports the findings of curriculum specific difficulties identified by 3rd year science education students at a South African university. The main aim of the study was to assess perceived difficulties of concepts within the natural sciences school curriculum. 120 third year students in a teacher training program from two different cohorts participated in the survey which was analysed descriptively. At the end of the survey period semi-structured interviews were conducted with five percent (n=6) of the participants, to validate survey findings and obtained the rationale for perceived difficulties. Findings from the study indicated that, for subjects within the natural sciences, chemistry and physics topics were perceived to be more difficult than biology and earth science topics. Descriptive analysis of the data indicated that the topics, “chemical reactions, balancing equations, forces, visible light (optics), the law of energy conservation, animals with skeleton and biodiversity”, were considered the most difficult topics within the natural sciences curriculum. Finding from follow-up semi-structured interviews indicated that, factors like abstraction, the language of science and representational complexities were the key reasons for perceived difficulties experienced by students in learning these topics. We concluded that the identification of context-specific difficulties associated with science learning is crucial in developing solutions that address low performances in science and increase interest in science. The implications for these findings and some recommendations for practice and research are also proposed herein.

**Keywords:** *Difficulties, representation, natural sciences, abstraction, scientific language.*

## 1. Introduction and background

Over several decades globally science has been continuously perceived to be among some of the the most difficult subjects to learn for similar reasons across the board (Achor & Agbideye, 2014; Sokrat, Tamani, Moutaabbid & Radid, 2014). Reasons like abstraction, misconceptions associated to the use of language, micro-representational complexities and science teachers’ pedagogical approaches for teaching the subject are among some factors implicated for poor performance in science (Harle and Towns, 2011; Kempa, 1991; Otor & Achor, 2013; Reddy, Visser, Winnaar, Arends, Juan & Prinsloo, 2016). These perceived difficulties constitute some of the reasons science students show less interest in science subjects, low motivation towards science and negative attitudes towards science subjects and science related careers (Reddy, Visser, Winnaar, Arends, Juan & Prinsloo, 2016).

In (1991), Kempa, proposed a rather narrow definition of learning difficulties to mean “situations where a student fails to grasp a concept or ideas as the result of several factors” (kempa, 1991, p. 119). In his review, he indicated that these factors might include the nature of ideas and knowledge possessed by the student, complexity of learning task, communication problems from the use of language, and mismatched instructional approaches.

In science education in particular, strategies of addressing the learning difficulties historically have included, inquiry –based teaching and learning approaches ((Department of Basic Education [DBE], 2011), science by discovery, collaborative and peer learning, multi-media enhanced learning (Lee & Park, 2016; Penn & Ramnarain, 2019a). This study therefore exploited a two-fold research gap in firstly acknowledging that, despite the numerous solutions available for the demystification of science subjects,

not many studies in the South African context have reported topics within the natural sciences grade 7-9 curriculum which are perceived to be difficult from learners' and teachers' perspectives. The second gap touches on the need for concept-specific teaching and learning approaches targeted to address concept-specific learning difficulties. The study seeks to investigate natural sciences topics and concepts that pre-service teachers (here in also referred to as students) consider difficult, as a prerequisite to designing a broader intervention on topic specific learning pedagogical approaches that can address these difficulties. Ultimately, it is worth noting that when teachers perceive a topic as difficult, they may also find it hard to teach this topic to their learners. Hence, this study aimed at assessing pre-service teachers' natural sciences learning difficulties by answering the following research questions;

- To what extent do pre-service natural sciences teachers perceive concepts in the South African natural sciences school curriculum as difficult?
- What are the perceived reasons for learning difficulties in the identified concepts?

## **2. Theoretical underpinnings**

The study is underpinned by cognitive constructivism which focuses on how science concepts are accommodated and assimilated within the mind of a learner (Piaget, 1970). In science concept formation, we recognise that for learning difficulties to be dispelled, there has to be a change of what is held as a preconception about a concepts and a change in what might be making a particular topic to be perceived by the mind as difficult (Sweller, 2015). Obvious therefore to science learning are concepts perceived as difficult due to underlying issues of abstraction, symbolic representation and complexities of scientific language. However, cognitive theorists hold that the learning process in science entails that student are able to maintain long-term schemas of the concepts they learn (Mayer, 2011).

### **2.1. Difficulties associate with science learning**

Some of the problems associated with science education globally at primary and secondary school levels are related to poor performance, lower interest, poor enrolment in science subjects, perceived difficulty, abstraction, misconceptions and negative attitudes towards science subjects (Penn & Ramnarain, 2019a; Reddy, Gastrow, Juan & Roberts, 2013). Despite several global reforms in science curricula the world over, these issues still persist. In the case of pre-service teachers, some of them still hold learning difficulties in science that spanned their secondary school years. In several studies it has been identified that, the pedagogical approaches used for teaching certain concepts make them incomprehensible and relatively complex as they exist in three levels namely, micro, macro and representational or symbolic (Nadelson, Heddy, Jones, Taasobshirazi, & Johnson, 2018; Sokrat et al, 2014).

In chemistry for example, when looking at the reactions of group 1 elements, students, may be asked to interact with common salt which they can touch and feel at the macroscopic level, then at the micro-level where they are informed that a molecule of salt consist of elements sodium and chlorine; Lastly the representational or symbolic level where the same substance can be represented as NaCl. The difficulty in learning concepts of this nature are associated to the fact that students' working memory becomes overloaded when the information is not adequately scaffolded across levels from the tangible to the representational (Penn & Ramnarain, 2019b; Sweller, 2015). Furthermore, some science teachers tend to use all three levels of representation interchangeable in one lesson causing student to be confused and hold misconceptions (Sokrat et al, 2014).

### **2.2. Pedagogical approaches for addressing difficulties in science learning**

Many pedagogical approaches like inquiry-based learning, the use of diverse representational tools like simulations, analogies, 3D illustrations, motion pictures and virtual laboratories are among the strategies proposed for addressing conceptual difficulties in science learning (Nadelson et al, 2018). However, the use of these pedagogical strategies must be consistent and deliberate to address topic and concept-specific learning difficulties in cases where traditional teaching approaches are unable to do so.

## **3. Methodology and design**

The study followed a sequential mixed methods approach (Creswell & Creswell, 2017), whereby quantitative data was initially collected using a modified perceived difficult questionnaire followed by qualitative data through the use of semi-structured interviews. The different aspects of the methodological approach are covered in the sections below.

### 3.1. The sample

The sample for this study was purposively selected to include one hundred and twenty (n=120) natural sciences pre-services teachers at the faculty of education at a South African University. The rationale for focusing on these students and the natural sciences was to ensure that difficulties across school science subjects including biology, chemistry, physics and earth science could be identified.

### 3.2. Data collection and analysis

Data collection was conducted by means of the perceived difficulty in natural sciences learning questionnaire (PDNSL), adapted from the Rating Scale on Student Perceived Difficult Concepts in Basic Science (RSSPDCBS) (Achor & Agbidye, 2014). The PDNSL questionnaire was reconstructed to cover 35 concepts/topics within the South African natural sciences grade 7-9 curriculum. The adapted instrument was first piloted by the researchers with students at another higher institution of learning and the internal consistency measured as Cronbach's alpha. An  $\alpha = 0.85$  was reached for all of the 35 items on the instrument. The responses on items ranged from very difficult (VD = 4), difficult (D = 3), slightly difficult (SD = 2) to not difficult (ND = 1). The descriptive means for survey items represented perceived difficulty when they ranged from 3.00-4.00. Follow-up semi-structured interviews were conducted with 5% (n=6) of the participants post analysis of the PDNSL questionnaire, with the aim of establishing students' rationale for perceived difficulties.

Collected survey data was then captured and analysed using descriptive statistics on SPSS 25 to show a holistic pattern of concepts pre-service teachers considered difficult within natural sciences grade 7-9 curriculum. Transcribed textual data from semi-structured interviews were also analysed with the aid of Atlas Ti, version 8 following the principles of thematic content analysis to generate themes.

## 4. Results

Table 1 below shows the descriptive means of perceived difficult natural sciences concepts including only concepts where the mean was above 3.00.

Table 1. Perceived difficult concepts in grade 7-9 natural sciences curriculum.

Concept	Strand in the N/S CAPS	Mean
Chemical reactions	Matter and material	3.81
Balancing chemical equations	Matter and material	3.58
Forces	Energy and change	3.45
Visible light (optics),	Energy and change	3.38
The law of energy conservation,	Energy and change	3.35
Animals with skeleton	Life and Living	3.15
Biodiversity	Life and Living	3.11
Beyond the solar system	Earth and Beyond	3.09

\*\* N/S CAPS= Natural Sciences Curriculum and Assessment Policy Statement (CAPS).

The table above presents the related areas in the natural sciences school curriculum where pre-service teachers consider concepts as difficult, in an attempt to answer the first research question. The strand matter and material is a chemistry strand of the curriculum while the strand energy and change represents the physics content within the CAPS natural sciences curriculum. The topics in these two strands (chemistry and physics) were perceived to be more difficult as they registered difficulty means between  $M = 3.35-3.81$  than topics in the biology strand (Life and living) and the earth science strand (Earth and beyond) where difficulty means ranged between  $M = 3.09-3.15$ . These results provided a pattern for the researchers to design questions that further probe participants' rationales for perceived difficulties.

In answering the second research, findings from thematic content analysis of semi-structured interviews revealed that, factors like inherent abstraction, the language of science and representational issues were key reasons for perceived difficulties experienced by students in learning these topics. The participants also indicated that several complexities to learning concepts were related to the pedagogical approaches used to teach the concepts. Three themes generated include:

- Concepts are inherently abstract to learn due to lack of visualisation.
- Scientific language is difficult to grasp in some concepts.
- Symbolic representation is complex and needs to be scaffolded.

The participants also highlighted that pedagogical approaches were related to these identified themes in several ways. It was then clear from the interpretivist views of the researchers that, the nature of every scientific concept must be considered in several dimensions when planning the pedagogical strategies for teaching the concept.

## 5. Discussions

The findings from this study present a baseline understanding of difficult concepts within the South African natural sciences CAPS curriculum. These findings suggest that learning difficulties in science are related to the nature of particular concepts and how they are taught. (Achor & Agbidye, 2014). The findings are concurrent with findings from other difficulty studies which have implicated factors like abstraction, representation, visualisation and pedagogy for some of the barriers to science concept formation (Achor & Agbidye, 2014; Sokrat, Tamani, Moutaabbid & Radid, 2014). Unique to this study is that, these findings provide a pre-requisite dimension for the development of concept-specific learning interventions that address difficulties in learning specific natural sciences concepts. The perceptions of participant also indicate that a “one size fit all” solutions cannot be adequate in addressing the problems and difficulties associated to science learning.

## 6. Conclusion and recommendations

Based on the findings of this study we concluded that the identification of concept-specific difficulties associated with different science subjects is crucial in developing solutions that address low performances in science and increase interest in science. The implications for teachers and pedagogues across all levels are that, the manner in which concepts are taught to students has a direct relationship to the way in which they learn and retain understandings of these concepts. Several studies have revealed that multiple representations, inquiry-based learning and activity –based learning could provide some of the much needed improvements in science achievement. However, based on the findings of this current study we conclude that these proposed pedagogical approaches must be intentionally planned to address the inherent factors that make concepts difficult to grasp. Some recommendations for practice and research are targeted at investigating how specific learning interventions could be used to address concept-specific difficulties in natural sciences learning; An investigation of the relationship between perceived difficulties in science learning and achievement in science for specific concepts and an analysis of the strategies that in-service teachers use to address concept difficulties as they teach natural sciences within the school curriculum.

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# VISUAL LITERACY FOR THE 21<sup>ST</sup> CENTURY: THE REQUIRED ABILITY TO UNDERSTAND THE POWER OF MODERN IMAGES

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## Abstract

The presentation elaborates on the theoretical concept of visual literacy, which is applied to the contemporary digital age. It gives special attention to developing and cultivating the visual literacy of children who, through television and social networks, in particular, YouTube (video) and Instagram (pictures), „consume” today mainly picture messages. The ability of children to decode this information correctly depends on how they can understand the true meaning of the information. We have studied two generations of young people – Millennials (Born 1981–1996) and Post-Millennials (Born 1997 – Present). They are experiencing technological advances in the digital world like no generations before but at the same time, they show differences in how much time they spend in digital space and their preference for using social networks. For example, Post-Millennials – unlike Millennials – prefer internet access through their mobile phones rather than a PC/laptop, further Instagram over Facebook, suggesting that they are more likely to view images and videos than textual information. We explain this new preference to share photographs and videos from mobile devices, which places it among new visual galleries the content of which is perceived mainly through pictorial messages. The ability of children to decode this information correctly depends on how they can understand the true meaning of the information. Although the concept of visual literacy is broader, in my presentation I will address the strategies and techniques of teaching the reception and perception of visual information of children of younger school age.

**Keywords:** *Visual literacy, post-millennials, social networks, primary education.*

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## 1. Introduction

The dominance of images and the messages they carry has never been as obvious as it is now, in the 21<sup>st</sup> century. An image, in various forms, still more and more penetrates every single sphere of life of each human being and becomes its inseparable and inevitable part. Photographs, films, television, as they had dominated the previous century, achieved a new platform of visibility. The rise of the Internet and social networks opened a new dimension of media and multimedia images. YouTube, Facebook, WhatsApp, Pinterest, Snapchat, Instagram and other channels of social networks produce thousands of videos and information in the form of images every hour. For illustration: YouTube has about 2 billion users, Facebook has 2.3 billion users, Instagram a billion users (Chaffey, D., 2019). Young generation, including children of younger school age, lives in the digital era and takes all new communication inventions for granted. Social networks thus affect the lives of children and young people and through interaction with other peers they influence their perception, opinions and attitudes to values. According to statistics, young people have significant representation on the social media: there are more than 110 million users at the age of 13 – 17 years on Facebook and almost 53 million on Instagram (Kemp, S., 2019). Considering that most of the information has pictorial or multimedia character, new skills come to the fore.

## 2. Literature review

The term of visual literacy appears in scientific and technical literature approximately from the half of the 20th century. Within the course of the period, the visual literacy is defined in both narrow and broad sense; however, its definition often changes. R. Pettersson says that “visual literacy is the learnt capacity to exactly interpret visual messages and to create such messages. The interpretation and capacity to create could be characterised similarly as reading and writing of hard copy texts” (Pettersson, 1993, p. 62). “The visual literacy relates to a great portion of attained abilities, like the ability to understand (read) and use (write) pictures, as well as think and learn” (Avgerinou, 2001a, p. 26). It is unambiguously implied by the study of foreign expert literature J. Clark-Baca (1990), J. A. Hortin (1994, pp. 5-29), etc. that there was hitherto no agreement about the unified definition of the term of visual literacy that would

be accepted by the majority of renowned theoreticians – researchers. In general, there is just the agreement about the main aspects expressing it: visual perception, visual thinking, visual language, visual communication and the attainment of new visual abilities by learning. We agree with R. A. Bradenom (1996, pp. 9-83), J. A. Hortinom, J. Clark-Bacom and others in their opinion that it is necessary to accept visual thinking, visual perception, visual communication and the attainment of visual abilities by learning as the fundamental concepts of visual literacy.

All we can see around us is an image. Thanks to our vision we can perceive up to 90 percent of information about the world. Surveys prove that the non-text (pictorial) information is read 90-thousand times faster than the text one. When looking at a certain object, we can see it at first and on the basis of this we can describe it. When we are able to describe it, then we can analyse it and subsequently interpret it. In the final stage, we can create meanings on the basis of this perception.

Visual literacy is not a skill in the common sense of the word that would be used by a human as a tool. It is the form of critical thinking increasing our intellectual capacity and allowing us to:

- Interpret the contents of the images
- Investigate the social impact of the images
- Possess the ability of internal visualisation
- Discuss about their meanings with a target group (to characterise who they are meant for)
- Visually communicate
- Read and interpret images

### 3. Methodology

In this contribution we focus on visual literacy of primary school children, because it is an important part of functional literacy of an individual and at the same time, it is one of the basic prerequisites of competences for the digital century. Our research focuses on identification of the preferences and usage of social networks by primary school children, the generation of Post-Millennials (Born 1997-Present), in all regions of Slovakia. To achieve our objective, we use a combination of research tools: our research is of qualitative-quantitative character. We implement it in the form of electronic questionnaires – web questionnaire, created in the Google form. When comparing two generations of pupils - Millennials (Born 1981-1996) and Post-Millennials (Born 1997-Present), we also use our older research implemented from 2013 to 2014. Altogether, in both stages, the target groups consisted of 588 children. The collected data are processed in a quantitative way, numerically, in percentages and graphically. Real personal identification of a child with each media is used in the qualitative research, more specifically in personal interviews with 56 pupils (8 pupils from each Slovak region). Their answers are interpreted by the quantitative method. As a complementary method we use desk research, in order to analyse the data from other Slovak and foreign researches. This data is used for comparative purposes of our collected data.

### 4. Findings

We have studied two generations of young people – Millennials (Born 1981-1996) and Post-Millennials (Born 1997-Present). They are experiencing technological advances in the digital world like no generations before but at the same time, they show differences in how much time they spend in digital space and their preferences for using social networks. For example, Post-Millennials – unlike Millennials – prefer internet access through their mobile phones rather than a PC/laptop, further Instagram over Facebook, suggesting that they are more likely to view images and videos than textual information. We explain this new preference to share photographs and videos from mobile devices, which places it among new visual galleries the content of which is perceived mainly through pictorial messages (figure 1, 2).

Figure 1. Daily internet use: the pupils in the primary school.

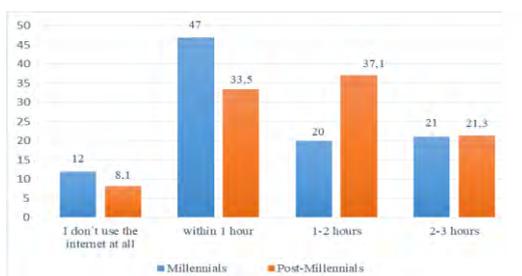
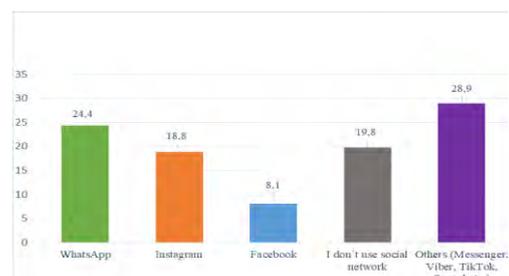


Figure 2. The popularity of social networks Post-Millennials.



## 5. Discussion

### 5.1. What makes social networks so attractive to young people

The ability of children to decode visual information correctly depends on how they can understand the true meaning of the information. Although the concept of visual literacy is broader, in my presentation I will address the strategies and techniques of teaching the reception and perception of visual information of children of younger school age.

Our research shows that in general, social networks are very attractive to primary school pupils, especially by enabling them to communicate fast and comfortably, to share not only texts, but also photographs and videos. It is appreciated especially by the Post-Millennials, who prefer social networks. Other examples of frequently searched and shared items are short, funny videos and photographs. What information they deliver to children? On this question, the young respondents most often responded briefly: they are funny and they have a good fun watching them. Unfortunately, only about 20% of the respondents seek deeper meaning in images. There is a strong dominance of superficial perception of pictorial information, without any deeper context, contemplation or critical thinking.

We can state that today we can no longer neglect the visual literacy – the ability to see “behind the image” and to seek what is not obvious to the common human perception. The possible benefit and impact of reflective view is the development of the ability to meaningfully analyse and interpret images. Learning visual literacy at primary education is justified, because children are since early age confronted with the demand to understand information in visual form. They must perceive this information critically, think about them, because they represent the current society and we need to teach our children since this early age to look at the world more sensitively and to be more perceptive (Gangwey, 2011). “Teaching pupils to understand and critically evaluate constructs is the substantial task of future and current teachers, pedagogues, educators” (Aguirre, In McMaster, 2015).

### 5.2. How to perceive pictorial information in context

Our research clearly shows that primary school pupils already have sufficient skills to operate digital media, but they are not always, or, better said, almost never, able to interpret the images, visual texts, schemes and graphs and to communicate their comprehension. We can call it insufficient ability to “read” with comprehension. We provide one of possible examples in the school environment of how to perceive pictorial information in context (figure 3a,b).

*Figure 3a,b. Perception of pictorial information in context.*

*Cyclist Peter Sagan is one of the most popular sportsmen in Slovakia and he is also very popular around the world – the three-time world champion, the winner of several stages of the Tour de France. Pupils know him very well from media, cycling is after all one of their favourite free-time activities. But can they read more from the pictures than just whether he is winning or losing?*



We have chosen two typical pictures of cycling that illustrate victories and falls, effort and toil, successes and failures. What can pupils read from the photographs?

One of several options – the method of asking questions – helps pupils to better delve into the situation depicted in the photograph and to “read” the image with comprehension:

- Describe in your own words what do you see.
- What emotions do you associate with this picture?
- Can you tell what the point of its author was?
- Who and what is in the picture? (What is the picture about?)
- What symbols are used in this picture? (Symbols)
- What do they represent?
- Which geometric shapes can you identify in the picture? Do they repeat? (Shapes)
- Do they manifest order or chaos?
- etc.

Gradual (critical) uncovering and comprehension of stories and visualised messages finally leads to understanding of facts contained in visuals and visual data. Pupils learn to understand the visual presentation of knowledge, to draw conclusions and to inform others on their findings and knowledge.

## 6. Conclusion and implications

According to the higher mentioned information and considering the mental and intellectual capacity of primary school pupils, we think it is important to implement new strategies into the educational process that will support the development of visual literacy, i.e. the ability to see and understand the basic elements of visual design, visual language, techniques and media, to understand the representative, explaining, abstract and symbolic images. It is also important to realise the affective, psychological and cognitive impacts in the process of perceiving the visuals, and also the ability to create and to communicate.

Our research findings prove that today, children of younger school age have much better access to any images and other visual materials or texts with informative value. Using this potential for analysis and interpretation of images is one of the most stimulating challenges the current and future teachers will have to face. Thus it is important to equip young perceivers with competences that will enable them to:

- Process information from visuals that are not easy to find
- Prove detailed understanding of an image
- To decide which information is important and which is not. Such perceivers are able to critically evaluate, formulate hypotheses based on specific knowledge and to respond to unexpected situations.
- A higher competence is an analysis of an image, i.e. the perceiver should not only identify the content of the visual, but he/she should be able to uncover such qualities of the image that create the meaning, i.e. to realise the means of expression that create the given content.
- The highest form of visual competence is interpretation of a visual and its evaluation. In this phase, the perceiver should be able to assess the visual as a whole.
- Visual literacy is a complex set of skills through which it is possible to develop the ability of a person to learn.

For children of younger school age to work effectively in today's society, it is not enough to emphasize just the effective reading texts with comprehension, to focus on written words. In the 21<sup>st</sup> century, the ability to understand digital, visual and acoustic media is similarly important as the ability to read and write. The visual literacy is just as desired as text literacy (Bleed, 2005, pg. 3). Visually literate young people are perceptive and able to navigate not only on the "visually rich web, social networks saturated with photographs, videos,..." (Metros, 2008, pg. 102), but also their "verbal competences, self-expression and arrangement of ideas, motivation and commitment in other educational areas" (Flynt & Brozo, 2010) improve. Research findings prove that acquired visual literacy has many other benefits:

- Visual information is easier to remember
- Visual information is "transferred" faster
- It helps pupils to communicate with the outside world
- It enriches the comprehension
- It increases pleasure, joy
- It increases the number of educated image readers
- It supports pupils from minorities.

Visual literacy is thus a versatile phenomenon and does not designate just a set of mechanically learnt skills to identify the function of an icon in computer or to understand the map of the underground just through sketches and pictograms. Visually literate people are able not only to create relevancies from everything they see, but they also find meaning in everything they perceive. They use reading and writing beyond the elementary literacy, i.e. they control the process of transmitting and receiving messages through images (Šupšáková, 2016). The art of seeing and understanding the visual details, the ability to read and write visual texts and also to understand the meaning of texts and images (Goularte, 2010) is captured by the term visual literacy.

It is essential to implement visual literacy into primary education, because it develops not only the visual information on encyclopaedic level, but also deeper, immanent values based on meanings, relationships, analyses, experiences. Instead of on "good eye", education should focus on "curious eye" that catches things not yet understood and articulated. It is obvious that through the development of "reading" images as subvention to the development of functional literacy in the context of primary education we constitute strong basis for the development of critical thinking that will later be useful for children of younger school age in real life. Thus the task of the school is to lead pupils to be able to resist the spiritual manipulation not by passive reception of images, but by taking an "educated and intentional stand of indifference towards everything that does not deserve their attention" (In Šupšáková, 2004, pg. 76).

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## A CLOUD IN A CUPBOARD: HOW TO TEACH MODERN TECHNOLOGIES IN A RESOURCE-CONSTRAINED ENVIRONMENT

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### Abstract

It is highly desirable to provide our computer science and software engineering students with hands-on exposure to currently industry techniques and technologies. One area of extreme growth and skills shortage is cloud computing which led to a curriculum redesign and a new module to teach these skills to final year students. Cloud computing products are available from a number of vendors, but their academic programmes often leave much to be desired, with limited credits and features. In the resource-constrained university sector simply buying vendor credits for students would be expensive but also wasteful as there is no capital investment. In an attempt to provide hands-on experience with the latest technologies an in-house “cloud in a cupboard” was designed and created at Queen’s University Belfast. This took advantage of the wide range of free open-source software systems which underpin modern cloud vendors and, for very little cost thanks to re-purposed equipment, was able to support a large final-year module and several undergraduate dissertation projects successfully. Student feedback was very positive, and plans continue to grow this system further to support the current functionality and add more in the coming years.

**Keywords:** *Cloud, innovation, resources, teaching.*

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### 1. Introduction

The area of cloud computing has seen impressive growth during the past decade. Cloud computing is largely seen as “using someone else’s computer” i.e. rather than running your own computer programs on your own (expensive) equipment, you write them then upload them “to the cloud”. The actual running of the programs is done by someone else (such as Amazon Web Services or Google Cloud Platform) and you pay a utility cost i.e. pay-as-you-go for as much computing power as you need. Consequently, this is often referred to as a “utility computing” model.

This paradigm is widely used in modern business practice and consequently skills in using cloud are much in demand by employers, something computer science schools have to take on board as industry alignment is critical to including the skills successful graduates will need (Plice and Reining, 2007; Benamati et al, 2010). Following industry consultation and as part of our attempt to teach modern techniques including cloud a new module was defined for 2019/20 which would cover a wide range of cloud techniques and technologies.

Learners learn in different ways (Schmeck, 2013) including learning by doing i.e. kinesthetic learning (Ayala et al, 2013). In an ideal world we could teach technologies using the actual tools supplied by the vendors i.e. students could have hands-on experience with the large cloud service providers gaining first hand experiences of exactly the same environments they would operate in once graduated.

While most providers do offer some form of educational grant or access our experience was far from straightforward, with students being rejected from academic programmes despite providing ID, or just running out of provided credit before completing their work. The option of just buying service time from these providers was simply not available in the resource constrained world of UK higher education, something some providers did not seem to understand being US-centric in their education where financial resources are more readily available. Another restriction on buying service was the transient nature of the spend, at the end of the year the students would move on but no long-term investment would have been made in the university facilities.

However, many of the technologies used are actually freely available, mostly built on free open-source software. The vendors charge for use of their computing resources and storage but the actual technologies and stacks can be installed by anyone. A plan was therefore formed to build the “cloud in a cupboard”, a state-of-the-art cloud computing lab available on campus facilitating hands-on learning but using resources which represented an investment rather than an ongoing cost.

## 2. Design of the cloud in a cupboard

From an initial overview of the curriculum and learning outcomes of the new cloud computing module a set of functional requirements were defined:

- **Latest industry practice** – the latest industry practice in cloud deployment should be implemented as far as possible. Given the focus of the module and the widespread use of containers and container orchestrations a working implementation of Kubernetes was considered the minimum viable product. This also provides full freedom in terms of language and deployment choices for the learners.
- **Open access architecture** – learners should be free to interact with the resources directly in user interfaces or through APIs to allow open expansion and access from third-party tools such as Terraform.
- **Shell access** – learners must be provided remote Unix shell access to allow for command-line use and execution of tools within the environment.
- **Pipelines** – learners must have access to pipeline systems to allow for continuous integration (CI) and continuous deployment (CD) within a source-code management (SCM) context. The pipelines must be integrable with the execution environment to allow seamless testing and deployment should the learner wish to implement this.

Having defined the functional requirements of the overall system (what we must deliver for the learners) a set of further non-functional requirements were created representing the environment and constraints:

- **Secure** – the system should provide a minimal security risk to the corporate network.
- **Reuse of hardware** – where possible the system should be able to reuse existing or “gifted” hardware to fulfil its function allowing minimal capital cost.
- **Immediate creation pending further investment** – given the funding and budgetary cycles of the university the system must be able to deliver a minimum viable product using only reused/repurposed hardware in the immediate term.
- **Robust** – as a critical component to a final year module the system must be robust enough to handle any minor issues without compromising performance and the ability of learners to do and submit their work.
- **Scalable** – the system must have the capacity to scale in future should this be required.
- **Evolvable** – the system should have the general design characteristics to allow the evolution of specific technology platforms deployed upon it.

## 3. System implementation

Before moving to implementation, a period of experimentation and up-skilling was required. During this time academic staff experimented with a variety of specific technologies, learning the systems from both a consumer (aka learner) and administrative perspective to support the live implementation. The decision was made the best fundamental architecture to meet the requirements, especially evolutionary needs, would be a semi-virtualised infrastructure allowing maximum flexibility.

During summer 2019 the system was built around a hardware cluster named the Hal cluster. Hal would provide a number of hardware nodes which initially were re-purposed from other projects with some providing generic virtualised platforms (able to run any specific technology) and others dedicated hardware “compute nodes” to allow learners to deploy their software within the system. The support and assistance of the school-based systems administration and support staff was pivotal during this time. Ultimately the system went live in late summer 2019 with three hardware nodes (hal01-03) gaining six more nodes while it was live (see Table 1).

Deployment was in time to deliver a minimal viable product ready for cloud computing teaching when the cohort started in September 2019.

Table 1. Hal Cluster Hardware Nodes.

Node	Threads	RAM (GB)	Storage (TB)	Role	Added
hal01	16	64	16	Virtualisation Host	Summer 2019
hal02	16	64	12	Virtualisation Host	Summer 2019
hal03	16	64	12	Kubernetes Compute Node	Summer 2019
hal04	8	16	2	Kubernetes Compute Node / CI Runner	October 2019
hal05	8	16	2	Kubernetes Compute Node / CI Runner	October 2019
hal06	8	16	2	Kubernetes Compute Node / CI Runner	October 2019
hal07	8	16	2	Kubernetes Compute Node / CI Runner	October 2019
hal08	32	64	12	Spare	January 2020
hal09	32	64	12	Spare	January 2020

Table 2. Hal Cluster Primary Virtual Guests.

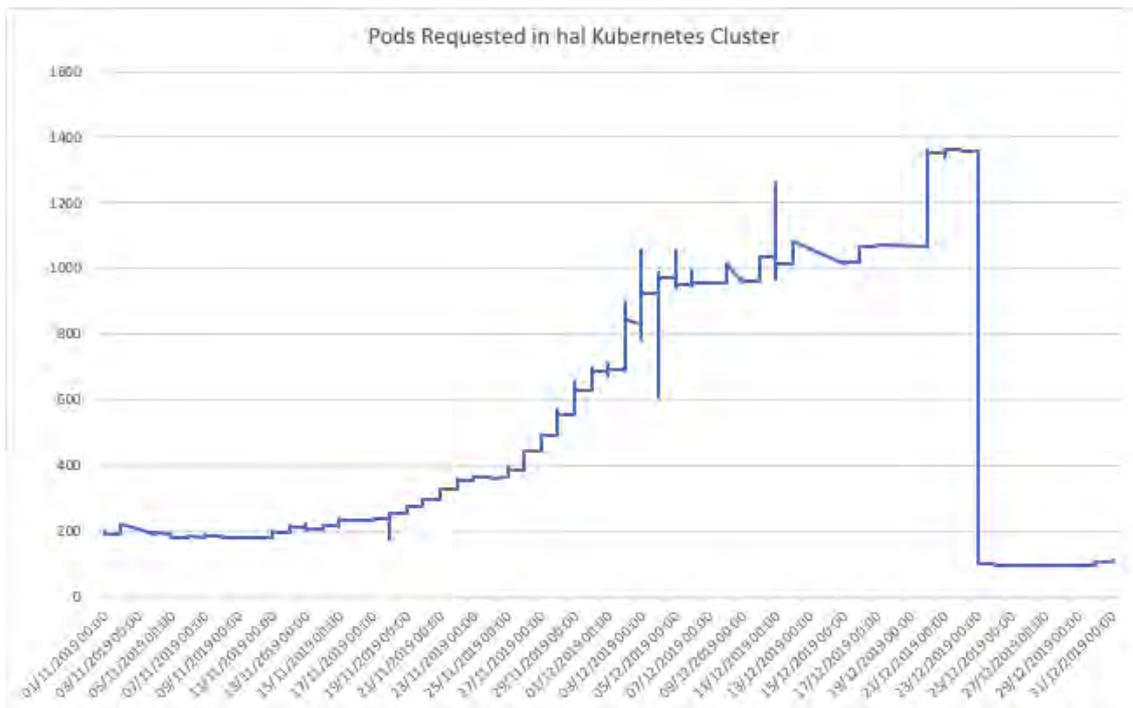
Node ID	Purpose/Role
Gitlab	Gitlab SCM Server
Login	Shell Server
Kluster-worker01	Kubernetes Compute Node
Kluster-worker02	Kubernetes Compute Node
Kluster-worker03	Kubernetes Compute Node
Kluster-worker04	Kubernetes Compute Node
Kluster-master	Kubernetes Master Controller
Rancher	Rancher Management Node
Gitlab-runner-01	Gitlab runner with shell+docker access
Gitlab-runner-02	Gitlab runner with shell+docker access

#### 4. System operation for teaching

The Hal cluster and its supported cloud infrastructure operated to support teaching in semester 1 (September – December), over the Christmas holidays and into semester 2 (January – April), for the taught cloud computing module. This module was a final year 20 CAT (1/6 of final year credits) module with a report and two project pieces of assessed project work. As would be expected, demand on the system fluctuated and reached a peak during the testing and delivery of a piece of assessment in which the learners were required to use the cluster.

The demand on the system in terms of pods (container units) requested and fulfilled for use by learners can be seen in Figure 1. At peak the system operated beyond the original planned capacity leading to some node failures which were, thanks to the nature of Kubernetes and the distributed model of the Hal cluster, largely mitigated against until nodes could be brought back online.

Figure 1. Kubernetes Cluster Pod Requests from November to December 2019 Inclusive.



After the conclusion of the taught module for which the Hal cluster was specifically provisioned, a number of enquiries were made about using the cluster in final-year dissertation projects. As this was an added use of the cluster every effort was made to support these projects including some custom configuration and provisioning of specific environments for project work. In many cases the learners were able to use academic accounts on cloud vendors but were deeply concerned as to the potential to run out of credit at a critical phase, a concern which wouldn't be present in using the Hal cluster which was provided free to them. These projects were all completed successfully by April 2020.

## 5. Conclusions, lessons learnt, and future work

In this paper we have briefly introduced our “cloud in a cupboard”, an attempt to facilitate hands-on learning of latest industry technologies in a highly resource-constrained environment where we see the systems as an investment not just a written-off cost. The approach was highly successful in both the hands-on teaching of cloud computing in a taught module and also to support final-year projects allowing a flexible industry-standard system which learners could use to develop their systems without external financial constraints.

Providing hands-on experience is essential in training the developers of tomorrow as these skills are specifically identified by industry as essential in the workplace. Graduates of this course will be able to make immediate use of standard technologies such as containers and Kubernetes and hit the ground running once employed.

Feedback from taught students was generally extremely positive with many expressing specifically their appreciation of the technical infrastructure provided. Feedback from project students who had used the cluster also validated the approach.

In the process of building and operating the systems not everything went smoothly which allowed for reflective feedback and lessons to learnt by staff. Primarily robust testing of systems is required, the loads that learners put onto a system is likely to be beyond what was initially planned for and their demand patterns outside of the tested scope. Ideally a group of learners should be found to “battle test” the system by trying to deploy and use as many features as possible in a short period of time. Staffing and support is another lesson learnt, in this case a single staff member was responsible for the setting up and administration of the cluster. Although fine on this occasion having one member of staff as a single point of failure on such an important resource was far from ideal.

Following completion of most of the teaching a further two funded-for-project nodes arrived brand new (hal08, hal09). These are currently “spare” nodes ready to be swapped into any critical function. The addition in summer 2020 of more repurposed nodes and storage will allow a more flexible automatically-balancing cluster to be created, dividing the same load over roughly 2.5x the compute power available in academic year 2019/20. The intention is to run for one more academic year with the same configuration but with much more power available avoiding any bottlenecks and slowdowns, then consider a bi-yearly refresh to latest industry technology.

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## **EARLY YEAR TEACHERS' UNDERSTANDING AND IMPLEMENTATION OF SCIENCE PROCESS SKILLS**

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### **Abstract**

The quality of South African learners' performance in science and mathematics continues to remain poor as reflected in National and International assessments. However, it is believed that learners' poor performance in these subjects could be attributed to their weak and/or disproportional exposure to science instructions during early childhood development. The research objective of this study was to explore teachers' understanding and implementation of science process skills (SPS) in the early years. Accordingly, data were collected using qualitative research design of one on one interviews and lesson observations with eight Grade R teachers that were purposively and conveniently selected. The result showed that though participants believe it is important to start teaching science to children in the early years, most of them don't have adequate understanding of the science concepts in the Grade R syllabus. Though teachers engaged learners in activities that allowed them to observe, describe, measure, classify, predict and communicate ideas during the observed lessons, most of the teachers were unable to describe SPS. However, six of the teachers attributed their ability to demonstrate the process activities to years of experience and indicated that the teaching qualification they have did not accurately prepare them to teach science in the early years. In addition, teachers expressed low level of confidence and competency in planning and demonstrating science activities in early years.

**Keywords:** *Early childhood education, early year teachers, early years science, science process skills.*

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### **1. Introduction**

Science and Technology pervades nearly every aspect of everyday life and lays claim to addressing existing and future economic, environmental, education and associated global problems. The Next Generation Science Standards (NGSS) of the United States suggests that the key goals of science education are to enable learners to investigate, feed their curiosity, improve their understanding of scientific practices, promote their cognitive and analytical skills in understanding the natural world (National Research Council (NRC), 2012). To accomplish this aim, teachers must focus on teaching learners how to think within a scientific framework. In this regard, many countries have adopted common standards for the improvement of science education and learning outcome in order to compete in the global economy (DeBoer, 2011). Despite the renewed efforts to set high standards for learning outcomes in science education, South Africa continues to suffer from challenges associated with learners' low level of confidence in their ability to solve science problems. This is evident in international studies like TIMSS where South African learners performed poorly in science and mathematics as compared to other countries (Reddy, Visser, Winnaar, Arends, Juan, Prinsloo, & Isdale, 2016). Furthermore, South Africa has a history of progressing learners from one grade to the other with a pass mark of 30% in science and mathematics (Van Staden, & Motsamai, 2017), this in turn influences the quality of learners' performance at National assessments (Seo, 2018).

Research attributes learners' poor confidence in solving science problems to weak nurturing and development of scientific knowledge and skills during early childhood development (Letaba, 2017). Worth (2010) establishes the increasing awareness and belief that science is an important area for developing effective learning skills and attitudes in early years. In this regard, the National Science Teachers Association (NSTA) of the United States affirms that teaching and learning science in the early years lays the foundation for fostering the interest, enthusiasm and trust of learners in solving problems as they advance in their education and career lives (NSTA, 2014). Nonetheless, many South African learners are not exposed to science activities in the early years, because of the confining of science topics within Life Skills' subject in the foundation phase curriculum (Minnaar, & Naude, 2016). Thus, many early year

teachers tend to limit children chances to study science and many children tend to use their childlike interpretations of scientific phenomena, since they are not exposed to activities that allow them to objectively learn, see and understand their environment (Minnaar, & Naude, 2016). Although the importance of science education in early years is been globally stressed by researchers and educators (Worth, 2010), its practice seems to be limited and problematic within the South African context. Hence, this study explored teachers' perspectives of science teaching and science process skills (SPS) in the early years. More specifically, the following research question guided this study:

1. What are teachers' understanding and implementation of science process skills in early years classroom?
2. What are the perceived factors that influences teachers understanding and implementation of SPS in early years classroom?

## 2. Theoretical framework

“Science is both a body of knowledge that represents current understanding of natural systems and the process whereby that body of knowledge has been established and is continually extended, refined, and revised. Both elements are essential: one cannot make progress in science without an understanding of both. Likewise, in learning science one must come to understand both the body of knowledge and the process by which this knowledge is established, extended, refined, and revised” (Duschl, Schweingruber, & Shouse, 2007, p. 26). Thus, Irvanto, Rohaeti, Widjajanti & Suyanta (2017:1) described SPS as “cognitive and psychomotor skills” that children use in exploring and “solving problem” in the world around them. SPS includes indicators such as observing, measuring, sorting/classifying, inferring and predicting, experimenting, and communicating information, controlling variables, and representing data (Worth, 2010; Irvanto et al., 2017). This implies that SPS is a vital outcome in science education across all levels of learning and it is required as a useful skill in enhancing learners critical thinking (Irvanto et al., 2017). Since these process skills are important in supporting children's basic abilities for learning science, mathematics, and language literacy in early childhood (Worth, 2010), teacher's awareness and understanding of science content in the curriculum, and science processes becomes very crucial to the development of SPS in young children. With regards to this study, teacher's understanding and implementation of science in early years is explored based on the development of teaching/play activities using SPS indicators. It is assumed that classroom implementation of these processes would stimulate teachers' autonomous recognition of relationship with the children.

## 3. Method

A qualitative research paradigm (Creswell, & Creswell, 2017) was adopted, as the study aimed at investigating the understanding and implementation of science process skills (SPS) by teachers in the early years. Eight Grade R teachers from four different schools in an inner city of South Africa were involved in this study. The rationale for using a multiple case design was to inform the case by generating possible outcomes for predetermined reasons on how teacher's interpretation of SPS relate to the nature of science teaching and learning in early childhood classrooms. The mean age of participants was 39 years with the youngest being 23 and the oldest being 60. All eight participants were females with teaching experience ranging from two to twenty years as shown in Table 1. The sampled schools have inadequately resourced science corners. Two methods of data collection namely: one on one interviews and lesson observations was used. The different method of data collected employed in this study provided researchers the ability to evaluate and examine observed lessons and then modify the teacher interview procedure to provide more clarity and follow up on important responses and findings (Corbin & Strauss, 2015). Data collected from participants were analysed using content analysis of direct, selective, and condensed codes (Erlingsson & Brysiewicz, 2017).

Table 1. Biographic Information of participants.

School	Participants (Teacher)	Age	Qualification	Teaching experience (Years)
S1	T1	27	National Diploma in Educare (N6)	3
	T2	23	Bachelor of Education (Early Childhood Development).	2
S2	T3	43	Diploma in Human Resource Management	9
	T4	35	National Diploma in Educare (N4)	6
S3	T5	32	Diploma in Grade R teaching	9
	T6	42	National certificate	6
S4	T7	53	National Diploma in Educare (N6)	20
	T8	60	Diploma in Primary education	7 years in South Africa 18 years in Zambia

## 4. Findings

To explore teachers' perspectives of SPS in early years, it is believed that teacher's awareness on the importance of teaching science in early years could influence their understanding and implementation of SPS in Grade R classroom. The discussion reflects around two key ideas based on patterns arising from data analysis. These are the teachers' awareness of science concepts in the Grade R syllabus which included their understanding of SPS, and challenges influencing teachers' implementation of SPS.

### 4.1. Teachers' awareness of science concepts in the grade R syllabus

It was evident from the interpretation of interview responses that all participants believe that teaching science in the early years plays a significant role in preparing children for future challenges in the academic endeavour. This was obvious from their answers to question that discussed explored teachers' awareness about the value of teaching science in early years and how they teach science in their classrooms. According to their responses, T5 believes that teaching science at a younger age "brings interest into the young child because they learn to experience science more and more". Here the participants focused on fostering learners interest in science at an early age. Furthermore, T5's perception to science teaching in early years was similar to those of T7 and T8, as they also indicated that exposing children to science in early years develops their interest in the subject and help to overcome the common perception of science as a difficult subject among South African learners. T2 mentioned that teaching science in early childhood exposes children to basic information required for understanding their environment. However, further explanation on how participants teach science in their classrooms revealed that five of the teachers do not have adequate understanding of science concepts that are included in the life skills subject taught in the Grade R curriculum. For example, T1 indicated that if children are taught science in early childhood, "they get the opportunity and foundation on how to explore things and when they grow it becomes part of them, but eerm, I don't really teach science to these children. Though sometimes I just take them outside to show them some plants and let them feel or see it". Here, T1 seems not to be sure if teaching plants was part of science even though she engages children in activities related to growing plants.

**4.1.1. Teachers understanding of science process skills.** Since science process skills are regarded as important outcomes in science education. Thus, participants were required to explain their understanding of science process skills and identify the SPS indicators that they practice in class. SPS according to T6: "Hmmm...my understanding is like...may be children ability to take time to understand what I am teaching and sometimes they understand their way not the way I expect them to understand". This implies that T6 lacks adequate understanding of what SPS entail. However, during her explanation on SPS indicators practiced in her class she said " For instance when i use blocks, I do tell the children to sort out the blocks according to colours, and in so doing, the children get to first observe the different colours available and then they are able to build their ability to classify". T7 however, believed that SPS entails -

"teaching them how to weigh different things, observing like for instance when we are dealing with different plants, growing plants.... you see, I teach them how to observe plants (when they are dead, when they start to grow and sometimes we can plough a bin and see how it grows

up...if we put in the shade it won't grow because it needs sunrays to make it grow)...The see and experience it for themselves”.

This implies that T7 teaches measuring and observation as SPS indicators as explained in her response, which was also observed during her lesson presentation on colour mixing. T7's response relates to that of T5, where SPS is seen as allowing children to observe, communicate ideas, draw conclusions and sorting out things according to shapes or colours. This was indicated when T5 said “Most times I explain to kids what they are expected to do first before carrying out the task, as a teacher I carry out the activity in their presence, then ask them questions such as did you see what happened, then I allow the kids to explain to me what they have seen that just happened ....this will allows me to know if they really understand what I am teaching. I allow them to see what they want they want to do and before finishing the whole thing, I ask them about their thought...as in what they think is going to happen if I do one thing or the other. Nevertheless, during the interview, the other five teachers were not able to give a definite description/explanation of their understanding of SPS. However, analysis of observed lessons revealed that all teachers engaged learners in activities that allowed them to observe, describe, measure, classify, predict and communicate ideas during their lesson presentation. For instance, during T1 and T8's lesson on my body, learners were required to interact with one another using pictures of body parts displayed on the board to identify and describe parts of their own body. From another point of view, during T3 and T6's lesson presentation on my environment, children were given a task to draw their school. In this regard, they were expected to use the teacher's example to identify objects in their own diagram, sort out the different shapes in the diagram using specific colours and describe their drawing using specific attributes.

#### **4.2. Factors influencing teachers understanding and implementation of SPS in early years**

Analysis of participants response during the interview and lesson observation revealed lack of confidence and competence in planning and demonstrating science activities as a factor influencing teachers understanding and implementation of SPS in early years. Some of the teachers attributed their lack of confidence and poor competency to lack of learning resources. For example, T3 said “teaching science and this SPS is not difficult but the problem is we don't have any resources to teach the children. So, it becomes difficult for a teacher like me to plan a science activity effectively”. This statement was also established by T7 when she said, “you see, teaching science to young children is not about talking, and though schools might not have enough resources for science teaching, teachers need to be creative around the lesson they want to teach”. She believes that most teachers don't know how to implement science concepts for young children and teachers' ability to improvise resources serves as a way of building confidence and competency in science teaching.

The second challenge affecting teachers confidence and competency as revealed in this study is poor background knowledge in terms of science content and pedagogical knowledge. For instance, T8 indicated during the interview that teaching science is very challenging because “I did not get enough exposure in terms of the various methods to use to help young children understand a lesson better, and I don't even attend professional development program/workshop. So it is affecting me as a teacher because i just teach my lesson based on the available topics covered in the textbooks we use”. T1's response was similar to T7's view on teachers not knowing how to teach science in early years. It is possible that early year teachers who find it difficult to teach science are not aware of the various teaching strategies that can be used to scaffold science activities for young children. T8 indicated that she also struggles with planning certain activities because she was not exposed to science content during her education program. She further explained that the kind of academic training she received was not okay to teach science subjects in the early years. In view of T8's response on academic qualification, six of the teachers however indicated that their experience over the years had greatly contributed to the science activities and process indicators that were implemented in the observed lessons. For instance, T5 said “You see, I believe my academic came in later. It is my experience that made me interested in getting the certificate which I believed I did just to back me up. In the real sense of it, my experience contributed a great deal to the knowledge and approach I now use in teaching science related activities to young children”.

### **5. Discussion and conclusion**

The data findings, in general, revealed that participants are receptive to teaching science in early years but did not feel qualified/confidence to teach science due to their academic qualification, and lack of resources. Though majority of the participants are qualified early year teachers according to South Africa's qualification framework, it was observed that their qualification did not adequately prepare them to meet the needs of science teaching in early years classrooms. It is believed that early year teachers do

consider themselves confident and competent in teaching science when science corner within the school/classroom is equipped with rich teaching materials, visual materials and hands on activities that can be used to teach science concepts (Dogan & Simsar, 2018). Findings also revealed that years of teaching experience was found to be associated with participants awareness of science teaching, and implementation of SPS indicators as observed in their classroom practice, but not on their understanding of SPS. Science process skills of observing, and communication was commonly found in all the observed lessons, only two of the teachers implemented measure, classify, predict and communicate.

To encourage the development and implementation of science literacy in early years, findings from this study suggest emphasis be put on developing early childhood teachers conceptual and operational understanding of SPS during teacher education programs. Also, education stakeholders, childcare workers, policy makers and ECD practitioners should be actively involved in the formation and maintenance of support structures that enhance early year teachers' science knowledge and practice. This will help improve the quality of early year teachers in enhancing learners' participation and growth in science education within larger South Africa context. Furthermore, engaging children in inquiry projects and more hands-on play activities that are scientific oriented at a very early age may also lead to improving the quality of early childhood education in the country.

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# THE RELEVANCE OF LEADERSHIP STYLES IN THE QUALITY OF EARLY CHILDHOOD EDUCATORS: A MULTIPLE CASES STUDY

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## Abstract

The purpose of this research is to analyze whether the leadership style of academic department's directors is relevant or not to explain the quality of the childhood educator's initial teaching. To this end, a study of three programs of early childhood educator's teaching conducted by different university institutions from Chile is carried out using Yin's recommendations (2014) to build the study and achieve internal validity, external validity, and reliability.

The research findings show that the transformational leadership style is associated with a better quality of the formative processes. The relationships found reveal that the inspiring motivation, intellectual stimulation, and individual consideration of the director of the department on which the teachers depend, influences in their degree of commitment, preparation, and in the effort of the teachers in their classes and in their relationship with the students.

These results are consistent with state of the art, except for the fact that, in this research, the charisma of the director of the department does not seem to be a differentiating element that influences the quality of the formative processes. In turn, it should be noted that the originality of this research lies in the fact that the impact of leadership styles is applied specifically to the case of the childhood educator's initial teaching. Certainly, in this field of application, the relationships found can contribute to the understanding of aspects, not sufficiently considered, that can influence the quality of teaching. Moreover, these results are found in an emerging country, in which this kind of study is rather scarce.

**Keywords:** *Childhood educators, initial teaching, leadership styles, quality, multiple cases study.*

## 1. Introduction

The aim of this introduction is to explore the concepts of leadership in the field of higher education and the relevance of this construct over the quality of early childhood teachers.

Nowadays leadership is considered one of the key factors for achieving quality in higher education institutions (Alzafari and Kratzer, 2019) since leaders have the ability to clarify roles and responsibilities, control the adequate allocation of resources, create partnerships and make improvements in persons and process management (Parvin, 2018). In this sense, Butler (2019) says that academic leaders must have technical, social, emotional and managerial skills since they are at the center of achieving the vision, mission and strategic objectives of these types of institutions (Adewale and Ghavifekr, 2019).

The practice of leadership has other effects to generate the more significant commitment of academics (Huang et al, 2020) and satisfaction and promotes academic results.

However, different levels of leadership coexist in higher education institutions, such as the senior leaders of these institutions, by one hand and the middle-range and the skills of Faculty leadership by the other hand.

In this area its proposed that these leaders must orchestrate the creation of strategic plans and allocate resources according to priorities (Sugrue et al., 2019), manage the demands and expectations of stakeholders such as the Faculty, the administration, the profession, students, international and government actors (Tellmann et al., 2020) and promoting an adaptive culture that embraces and balances the tension between innovation and operation (Tsai et al., 2019).

Huang et al. (2020) state that these increasingly play a more important role due to their proximity and daily contact with the members of their unit, which allows them to influence people and culture within the area for which they are responsible (Butler, 2019), thus helping to support a trustworthy relationship between the academy and human resources (Munir et al., 2019). Salmi and Pham (2019)

argue that teaching leaders play an essential role in maintaining academic standards and in developing research and training programs as the core activity of this type of institution.

Transformational and transactional leadership theory has received widespread attention in the past three decades. Indeed, leadership style constitutes the leader's pattern of conduct that mobilizes followers to do what they have been required to do in pursuit of institutional goals (Anderson and Sun, 2017).

There are multiple ways to typify leadership styles, although a dominant perspective currently distinguishes between transactional leadership, transformational leadership, and passive-avoidance (Kahn et al., 2016). International evidence recognizes that transformational leadership can affect educational entities, mainly in: climate, culture, and academic performance, at the level of student achievement and student engagement, impactful in teaching processes and academic results (Ling and Ling, 2016).

Research indicates that leadership is considered a highly necessary skill to maintain the competitiveness of institutions, since the leader's role is not only limited to managing implementation processes, but is also in charge of supporting development and managing the change. Thus allowing new ideas to be generated and increasing the effort to achieve institutional effectiveness (Munir et al., 2019). In this sense, multiple authors recommend the incentive of this ability both in formal leaders especially in Faculty (see Butler, 2019; Cronje and Bitzer, 2019; Fam et al., 2019; Thornton, 2020 and Toni and Moodly, 2019).

On the other hand early childhood education is the foundation for the better life of the youngest children. (Gasper, 2020). Thus this area has a particular relevance to the study. Different researches show that teacher training at university apparently fails in practice and in promoting skills, meanwhile society demands a new and competent form of education.

A considerable group of works focuses on learning and development programs implemented in educational institutions to encourage leadership in students, through pedagogical projects as well as initiatives to encourage the development of this ability in academics. Here are studies carried out in countries such as the United States (Kearns, 2019), Canada (Corriveau, 2020), Australia (Butler, 2019), New Zealand (Thornton, 2020), Ukraine (Soroka et al., 2019), China (Lin and Shek, 2019), South Africa (Cronje and Bitzer, 2019) and Spain (Pérez et al., 2019).

There are relevant evidence of the leadership styles and quality of university careers especially in developed countries. In contrast, there are no novel findings in the field of higher education in emerging countries like Chile.

The purpose of this research is to analyze whether the leadership style of academic department's directors is relevant or not to explain the quality of the childhood educator's initial teaching.

## **2. Methods**

We made case studies by three programs of early childhood teaching from different university institutions from Chile. Quality of careers was related to the accreditations years from the National Commission of Accreditation CNA. We use Yin's recommendations (2014) in order to build the study and achieve internal validity, external validity and reliability. We conducted semi-structured interviews and a questionnaire: Besides we review the characteristics of careers and documentary background of the universities in the context of a grant Fondecyt 1180484 developed in Chile that support this research.

## **3. Results and discussion**

In the higher education field there is a consensus about that leadership is considered a highly necessary skill to maintain the competitiveness of institutions, areas and departments, since the leader's role is not only limited to managing implementation processes, but is also in charge of supporting development, managing change and build a quality culture (Alzafari and Kratzer, 2019), thus allowing new ideas to be generated and increasing the effort to achieve effectiveness (Munir et al., 2019, Huang et al., 2020).

The research findings show that the transformational leadership style is associated with better quality of the formative processes. The relationships found reveal that the inspiring motivation, intellectual stimulation and individual consideration of the head of the department on which the teachers depend, influences in their degree of commitment, preparation and in the effort of the teachers in their classes and in their relationship with the students. These findings are consistent with the state of the art (see Cendra, 2020; Huang et al.)

Indeed, the analysis and findings show that the results are consistent with the state of the art, except for the fact that, in this research, the charisma of the director of the department does not seem to be a differentiating element that influences the quality of the formative processes. In turn, it should be noted

that originality of this investigation lies in the fact that the impact of leadership styles is applied specifically to the case of the childhood educator's initial teaching. At the same time, schools need for social recognition, which is often denied, very few are able to carry out inclusive pedagogical project (Pedraja et al., 2012).

Chile is in debt with suitable human capital formation mainly due to the formation of the teachers, so the country should focus its efforts on pedagogical training and quality disciplinary in the careers of early childhood through from which the maximum potential of the students can be achieved so that they develop from a young age skills and competencies required in the knowledge society. (Rodriguez-Ponce et al.) As Gravett (2019) show the students want to be considering more than consumers in their careers.

However, the early childhood education field is still at an early stage of understanding in order to promote quality improvement inside the Faculty. As indicate Corriveau 2020, leaders must question their values, learn to take other people's views into account in their decisions, be transparent and develop a strong moral ethic. Certainly, in this field of application the relationships found, can to contribute to the understanding of aspects, not sufficiently considered, that can to influence the quality of teaching. Moreover, these results are found in an emerging country, in which this kind of studies is rather scarce.

### 3. Conclusion

The main conclusion is that the transformational leadership style is associated with better quality of the formative processes. Finally it can be argued that leadership styles are a key issue that through specific dimensions such as inspirational motivation, intellectual stimulation and individual consideration can influence the behavior of educators into the classroom.

Trough the literature review and the multiple case studies conducted we hope to contribute to the understanding of aspects, that can to influence the quality of teaching. Moreover, these results are found in Chile, in which this kind of studies is rather scarce.

In the future, research should be undertaken to determine another factors, like pedagogic isomorphism, that can influence to the quality of early childhood teachers.

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## DRAWING VS. DESIGN: A STUDY ON INDUSTRIAL DESIGN BSC IN ITALY

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### Abstract

In Italy, the education on Industrial Design is provided by two categories of institutions: Universities and Academies. The first ones provide a degree course with a strong influence of technical-engineering disciplines (BSc). The Academies have instead a more artistic nature, related to a shapelier aspect of design (BA). These two training paths, while having the same macro objectives, inevitably generate different outgoing profiles.

This study focuses specifically on the BSc students' lack of ability to use drawing to represent the project. This weakness, which is already noticeable within their studies, becomes increasingly evident after graduation, during the portfolio development. Portfolio is the main tool that graduates must submit during selection processes, both professional (job search) and academic (application for admission to higher education courses) when the two profiles (BSc and BA graduated) are in a direct competition.

Indeed, the portfolio, by its very nature, can be much more effective when the projects within it are described through iconographic representation systems such as conceptual sketching and rendering, as well as moodboards and graphs.

The correlation between representation and design disciplines is essential, both in the professional and academic field. Drawing not only plays a central role in the process of "shape - shape perception - transmission of shape perception", but also strongly contributes to the creative process of design "idea - idea formulation - idea realization". The continuum that connects these two areas of knowledge is the one that indissolubly connects the medium (drawing) with the aim (designing). It is therefore fundamental to explore the didactics of drawing not only as a separate discipline, but also in relation to the didactics of design.

Therefore, this study explores the relationship between the disciplines of representation and those of design within the BSc and BA in Industrial Design in Italian Schools with the aim of understanding what the current state of art and what future trends are. This critical analysis, based on data published by the Italian Ministry of University & Research and by each School, will provide the foundations to suggest a proposal of a representation didactics, renovated exploiting also the potentiality available by some innovative teaching techniques.

**Keywords:** *Drawing, industrial design, drawing teaching, innovative education, representation.*

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### 1. Introduction

This study focuses specifically on a supposed lack of ability in using the representation techniques by BSc students in industrial design in the Italian universities. This weakness is already noticeable during their studies and it's in some way facilitated by the selection process setup by universities for the students recruitment, that is based on verifications of theoretical knowledge and not on attitudes or on doing capabilities. At the graduation time this weakness becomes even more evident in the graphical choices used as part of their portfolio.

The portfolio, that is a document collecting the projects developed by students in the timeframe they attended the school, is the main tool that just graduated people in Industrial Design must submit during selection processes for being evaluated, both professional (job search) and academic (application for admission to higher education courses). So a portfolio, by its very nature, can be much more effective when the projects within are described through iconographic representation systems such as conceptual sketching and rendering, as well as moodboards and graphs. At the time of selection processes the BSc graduates enter in a direct comparison scenario with BA graduates from art academies, because of the equivalence stated by the Italian law (Equipollenze, 2020) of all the same level degrees, and their weakness in managing the representation techniques stands out more.

We have become aware of this weakness attending evaluation committees in charge to admit candidates to higher education courses.

## 2. Objectives

In Italy there is a law stating that any same level degree titles, released by any state school (universities, academies, conservatories) or by any private school previously recognized as equivalent, have the same value. In our scenario that means the Industrial Design graduates are equivalent both with a BSc by a technical university or with a BA by an art academy.

Of course the background and the acquired knowledge of these graduates will be different, but we don't care to understand who is better; the industrial design professional world is wide and varied, so probably there are good opportunities for both these professional profiles. We are interested in investigating only one specific aspect, the weakness in managing representation techniques in the technical universities, at first by students and later by graduates, because it could stand for a lack in their skills able to prevent them to be selected in a comparative process.

So the goal of this study is to analyze the main differences in the Industrial Design curricula in the main technical universities and art academies. This analysis is due to the fact that, despite the equivalence of the degree titles, every single school has some space of autonomy in setting up their curricula that have to suit in a predefined framework and to be approved by the state minister in charge for higher education.

The basis of the equivalence for the degrees is that all the same level didactical paths release to students the same amount of academic credits, that is 180 credits for a BSc/BA degree. It's easy to predict there are many differences in the courses setup by universities and by academies around the core that's based for all on the design courses: the surrounding courses can be about technological aspects and/or characters of materials and/or humanistic studies and/or representation techniques and/or history and so on. Here we are looking only at the representation courses and at their relation with design ones.

## 3. Methodology

In order to achieve the set objectives, we used the publication of statistics by academies and universities on the website of the Italian Ministry of University and Research. The Academic Year is 2018-2019 and the numbers of students enrolled for BSc (MIUR, 2020) and BA (MIUR, 2019) have been collected.

The BSc design courses (L-4 and 42) and the BA design courses (DAPL06 and DIPL02) were initially selected. In Italy the category "design" includes all those disciplines related to "aesthetic" industrial production such as product design, communication design, fashion design, furniture design, etc. So, after a first selection of the macro-category "design courses", specific Industrial Design courses were selected according to the course title. Finally, a ranking was made by number of students, a data that identifies which of the schools at national level have the greatest impact on the training of future industrial designers.

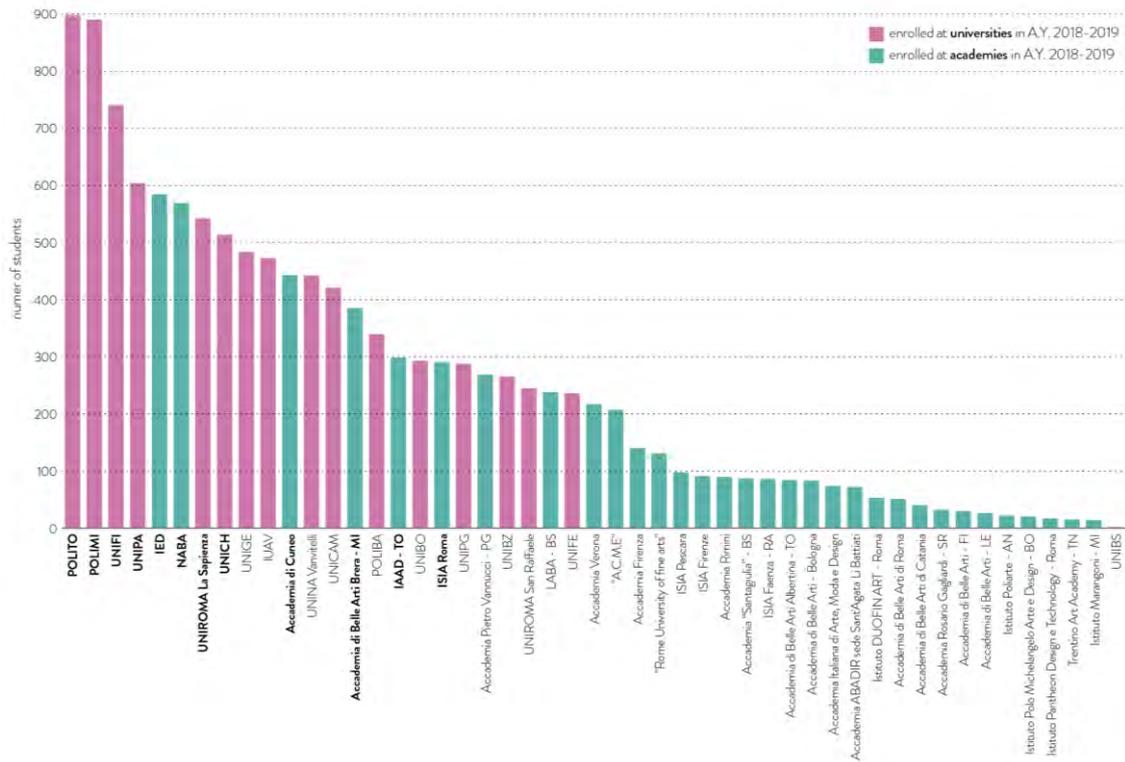
We selected a reduced group of universities and academies from the largest until the achievement of 50% of the global amount of students and we proceeded to analyze each single course through the information on the websites of the institutions and on the Ministry website, dividing the courses into four categories:

- Subjects dealing with the *representation for the project*: they are courses that deal with drawing, physical modelling, digital modelling, photography, product communication, etc..
- Subjects dealing with the *design*: all the design workshops and studios.
- Subjects dealing with the *professionalization* of students and the compilation of a dissertation: they are all the courses and credits both assigned to the final exam, but also to all those subjects aimed at preparing students to enter in the professional world, such as "empowerment".
- The category *others* include all the theoretical science, humanities, technology and techniques that complement the academic framework.

This categorization was carried out through the course nomenclature, the description of the course program and some interviews with professors teaching in the surveyed schools.

At this point the relative training credits dedicated to the disciplines of representation and those dedicated to the disciplines of the project have been related.

Figure 1. Enrolled students in A.Y. 2018-2019 at universities (pink) and academies (green). In **bold** the schools selected for the analysis.



### 3.1. Universities vs academies

In Italy, the peculiarities that distinguish universities and academies are not only about contents, but also, as the numbers show, of other kinds. First of all, it must be pointed out that, in the field of Industrial Design, the universities are all state universities while the academies are mostly private schools.

Moreover, the number of total universities (16) is much lower than the number of academies (32), although they manage, in the Industrial Design field, a much higher number of students (universities 7678 vs. academies 4859). Despite this, in both the sum of enrolled students in the six larger schools registers more than 50% of global students.

Moreover, a further characteristic is that, due to their being predominantly private schools, the academies usually have several locations scattered throughout the country. In spite of this, the numbers of all the locations were taken into account in the survey because the teaching methods adopted in each location is common.

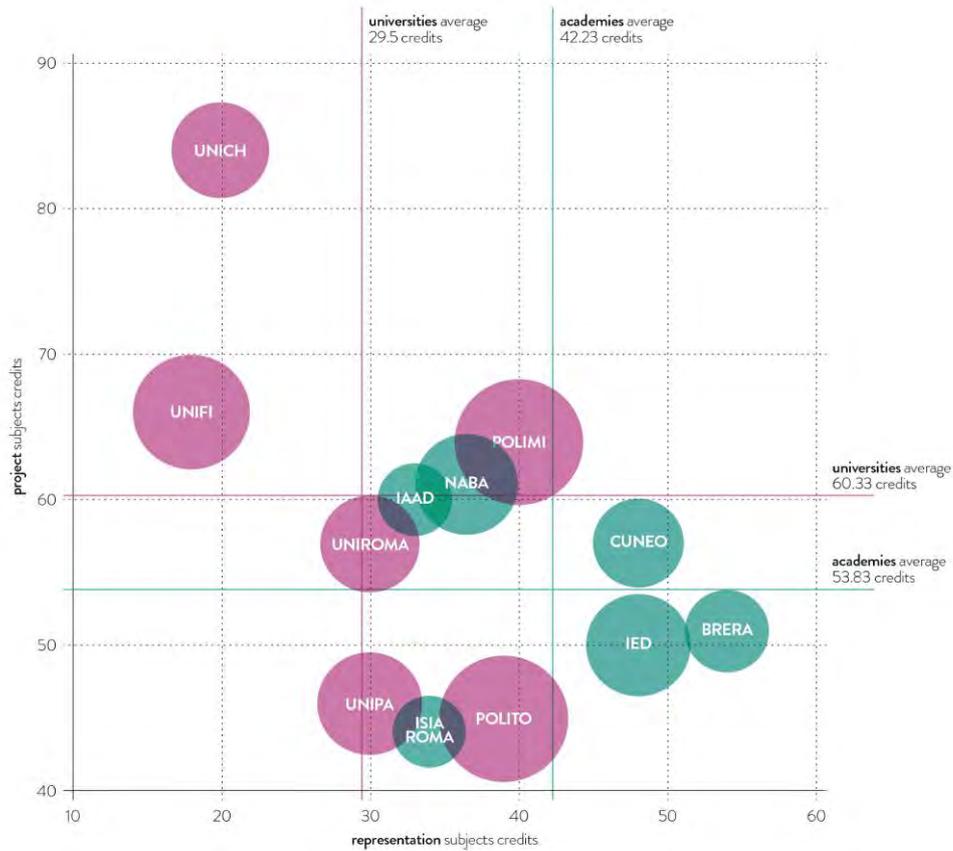
It should be pointed out that there are a certain number of private schools that do not have (by choice or lack of requirements) an equal certification of which it is not possible to know the numbers and programs because they are not published.

## 4. Results

The results of the recording are summarized in Figure 2. Overall, universities have a lower number of credits dedicated to representation, but a higher number of credits dedicated to project subjects. The difference between the credits dedicated to representation is relevant: an average of 29.5 credits for universities against 42.23 credits for academies. The difference between the credits for the subjects dedicated to the project is smaller: for universities they are 60.33, for academies 53.83.

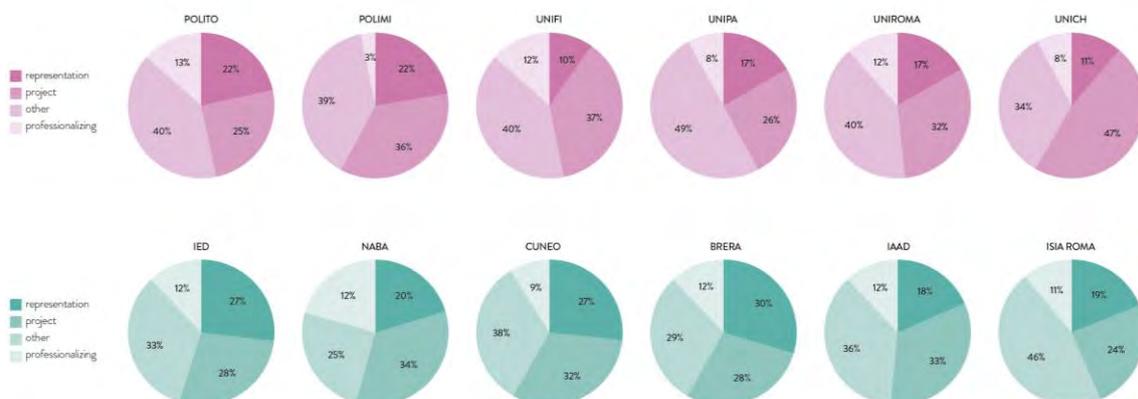
In general, if we observe Figure 2, we can see a greater uniformity in the behavior of academies, more concentrated in a restricted area of the graph, compared with universities which are in scattered positions.

Figure 2. Relationship between the credits dedicated to the representation (on the abscissa) and those dedicated to the project (on ordinates). The solid lines represent the average values of credits dedicated to the representation (vertical) and credits for the project (horizontal). The bubbles dimension represents the different number of enrolled students.



In academies you can read a compact core represented by IED, Cuneo and Brera, which are also the three schools with the highest number of credits dedicated to representation. We find a second nucleus (NABA and IAAD) and, at last, ISIA in Rome which differs from the other academies with the lowest number of credits dedicated to the project. Despite the more scattered positions of universities, we can find a central nucleus created by the Politecnico di Torino, Politecnico di Milano and the Universities of Palermo and Rome. Florence, but above all Chieti-Pescara, are detached from the group with a lower number of subjects dedicated to representation and with a higher number of credits dedicated to the project (Chieti-Pescara in particular, with 84 credits against a general average of 57.08).

Figure 3. Pie charts with the subdivision of the four categories: representation, project (green), others and others.



Let us now look at figure 3 which represents the division of the curricula of the schools into the four categories used. In this case it is interesting the behaviour of the schools in the other two categories not analysed in the previous graph: the subjects dedicated to the students professionalisation and the category "other". In academies, on average, more credits are dedicated to professionalizing subjects than in universities; in universities, on the other hand, more credits are dedicated to other courses. In particular, there is a very low percentage of professionalizing subjects at the Politecnico di Milano.

## 5. Discussion

The quantitative (number of participants for the selection of observed schools) and qualitative (evaluation of the courses dedicated to four analyzed categories) confirmed the trend towards a more artistic approach and therefore linked to the subjects of representation by academies. The credits of the subjects related to the project are not so different between academies and universities: this means that students dedicate equal commitment in both types of schools.

Furthermore, an analysis of the training courses shows that the difference in the credits dedicated to the subjects of representation, as concerns universities, is balanced by a greater number of credits dedicated to scientific and technological subjects. In fact, in the number of credits in the "other" category there are both humanities and technical-scientific subjects. In academies, on the other hand, the subjects in the "other" categories are mainly of a humanistic nature, more characteristic of artistic teaching.

The difference in the output profile between the two types of schools can also be found in a greater attention of academies to provide the tools for jumping into the professional world, measured by the amount of credits dedicated to this category. Therefore, the analysis carried out shows that the difference between the two institutions also lies in the attention to the professionalizing subjects and not only in the greater attention for representation subjects. It is also assumed that this can improve the appearance of the portfolio and its maturity.

On the other hand as their curriculum is strongly multidisciplinary, just graduated people in BSc have a greater maturity in dialoguing with all the actors involved in the industrial design process (including the technical ones) and understanding all phases of the process. This characteristic is especially appreciated during the internship phases, but it is hardly noticeable by the companies during the interview, if not with more specific questions.

In general this study confirms the basic assumptions by adding a finer analysis of the other subjects and not only of the two main axes analyzed of representation and design, opening the possibility to further research.

The paper is the result of common research and findings undertaken by the authors. Nevertheless, section 1 and 2 was edited by Fausto Brevi; sections 3, 4 and 5 were edited by Flora Gaetani.

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## DEVELOPMENT OF AN ANIMATED VIDEO FOR PRE- AND POSTOPERATIVE LEARNING FOR OSTEOARTHRITIS PATIENTS

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### Abstract

Osteoarthritis (OA) is a condition in the joint that is developing for a long time and hit first and mainly articular cartilage, and it is a long-term chronic disease characterized by deterioration. In the final stage it is affected all the tissues of the joints such as bones, ligaments, arthritis, joint fluid and muscles, which results in bones rubbing together and creating stiffness, pain, and impaired movement. This disease can affect the joints in the knees, hands, feet, spine and shoulder. OA is the single most common cause of disability in older adults worldwide. Patients need to receive detailed information about the disability, learn about their disease, its treatment and how to follow recommendations both before and after the surgery. As hospital stays are shortening the need of information is increasing, as the patients need to prepare themselves at home before the operation, as well as take care of their rehabilitation when they are coming home, discharged from hospital. In this paper we present a case study about the development of a web-based animated video that was developed to support the learning for patients with OA, using a design science research approach. DSR is an iterative process that include three iterative research cycles. The relevance cycle provided the requirements for the application from the very beginning. The relevance cycle, the rigor cycle and the design cycle were conducted iteratively, and have generated design alternatives that have been evaluated in discussions with OA surgery physicians, as representatives from the application domain.

**Keywords:** *Osteoarthritis, animated video, patient learning, surgery, design science research.*

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### 1. Introduction

Osteoarthritis (OA) is a condition in the hip or knee joints that develops during a long period of time and affects first and mainly articular cartilage. OA is a long-term chronic disease characterized by deterioration. In the final stage it has affected all the tissues of the joints such as bones, ligaments, joint fluid and muscles, which results in bones rubbing together and creating stiffness, pain, and impaired movement. The condition can also affect the joints of hands, feet, spine and shoulders. However, OA is most common in hips and knees. OA is also the single most common cause of disability in older adults worldwide (Palazzo, et al., 2016). It is estimated that 10 to 15 per cent of all adults in the age of 60 and above have some degree of OA. Every tenth man and every fifth woman over 60 are estimated to have OA. The condition is not considered a part of the natural aging process, although, it is more common among elderly. Approximately one in four above the age of 45 in Sweden have OA, and in line with an aging and increasingly obese population, the condition is expected to become even more widespread. This will cause an increased pressure on the healthcare worldwide. However, OA can be treated with physical activity, and anyone with OA can do a lot by themselves to improve their health. It is recommended to continue being active adjusting the activities in accordance with the physical circumstances. Although, many patients still require hip or knee joint replacement surgery when pain gets too in-tense. Studies have demonstrated good outcomes of joint replacement surgery (Hamel, et al., 2008).

Patients require detailed information about their condition and upcoming surgical procedure, in order to comprehend the process of pre- and post-operative recommendations; how to prepare before surgery and how to carry out physio-therapy afterwards. As hospital stays are shortening, the need for information is increasing, as the preparations need to be carried out at home to a greater extent., as well as taking care of their rehabilitation when they return home. The hospitals strive to reduce the number of

operations canceled, due to unprepared patients, as this entails costs for unused resources such as surgeons, nurses, as well as operating rooms. Not only is patient satisfaction an important criteria for the overall healthcare service quality, but for the society at large

Healthcare professionals giving medical advice orally has not proven to be a successful method for patient compliance. Neither is handing out written information sufficient, as written instructions can be hard to understand. However, animation and cartoons have been used to improve adherence to instructions, which have shown better patient understanding (Kessels, 2003). Digital tools have also been tested, for example video-conferencing to provide tele-rehabilitation services allowing patients to consult with a physiotherapist from their home (Lawford, et al., 2018). The effectiveness of a web-based exercise therapy program tended to improve in physical function of the patients (Uesugi, et al., 2018). However, the digital technologies can be developed to better suit the patients' needs for information and instructions. In this paper we present a case study about the design and development of a web-based 3D-animated video film that was developed to support education for patients suffering from OA, using a design science research approach.

## 2. Research method and design process

The design science research (DSR) approach was followed by creating a web-based animated video. Two of the authors are specialists in 3D-animation and informatics and have been working through the entire design process, from the very beginning in collaboration with healthcare professionals. The third author has been involved in the documentation of the design science research process. The case study presented in this paper is motivated by the desire to improve the patients' learning by the introduction of a new and innovative digital application, and the processes behind this. Thus, DSR is a suitable framework to reach this goal. DSR is an iterative process that includes three iterative research cycles (Hevner, 2007; Hevner, et al., 2004).

The first cycle, the relevance cycle, provided requirements for the application from the very beginning. In this cycle our team consulted OA surgeons and other healthcare professionals such as nurses, assistance nurses and physiotherapists. In the beginning, employees from the hospitals' communication department were included. Three group meetings in total were conducted in order to identify challenges in learning and instructing patients who will be subjected to OA surgery and the following rehabilitation. This cycle also defined the acceptance criteria for the evaluation of the results. The acceptance criteria were defined in a manuscript for the application, with 5 different scenes, each describing «What We See» (Imagery) and «What We Hear» (Dialogue). In each scene 5 to 25 different parts were describing the acceptance criteria.

The relevance cycle was connected to the rigor cycle in iterations, as literature reviews of the knowledge base of the application domain were conducted. Moreover, expertise was consulted to define the state of the art in the domain and processes of OA surgery, together with patients' required preparations and rehabilitation activities.

The iterative design cycle has generated design alternatives that have been evaluated in discussions with OA surgeons and nurses as representatives from the application domain. Staff from the communication department and patients were also included in the iterative design cycle. The evaluating activities were ongoing until a satisfactory design was achieved. Moreover, the evaluations in the design cycle also resulted in additional iterations of the relevance cycle to improve the requirements. This was done in order to increase the application's utility in practice in the OA surgery domain of patients' increased learning. Iterative building and evaluating activities are significant characteristics of DSR framework (Hevner & Chatterjee, 2010). This is a novel application, useful for teaching patients what to expect and how to prepare in relation to an OA surgery. Therefore, this study can contribute to the design knowledge (Baskerville, et al., 2018).

## 3. Results: the rigor cycle

In order to accomplish the objective to design and develop a 3D-animated film to prepare patients for OA surgery, and to teach patients how to conduct the rehabilitation process, we studied OA literature, literature on technology adoption and 3D-user interfaces. The OA literature informed us on how the hip and knee joints are constructed, why a surgery could be necessary, how the patient needs to prepare, how the operation will be conducted, and how the patient should carry out their rehabilitation. It is crucial to understand all these areas in order to design the application on OA from a patient perspective. We turned to both scientific and popular literature to gain knowledge about the domain. We also had the opportunity to discuss the state of the art in the OA domain with OA surgeons.

#### 4. Results: the relevance cycle

In order to design the application for patients' learning of OA we first analysed the process of pre- and post-operation of OA surgery, together with intrinsic details of OA and its characteristics. To fully understand the requirements and the evaluation criteria of the application we have conducted a thorough ethnographic research with triangulation. Field observations were carried out by two of the authors, attending OA surgery operations at a hospital in Sweden. Interviews with OA surgeons and groups interview were conducted. The observations were captured in field notes afterwards and the interviews were documented in written notes during the interviews. The two group interviews' discussions were based on different versions of the manuscript for the 3D animation. The results were summarized in a new version of the manuscript containing the sequence of the scenes in the 3D animated video: (1) anatomy, (2) why surgery, (3) before operation, (4) operation, and (5) after operation. 5-25 parts were identified in each of the scenes, as these parts are also defining the evaluation criteria.

The group interviews discussions were conducted in order to get insights in the surgical process including pre- and postoperative activities, and to get input to be able to conceptualize the first version of the prototype for the 3D animated video. The goal of the relevance cycle was to get a detail understanding before creating the first prototype of the 3D animation as well as the associated requirements and evaluation criteria. Table 1 provides an overview of the operation scene of the first version of the manuscript for the 3D animation, where «what we see» is what is expected to be animated, as not yet analysed, and «what we hear» is what is expected to be told by the spoken narratives in the 3D animated video.

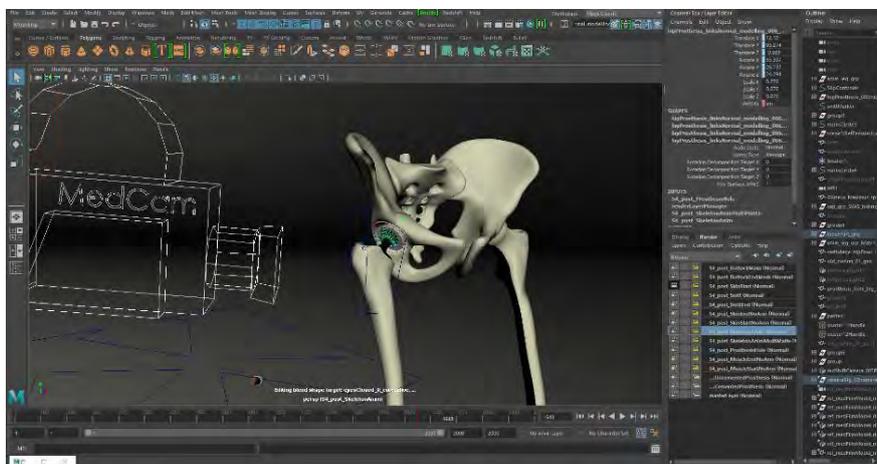
#### 5. Results: the design cycle

Together with our insights from the rigor and relevance cycles, our previous experiences in designing 3D animated videos as well as the technology acceptance literature, we designed two different digital prototypes before the last version of the 3D animated video was released. However, even after the 3D animated video was implemented, we still received feedback on the final result. We followed a user-centered approach following the design requirements in creating the 3D animated video in the design cycle.

##### 5.1. First design cycle – animation exploration

In the first design cycle we focused on designing the human body as natural as possible in the animated video. We experimented with both a male and a female human body. We especially focused also on the challenge in finding a balance between showing frightening pictures of body parts as well as lifelike pictures of the hip joint, see the design process in figure 1. Insights from the relevance cycle taught us for example to avoid showing blood in the animated video. In the first design cycle we also designed the five scenes with the parts identified in the relevance cycle. In the first design cycle there is also a focus on finding a balance between the time used for showing the animations in relation to the time it takes for the spoken narrative to read the corresponding text.

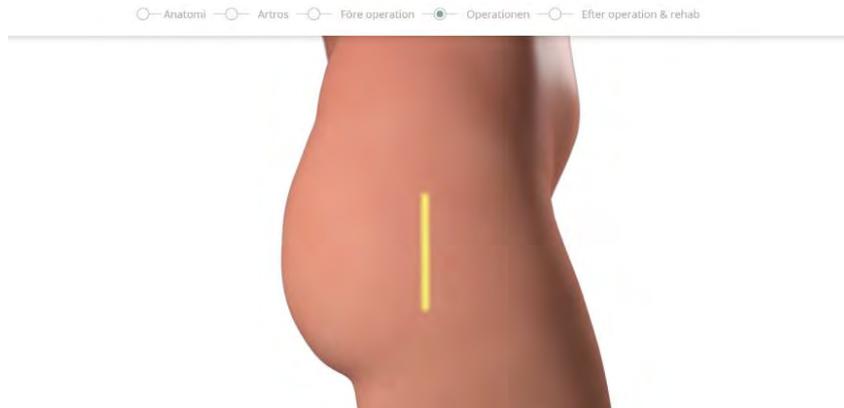
Figure 1. How it looks like in the workflow in the design process before the images are rendered.



### 5.2. Second design cycle – design validation

In the second design cycle the different parts in the five scenes were revised, in order to customize the content to reflect the specific workflow of the clinic in question. The second design cycle also resulted in removing the scalpel from the animated video, and to not show the incision as it looks like in reality. Instead, the incision was shown as a yellow stripe on the body, as in figure 2.

Figure 2. The incision shown in the film, that is around 15 centimeters.



### 5.3. Third design cycle – validation after implementation

The third design cycle is an ongoing cycle after the films have been implemented into the daily routines of the clinic. In this cycle there is a continuous feedback-loop where healthcare personnel and patients from time to time comment on the film content, making the product development a constant process. The two figures, 3 and 4, show the improvements from a previous version to a later version of the film, showing the moment of the artificial hip component that is fitted to the acetabulum. The developed version shows a more pedagogical view of the hip, and the picture is of a better quality.

Figure 3. First version of the implemented film, showing the artificial hip component that is fitted to the acetabulum.



Figure 4. The last version of the film in the section of artificial hip component fitted to the acetabulum, after the feedback-loop comments on the film from healthcare personnel and patients.



## 6. Conclusion and further work

It is important to consider each group of professionals working together in a surgical department. The differences become even more clear when implementing the film in another clinic within the same surgical profession. Each department is often keen to change various details in the manuscript to reflect their specific workflow.

Healthcare professionals are often eager to give feedback. However, it seems that different professions give different kinds of feedback, taking pride in their own specific profession not always seeing the full picture. It is important to consider every branch of healthcare professionals since their expertise need to be conveyed in the film. During the different design cycles, it became the 3D-animators responsibility to limit the amount of information and produce a well-balanced film containing all aspects of the patients' journey. The film will continue to evolve, even with other clinics as clients, and it will also be adapted and adjusted in order to their feedback.

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## EHEA INTERNATIONAL STUDENTS MOBILITY AND TRANSPARENCY

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### Abstract

This paper investigates the importance of transparency of internationalization and various obstacle and barriers that influence international student mobility within the European Higher Education Area (EHEA). Having in mind that due to privacy regulations and availability of data regarding international student mobility, this article is using a framework based on literature review as well as using data made available by Eurostat. The authors analyze patterns in international student mobility, both between countries and over time, using various literature quantitative analyses based on survey data to underline that internationalization and various factors are relevant and can positively influence the international student mobility. Even though transparency is thought of as one of the benefits of European Higher Education Area (EHEA), it has evolved into an essential component of the European Union's strategy for bringing higher education frameworks up to date; students, employers and policy maker must have a greater degree of transparency in order for them to better fill out their roles and achieve their objectives. Higher education management also greatly gains from transparency, since it supplies important data in the process of coming up with new strategies and making decisions. This article presents an important contribution to this growing field of literature by doing a comparative analysis about the factors which positively improve the international student's mobility within the EHEA. The three folded impact of this paper is obvious for the stakeholders mentioned as students, institutions and policy makers are responsible for the smooth cooperation and coordination for a better international mobility.

**Keywords:** *European Higher Education Area (EHEA), student's mobility, international higher education, internationalization.*

### 1. Introduction

The key for the legitimacy, competitiveness and funding for the higher education institutions and their subunits is represented by the unfailing information regarding the benefits provided to their funders, students and society overall. The transparency of higher education institutions has an important role in the quality of accountability and decision-making process. Consequently, transparency of the benefits provided by higher education institutions should be an essential pillar for the governance framework. Due to the increasing variety of these benefits, students have to face an important challenge to decide what field of study to choose and where to study. Moreover, governments are interested that the research services and quality education that are important to the communities, local business and labor market to be offered by the higher education institutions that are in their jurisdiction.

All the stakeholders that are interested in the higher education are expecting transparency. The demand for transparency in higher education is growing from the side of the general public, public authorities and of course from the side of students. Tools that are helpful for a broader use of information and for a better understanding of the performances and services provided by the higher education institutions are needed. A core objective of the rethinking governance in higher education is the improvement of the transparency regarding the activities and outcomes provided by the higher education institutions.

In the article *Transparency in Higher Education: The Emergence of a New Perspective on Higher Education Governance*, the authors critically discuss some transparency tools such as accreditation, rankings and performance contracts according to a larger context of higher education policy-making and governance. These transparency tools are analyzed from the perspective of how they are modified in order to ensure the growing demand for transparency in higher education (Jongbloed et al. 2018). According to Schwaninger et al. (2017) higher education institutions have their own capacity

to lead into a collective environment and they act into a multi-centric network. Students and other stakeholders must be protected and supported by the government against rent-seeking behavior and different similar perverse effects. Information asymmetry between higher education providers and students, government and other stakeholders is acknowledged and intended to be rectified by the orientation in the networked governance paradigm and by encouraging transparency. One of the core characteristics of networked management is given by the sharing information by using ICT tools like ranking websites. Stakeholders can behave more effectively and efficiently in the network based on the trust that increased with the information shared. In order to increase the public value of higher education in the following years it is essential to improve the transparency tools since transparency is one of the fundamental elements of the dynamic in the networked management of higher education systems. What is the scope of higher education policies to attract international students if they are not transparent? What is the scope of specific international mobility policies to attract international students if they are not transparent? What is the scope of higher education institutions to attract international students if they are not transparent? Consequently, even if accessing the data is quite impossible due to the privacy issues, students' perspective is decisive for transparency.

## **2. Internationalization and international student mobility**

In order to gain a better understanding of the value of internationalization and to increase the interest in mobility a great tool can be internationalization at home. The demands related to the number and accessibility of outgoing mobility programs should never be reduced by the internationalization at home tools. There are still many barriers that remain mostly unsolved despite the fact that the need for equitable access to mobility has known for a long time now. The courses taught in English or in different foreign languages and the mobility of professors and lecturers represent the foundation of the concept of internationalization at home. However, the degree of use of this concept varies around the world. Both local and international students who are involved in internationalization experience are integrated worryingly uncommon.

The number of international students coming from outside of Europe and the European Union increase and this situation will be a challenge especially regarding visas for the European higher education institutions. According to ICEF (2018), India and China are those two countries that account for about 40% of the students that are part of the outgoing mobility between the years of 2012 and 2015. Moreover, these two countries have almost half of the tertiary-education-aged population at the global level.

More focus should be paid to modernize, updating and equalizing visa policies in European countries, moreover now considering the imminent Brexit. This focus should be centered to those students who are facing higher costs and most difficulties when applying for visas in European countries, namely non-European international students. One of the major troubles for some non-European international students is represented by the length of student visas. These non-European international students must re-apply for visas every year in order to avoid the risk of deportation before completing a full degree as an international student and this situation is a well-known barrier.

Even if the participation of international students enriches the education, it should be emphasized that in situations of unclear future prospects internationalization cannot flourish. All the European HEIs should consider international students as an opportunity and not as potential cash-cows. In order to support this idea, the needs of students should be seen as highly significant in international mobility. Internationalization should be a core topic in Europe in order to reach set goals. In this context, internationalization and mobility in Europe should be a priority where students must be an essential part of internationalization strategies that require special attention. International students must be integrated in the local student body. Moreover, very often internationalization is not encouraged due to the numerous obstacles that international students have to face during the mobility. Longstanding efforts in the internationalization area may be compromised as a consequence of the unresolved long-term problems and negative experiences that students may have during the mobility. In order to ensure sufficient opportunities to work for students that choose mobility in a country, visa periods should stand during the entire period of stay in a country, consequently, the governments should consider students as a crucial stakeholder when visa regulations are created and updated at national and international level.

## **3. International student mobility obstacle and barriers**

In the different phases of the decision process, different obstacles may deter students from studying abroad. Financial and familial obstacles are of especially high relevance with regard to the initial decision to go abroad for study purposes. Students who are already planning to study abroad are more

concerned about practical matters: integrating a stay abroad into their study programme, getting relevant information, securing a place in a mobility programme, and ensuring their results achieved abroad will be recognized.

Table 1 shows an overview of what students perceive to be obstacles preventing them from studying abroad. All the studies were based on quantitative analyses using survey data. The obstacles were split into eight dimensions based on what was most commonly assessed in the literature. Every x in the table means that it was found by a study. If there is no x it means that either it was not measured, it was not found to be significant, or the authors indicated that it was not important in their results.

Financial cost refers simply the financial costs that students would incur if they would decide to study abroad. The social cost refers more specifically to leaving behind friends and family and the anxiety that is involved in forming new networks. Lack of information relates to students indicating that they are not sufficiently informed to feel comfortable in deciding to study abroad. Lack of foreign language skills concerns student's fear that their language proficiency is not good enough for staying abroad for a longer period of time. Institutional problems are related to obstacles concerning the higher education institutions such as the transfer of credits or the recognition of foreign degrees. Uncertainty about benefits concerns students that indicate that they are unsure about whether studying abroad is beneficial for their career or personal development. Academic performance is related to student's grades or their doubts about their academic performance. Finally, lack of motivation is a general concept where students simply indicated that they did not feel motivated to study abroad without being more specific.

Table 1. Indicators mentioned as important.

	Financial cost	Social cost	Lack of information	Lack of foreign language skills	Institutional Problems	Uncertainty about benefits	Academic performance	Lack of Motivation
Beerkens, Souto-Otero, de Wit and Huisman (2015)	x	x	x	x	x	x		x
Bryya and Ciabiada (2015)	x	x	x					x
Doyle et al (2010)	x	x	x		x		x	
Hauschildt (2016)	x	x	x	x	x			x
Kmiotek-Meier et al (2019)	x		x	x	x			
Lörz, Net zand Quast (2016)	x	x		x		x	x	
Netz (2015)	x	x		x		x	x	
Souto-Otero, Huisman, Beerkens, de Wit and Vujic (2013)	x	x	x	x	x	x		

From table 1 it can be seen that financial cost is the most often cited obstacle. Moving abroad is costly and while grants are available, many students see them as insufficient. Especially the ERASMUS grant is considered by some to be too low to appropriately cover the costs (Souto-Otero et al., 2013). The second most cited obstacle is the social cost which is not too surprising since moving abroad means leaving behind family, friends and partners. Lack of information is more surprising since it would be expected that this is relatively easily remedied by students themselves. Like lack of information, lack of foreign language skills was mentioned by six out of eight studies. Institutional problems come in sixth place showing that students apparently are unsure about the ability of higher education institutions to coordinate and communicate. Uncertainty about the potential benefits was only reported by half of the studies, and academic performance and lack of motivation only by three studies. Some studies also looked at difference between countries (e.g. Netz, 2015; Beerkens et al., 2015) but found these differences to not be very substantial indicating that obstacles and barriers are largely similar across different contexts.

These findings can be interpreted in line with the conceptualization by Beech (2015). She argues that the decision to move abroad is not simply due to financial resources, many international students come from a background in which studying abroad is normalized and accepted as a natural step in one's career. Coming from such a culture could lower the social cost and increase the perceived benefits of spending some time studying abroad. This would therefore mean that studying abroad is not just a question of resources but also of attitude and culture.

#### 4. Conclusions and further research

The question regarding the positive assessment of increasing internationality arises and if this positive assessment has continued. Despite the fact that numerous advantages were highlighted for those countries losing talent by "brain circulation", there were also critiques regarding this situation. The negative impact of the "brain drain" process has been stressed out from several decades ago (see Wächter, 2006). There are different views regarding internationalization and its consequences, even if there is no dominant policy or a certain perspective that can be claimed. There are fears considering that quality and undermining academic approaches through economic rationales are effects of internationality. Moreover, it is considered that aspects such as "global citizenship" and "international understanding" have lost their role as fundamental values of internationality of higher education.

Financial situation is so far the major and most dominant obstacle for the students interested in outgoing mobility. For over a decade financial aspect has been a major obstacle to mobility and it still remains unsolved in many situations. Statistical data and also some research papers, as for example Ballatore & Ferede (2013), point out that most of the students who are applying for Erasmus+ mobility are mostly part of distinct higher socioeconomic groups. Such studies are focused on the elitist nature of different mobility programs and also on the impact that these programs produce. According to Ballatore & Ferede (2013) there is an impression that international mobility is more accessible for certain type of students, in this way creating privilege among students. This observation is based on the fact that those students who have been part of international mobility are mostly students having a higher income and also more job opportunities. Another research elaborated in Germany by Netz & Grüttner (2018) comes to support this view. The empirical study developed by Netz & Grüttner (2018) highlights the fact that nowadays there is a tendency in mobility programs to generate a division between students having a lower socioeconomic background with those students having a higher socioeconomic background even more deeply.

This deepening inequality needs immediate attention since it is not in accordance with the objectives and values of European mobility programs. There is a direct contradiction between this deepening of separation among students coming from different socioeconomic backgrounds and the engagements taken at the Yerevan communiqué in 2015. According to the Yerevan Communiqué (2015) the EHEA will follow certain steps in order to ensure that the gender balance will be improved, the social dimensions of higher education will be intensified and opportunities for access and completion of international mobility will be expanded even for those students having disadvantaged backgrounds.

Until the inevitable disparities that are present within the actual system(s) are not solved, the full potential of mobility cannot be reached even if mobility is a tool helpful for the improvement of the learning and abilities of all learners. The number of dependents, the lower income and several other economic factors are among the obstacles that are part of the internationalization process.

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# RESEARCH ON THE CAUSES OF THE "UNDERGRADUATE MIGRANT WORKER" PHENOMENON BASED ON THE THEORY OF LABOR MARKET SEGMENTATION

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## Abstract

"Undergraduate migrant worker" is a kind of special phenomenon during the social changes of China. At present, some college graduates with rural household registration cannot find an ideal job under the background of employment difficulties of Chinese college students, then they choose to converge with the migrant workers of their elder generation in the choice of unemployment and employment in order to achieve short-term transition. Therefore, they are called "undergraduate migrant worker" by the researchers and become another special social vulnerable group which following after the "ant clan". What's more, high human capital is possessed by the group of "undergraduate migrant worker", and the phenomenon of "university migrant workers" would be a great waste of labor resources. Therefore, concerns about this group is the key to realizing the rational allocation of human resources, which is also related to the healthy development of social justice and the socialist market economy with Chinese characteristics in the meantime. Based on the survey of "undergraduate migrant worker" in Chengdu, Beijing and Shenzhen, the article studies the factors that affect their employment based on the perspective of the theory of labor market segmentation, focusing on the influence on the selection of this special group under the background of labor market segmentation in China. The materials in this study are collected through in-depth interviews as well as participation and observation, interview materials are processed by means of using Case analysis. The investigation found that:

(1) The dual segmentation of the labor market makes the main labor market like a huge "black hole", which continuously attracts the in burst of college students, therefore it leads to the increase of barriers to entry continuously and affects the choice of employment market for the rural registered college students.

(2) In China, the inter-regional economic development is unbalanced, and regional differences are obvious. The regional division of the labor market has resulted in an imbalance in the allocation of human resources with partial surplus and shortage of talents.

(3) The market segmentation, which is under the control of social stratification order, has weaken the market competition based on the amount of human capital, moreover, the "crowding-out effect" is existed among the rural registered college students due to the exclusive factors such as internal cultural psychology and professional intergenerational inheritance in the main labor market.

Therefore, it is necessary to give full play to the competitive effects of market factors based on human resources, so as to break the ice of institutional isolation and cultural exclusion, accelerate the coordinated development of the region as well as provide equal employment opportunities for the rural registered college students.

**Keywords:** *Social change, human resource development, the theory of labor market segmentation, undergraduate migrant workers, cause of formation.*

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## 1. Introduction

"Undergraduate migrant worker" is a kind of special phenomenon during the social changes of China. At present, some college graduates with rural household registration cannot find an ideal job under the background of employment difficulties of Chinese college students, then they choose to converge with the migrant workers of their elder generation in the choice of unemployment and employment in order to achieve short-term transition. Therefore, they are called "undergraduate migrant worker" by the researchers and become another special social vulnerable group which following after the "ant clan".

Currently, the analysis of the causes of the phenomenon of "undergraduate migrant worker" focuses on the contradiction between college students' ability and the need for ideal employment, that is, their own ability development does not adapt to social needs, and urban-rural differences are not

conducive to fair employment. Therefore, there is a lack of attention to the impact of the job market itself on college students' career choices, especially the impact of the labor market segmentation. Because if there are no two markets, there will be no situation where college students flow into the secondary labor market and become "undergraduate migrant worker". The phenomenon of "undergraduate migrant worker" is an awkward situation that they face in the process of entering the job market. If it is said that becoming an "undergraduate migrant worker" is the result of a dual labor market, what kind of market mechanism is about their choice? This requires the use of labor market segmentation theory to explore the causes of this phenomenon.

## **2. Theoretical perspective and research methods**

### **2.1. Segmented labor markets theory**

Segmented Labor Markets Theory (SLM), which originated in the 1960s and 1970s, is a theoretical system composed of a series of theories, including dual labor market segmentation theory, job competition theory, and rank or class division (Jin, L. Z, 2002).

As far as China is concerned, after more than 30 years of reform and opening and economic development, Segmentation of labor market have become a significant feature of China's labor market, which is dynamic, local, and spatial. [11] Among the factors that lead to the division of the labor market, China is different from the West. China has a typical characteristic of institutional division, which is mainly affected by institutions (such as the household registration system, administrative monopoly regulation system, and local protectionist system, etc.) (Wu, K. M, 2012). In the form of segmentation, it has the characteristics of multiple segmentation. For example, a scholar divided the segmentation of the Chinese labor market into urban and rural divisions (geographic region divisions) and institutional divisions (including Labor market "and" out-of-system labor market ") and industry segmentation (Su,Y.Z, 2002). At this point, a multi-dimensional labor market segmentation pattern formed by the intersection of primary and secondary labor markets, urban and rural labor markets, departments, and occupational labor markets has officially taken shape in China (Li, J. H, & Zhang, M. L, 2012).

### **2.2. Research methods**

This article collects materials through in-depth interviews and participatory observation methods. From July to August 2019, the author visited a number of industrial zones in Chengdu and conducted an employment survey of some migrant workers. The target of this survey was a group of young people between the ages of 20 and 25 who had rural household registration or were from rural areas, had received college education or above, and had mixed occupations with ordinary migrant workers. Their characteristics are in line with the academic definition of " Undergraduate Migrant Worker ". The focus of the survey was on their past education experience and job search process. A total of 45 college student migrant workers were interviewed. The interview time for each subject was about 2 hours, which provided valuable first-hand materials for the research.

It is worth noting that although case study faces the shortcomings of small sample numbers and unconvincing. However, for the exploration of social issues, especially the study of complex social people, case study shows the individual's interpretation of social expectations and the individual's adaptation to structural forces such as social history through individual perspective. Finally, it outlines the general development context, survival trajectory, and thinking mode of the group, which hides behind the individual.

## **3. The connection between labor market segmentation and the phenomenon of "Undergraduate Migrant Worker"**

### **3.1. The dual labor market makes fierce competition in major labor markets**

The Dual Labor Market Theory holds that the labor market is not a whole, but is divided into two sectors with significant differences, namely the main labor market and the secondary labor market. According to relevant research by Chinese scholars, hold the view that occupations in the main labor market include state agencies, party and mass organizations, business leaders, professional and technical personnel, and clerks. And occupations in the secondary labor market include production and transportation workers and service workers, commercial workers, agricultural workers and so on (Gu, C. B, 2004). Compared with the secondary labor market, the main labor market has the salient features of high wage income, perfect social security system, comfortable working conditions, high level of satisfaction, many opportunities for personal promotion, stable work and so on. In this context, based on the difference between the primary and secondary labor markets, workers must give priority to the main labor market, but the contradiction between supply and demand in the market determines make that

the main labor market cannot be opened to everyone as a limited resource. Under the decision of market mechanism, the amount of human capital has become a fundamental factor in whether to enter the main labor market. For the country, improving the comprehensive quality of the entire nation, accelerating the process of higher education popularization, and continuously satisfying people's growing desire to receive higher education have been continuously implemented in recent years. However, the number of college students' supply is significantly higher than the demand in China's main labor market, which has directly led to rising barriers to entry into the main labor market. The level of education and professional category are important reasons that affect graduates' career acquisition. Due to rational thinking and mental accounting, many families will choose continuous education investment so that children can win the competition in the main sector, which leads the phenomenon of "the Post-graduate Craze" and "Certificate Craze".

The phenomenon of "Undergraduate Migrant Worker" arises from this background. If college students who graduate from ordinary universities fail, they will inevitably flow into the secondary labor market and even engage in the work of migrant workers, becoming "Undergraduate Migrant Worker".

"When I graduated from junior high school, I wanted to go to technical secondary school to learn technology, but my family was very opposed to it, saying that going to college is the right choice. I didn't get good grades at first, and I don't think I can get into a good university in the future. In the end, I entered a very poor university. When I chose a major, I learned management. I hope that I can join the company and become a leader after graduation. However, it is very difficult for management students who graduated from ordinary schools to find a job corresponding to their major."(LQF, male, born in 1996, graduated from XX College, unmarried, supermarket distributor)

This shows that the phenomenon of "Undergraduate Migrant Worker" is not only due to the low level of their own education and limited human capital, but also because of blindly admiring high-paying majors when they choose college majors. Then they have encountered awkward employment when graduating.

It is worth noting that college students are different from ordinary laborers. As a diploma representation of human capital, they perform outstandingly. Therefore, no matter from the psychological level or social expectations, they tend to choose the main labor market. This desire is even more urgent for college students from rural areas, "You must find a good job in the future. The whole family has spent so much attention on you, and never plan to eat in the soil like your parents. From elementary school to university, these words were repeatedly told by them. Now that I'm in college, can you say that I don't want a decent job? If everyone thinks so, how can individuals be so easy!"(CZ, male, born in 1995, graduated from XX College, unmarried, courier)

This means that the segmentation of the labor market caused by the existence of income differences and the human capital that is characterized by diplomas make the competition for university students' employment on the main labor market increasingly fierce. Therefore, in order to find a satisfactory job, some of them will first choose to engage in some "part-time" as a transition,

"Although I studied civil engineering, I will definitely not be a surveyor here all the time. This work is not as good as you think. We do the same work as migrant workers, but I have not found a better job. Poor family, you know ! I can only choose this small place. (SZ, male, born in 1997, graduated from XX College of XX University, unmarried, surveyor)

It can be seen that some of the "Undergraduate Migrant Worker" just choose to become migrant workers temporarily, not equivalent to the existence of "new generation migrant workers" as a stable social group. The main labor market is still attractive to them.

### **3.2. The imbalance in the allocation of human resources with partial surplus and shortage of talents caused by labor market segmentation**

Affected by geography, history, population, society, national system and other factors, China's various regions have shown an uneven economic development. From the perspective of regional division, the eastern region has the best development, the central region has the second, and the western region has the worst; In terms of urban division, provincial capital cities and special municipalities are superior to ordinary prefecture-level cities and small county towns. A prominent disadvantage of this imbalance in regional economic development is that the labor market is characterized by obvious regional divisions, and this relative division formed by regional economic differences will directly affect the rational allocation of human resources. Different regions represent different Development opportunities. Generally speaking, developed areas have many jobs, high wages, and bright prospects. Due to the lack supporting mechanisms to attract talents and human resource transformation capabilities, developing areas have limited appeal to college students.

Especially for rural college students who need to quickly improve the family's economic situation, their employment choices must first consider the return on education investment, development opportunities and future income expectations. Secondly, life pressure! "I think I may get better development opportunities in big cities. After graduating, I didn't return to the small county in my hometown. Instead, I chose to go to Guangzhou. The competition in Guangzhou was too great. I had studied software design and wanted to go to a large company like Tencent, but it was not satisfactory. After the New Year, I am still going to go back to Guangzhou to see if I can find a way out." (GC, male, born in 1995, graduated from XX College, unmarried, Street vendors)

Thus, the level of economic development and job treatment have become the fundamental driving force that affect their choice of employment area. This flow is also due to the imbalanced regional economic development in China, which is trendy and centralized. As a result, the talent markets in the developed eastern coastal areas and large and medium-sized cities are overcrowded; On the other hand, employment in small counties and vast rural areas is difficult to recruit, even if wages are not bad. Those who have a hard time finding a job in the talent market only have to go to the manpower market to seek work, and the situation of "college students and migrant workers competing on the same stage" has emerged.

### **3.3. The exclusivity of the main labor market has a "squeeze-out effect" on rural college students**

The dual segmentation of the labor market is closely connected with the stratification of social classes. In a stratified society, Different social classes try to monopolize the resources that they have in their own circles by establishing a series of qualifications, rules, and systems to restrict other people's access. Although these qualifications are open to all members of the society and can be obtained through individual efforts, they are exclusive in nature, that is, strong group protectionism. For example, the existence of insiders' cultural psychology has affected the job market, which makes college graduates from rural household registration lagging behind college students from urban household registration in the job selection process. This part of the difference is the result of labor market choices deviating from the market mechanism, and it is also the direct cause of the phenomenon of "Undergraduate Migrant Worker".

"After graduating, I have a good friendship in school. Some classmates with good family backgrounds asked me to go to K-sing, travel, visit their home, etc., but because of economic reasons, it is difficult to integrate into their circle. There was a certain distance between them, then I slowly rejected their invitation, naturally the connection was broken." (YP, male, born in 1997, graduated from XX College, Unmarried, barbecue owner) Culture is an identity that is created by a specific social group. Therefore, people in different circles have different cultural atmospheres, and differences in cultural strata are manifested as a cultural identity, which discriminates children who grow up in the lower cultural environment. In particular, children from rural families must first break through the constraints of the original culture and then integrate into new culture in order to be accepted by a certain social identity group. However, due to the cultural psychology of insiders, it is a long and tortuous process from breaking through cultural barriers to cultural adaptation.

## **4. Conclusion**

Based on the survey of the living situation and job-hunting experiences of 45 "Undergraduate Migrant Worker" and the theory of labor market segmentation, the study found that:

(1) The dual segmentation of the labor market makes the main labor market like a huge "black hole", which continuously attracts the in burst of college students, therefore it leads to the increase of barriers to entry continuously and affects the choice of employment market for the rural registered college students. (2) In China, the inter-regional economic development is unbalanced, and regional differences are obvious. The regional division of the labor market has resulted in an imbalance in the allocation of human resources with partial surplus and shortage of talents. (3) The market segmentation, which is under the control of social stratification order, has weakened the market competition based on the amount of human capital, moreover, the "crowding-out effect" is existed among the rural registered college students due to the exclusive factors such as internal cultural psychology and professional intergenerational inheritance in the main labor market.

Therefore, it is necessary to give full play to the competitive effects of market factors based on human resources, so as to break the ice of institutional isolation and cultural exclusion, accelerate the coordinated development of the region as well as provide equal employment opportunities for the rural registered college students.

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# THE EVOLUTION OF CHINA'S PRIVATE EDUCATION POLICY: HISTORICAL REVIEW AND PATH ANALYSIS

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## Abstract

Based on the policy texts of private education since the founding of the People's Republic of China and from the perspective of historical institutionalism, this article draws the following conclusions: under the shaping of state policies in different periods, China's private education has experienced three main stages: the elimination of private education (1949~1978), the recovery and preliminary development of private education (1978~1992), and the rapid development of private education (1992~2016); the evolution of private education policy has experienced punctuated equilibrium and gradual transformation as two main modes, which is determined by critical junctures and path dependence; government power and market mechanism play the role of dynamic mechanism of institutional change. The article suggests that the state should further clarify the respective responsibilities of the government and the market mechanism to realize the positive interaction between them.

**Keywords:** *Private education, education policies, historical institutionalism, government, market mechanism.*

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## 1. Introduction: China's private education is now at a critical stage

Private education is an important part of Chinese education. According to the 2017 national education development statistics bulletin published on the official website of the Ministry of Education of China, as of 2017, there were 177.6 thousand private schools at all levels, accounting for 34.57% of the total number of schools at all levels in the country; the number of students registered in private schools reached 51.2047 million, accounting for 19% of the total number of students in the country. (The Chinese Ministry of Education, 2018) Private education has made contributions in providing diversified and personalized education forms, improving the quality of education of the whole society, and safeguarding citizens' right to learn and receive education.

In 2016, China's legislature revised The Private Education Promotion Law, which was promulgated and implemented in 2002. According to the revised law, the state will continue to encourage private education, and the government shall create good conditions to promote the development of private education; in the meantime, the government should carry out classified supervision on different kinds of private schools, and private schools of the compulsory education stage are forbidden to operate for profit making. Besides, the government is about to make more detailed and strict regulations on the operation of private schools and educational institutions, such as running collectivization, merger and acquisition, being listed and so on. The strict management implemented by the state added to the worries of the whole society (especially the capital market) about the development prospect of private education, and it seems that private education in China is faced with challenges.

The expectation and anxiety of the private education industries to the new law is a miniature of the historical fact that development of private education was deeply influenced by the national policies since the founding of the People's Republic of China. The socialist nature of the state and public ownership economy occupying a leading position in economical operation have both led to the current situation that the public education dominates the whole education system in China. The survival and development of private education in China largely depends on the state policies, and it is the state that decides whether to tolerate its existence or encourage its development; at the same time, the market economy also has a profound impact on the development of private education. This paper will review the private education policies in various stages since the founding of the People's Republic of China, and explore the internal logic of the evolution of private education policies.

## **2. Analytical perspective: historical institutionalism**

Historical institutionalism is an important branch of New Institutionalism. Historical institutionalism developed in response to the group theories of politics and structural-functionalism prominent in political science during the 1960s and 1970s. (Hall & Taylor, 1996) On the basis of absorbing and drawing lessons from the mainstream theories of structural-functionalism, conflict theory and New Marxism, the theory of historical institutionalism holds that the conflict of competing for scarce resources among different interest groups is the core of politics; the political and economic structure of society makes different interest groups occupy different positions in the conflict of interest with each other, and some groups' interests are satisfied while the others' are deprived. In this process, the state is regarded as not a neutral "intermediary" between competing interest groups but a complicated "institution" that can build group conflict. Historical institutionalism emphasizes the essence of the asymmetries of power in the process of institutional development, and the role of path dependence in the process of institutional continuation and change: under the established socio-political and economic structure, institutions give some people more power, and accordingly, those who obtain more power will further maintain the institution. Through the understanding of path dependence, historical institutionalists put forward the theory of institutional change. According to historical institutionalism, the process of institutional change is generally divided into the normal periods of institutional existence and the critical junctures of institutional fracture. In the normal period, institutional change follows the pattern of path dependence, and there is a certain balance between institution and social circumstances as well as within institution. However, in the period of institutional fracture, the fierce change of institution will be possible, (He, 2002) which is named "punctuated equilibrium" (Krasner, 1984) by some researchers. Historical institutionalism not only presents a suitable theoretical lens for understanding institutions and institutional change, but also offers an explanation for the sources of change. (Huang, 2017)

Historical institutionalism's theories on institution change provides a good perspective for us to analyze the evolution of private education policy since the founding of the people's Republic of China. The development process of private education presents several distinct stages, and the continuation of policies in each stage and the transformation of policies in different stages are subject to the existing political and economic structure of the state. The theory of historical institutionalism helps us to explore the essential power of determining institutional change.

## **3. Historical review: the evolution of private education policy in China**

Through analyzing the policy texts and legal documents related to private education in different historical periods since the founding of the people's Republic of China, combined with different researchers' division of the development stages of private education in recent years, this article divides the development of private education into three main stages: the elimination of private education (1949~1978), the recovery and preliminary development of private education (1978~1992), and the rapid development of private education (1992~2016).

### **3.1. The elimination of private education (1949~1978)**

During the period of the Republic of China (1912~1949), the national government allowed private schools to be set up, and there were various kinds of schools at all levels run by non-governmental organizations, citizen individuals and foreigners. In 1949, the People's Republic of China was founded, and the new government took over public schools run by old government at all levels in the country, and organized the reopening of schools; from 1950 to 1951, the state changed all the colleges and middle schools run by foreigners into public schools to "resume the exercise of educational sovereignty"; in 1952, the Ministry of Education carried out the adjustment of colleges and departments throughout the country, and changed all the private universities into public ones; finally, the Ministry of Education ordered all private primary and secondary schools in the country to be taken over by the government and changed to public schools. Since then, all kinds of schools at all levels had been transformed into socialist public schools, and public education became the only one legal form of education in China. Private education was declared no longer legal, banned, and eliminated.

During that period, the central government had also briefly introduced the policy of allowing the existence of private education, but the implementation effect of the policy is extremely limited. Private education could not survive because of its conflict with "pure socialist ideology".

### 3.2. The recovery and preliminary development of private education (1978~1992)

Experienced ten years of social unrest during the Cultural Revolution from 1966 to 1976, the state began to reform its political and socio-economic system in 1978. On April 22, 1978, the Ministry of Education held a national education affairs conference in Beijing. Deng Xiaoping emphasized to improve the quality of education, improve the teaching level of science and culture, and better serve the socialist construction, which defined the basic direction for the development of education in the period. At the beginning of this stage, the state adopted an acquiescent attitude towards private education, which made private education began to recover slowly. According to statistics, from 1978 to 1982, eight private universities emerged in the field of higher education (Yang, 2002), and private primary and secondary schools and private vocational schools began to emerge. On December 4, 1982, the supreme legislature passed the Constitution of the People's Republic of China, which is known as the 1982 Constitution. It clearly stipulated that “the State encourages collective economic organizations, state enterprises and institutions and other non-governmental sectors to run various educational undertakings in accordance with the provisions of the law”. From the perspective of the fundamental law of the state, it was clear that private education was allowed to run educational undertakings as “non-governmental sectors”. On May 27, 1985, the Party passed The Decision of The CPC Central Committee on The Reform of Education System to encourage the development of private vocational education. On July 8, 1987, the former State Education Commission issued Several Interim Provisions on the Running of Schools by Non-governmental Sectors. It clearly stated that “running schools by non-governmental sectors is an integral part of China's education and a supplement to public schools”, “governments at all levels and education administrative departments shall encourage and support non-governmental sectors to run various education undertakings, safeguard the legitimate rights and interests of schools, and protect the running of schools.”, “try to help solve the difficulties in running schools, and commend and reward those who have made outstanding achievements in running schools.” The state policy once again clarified the legitimacy of private education, and even encouraged private education to grow and expand. Private education seized this historical opportunity period and gradually grew in scale, and achieved its comprehensive recovery and preliminary development.

### 3.3. The rapid development of private education (1992~2016)

In 1992, the central government decided to establish a market economy system in an all-round way and abandon the original planned economy system, and therefore, education policy of the state should be altered to fit in the market economy. In 1993, the state issued The Outline of China's Education Reform and Development, pointing out the basic tasks of education reform under the requirements of establishing a “socialist market economy system”. The outline points out that social organizations and individual citizens should be encouraged to run schools, and the government should encourage enthusiasm of the people in running schools and raise educational funds through various channels. Specifically, in order to raise funds for education and promote the development of education, the outline stipulated that the state encouraged and advocated factories, mining enterprises, institutions, social organizations and individuals to donate money to help students and raise funds for running schools, excluding taxes, and welcomed compatriots from Hong Kong, Macao and Taiwan, overseas Chinese, foreign groups and foreigners to provide financial support and donations to education. In order to raise funds for education, the state took the initiative to introduce private capital and foreign capital, and began to attach importance to the role of the market economy in the allocation of educational resources, which promoted the development of private education. In 1997, the State Council promulgated The Regulations on Running Schools by Non-governmental Sectors. The regulations not only clearly defined the rights, obligations and legal responsibilities of the schools run by non-governmental sectors, but also clearly defined the responsibilities of government to guarantee and support the running of schools by non-governmental sectors, which is a milestone in the development of private education.

In the 21st century, private education ushered in greater historical opportunities. At the end of 2002, the supreme legislature promulgated The Private Education Promotion Law, which marked the establishment of the legal system of China's private education. Private education started on the right track of running schools and teaching students according to law. With the comprehensive protection of national policies and laws for the legitimate rights and interests, private education has started a rapid development for more than ten years. According to the statistics of the Ministry of Education, at the end of 2002, the number of private schools at all levels and types in China was 61200, with a total number of 11.1597 million students (The Chinese Ministry of Education, 2004); by the end of 2015, the number of private schools increased to 155200, with a total number of 43.0191 million students (The Chinese Ministry of Education, 2015). Private education has grown into an important force that cannot be ignored by the state, government and society.

#### **4. Path analysis: from a historical institutionalism perspective**

Based on the theories of historical institutionalism, this study believes that as a kind of institutional change, the evolution of private education policy has gone through punctuated equilibrium and gradual transformation as two main modes, which is determined by critical juncture and path dependence; government power and market mechanism plays the role of dynamic mechanism of institutional change.

##### **4.1. Punctuated equilibrium led by government power: 1949~1978**

Since the founding of People's Republic of China in 1949, the new proletarian regime controlled over all industries in the country in a very short period of time, and rebuilt the whole national machinery according to the socialist ideology. In order to maintain ruling stability, the government managed to take full control of education system and transformed it into one that obeys the orders of the proletariat. Private education was defined as "bureaucratic capitalism, imperialism and feudalism" and eliminated by the state. During this period, the evolution of private education policy showed the characteristics of punctuated equilibrium, and the establishment of new regime was the first "critical juncture" in the process of private education policy change: under the strong direct interference of government power, the original education system was completely ruined.

##### **4.2. Gradual transformation led by government power: 1978~1992**

The second critical juncture in the process of private education policy evolution is that the state began to reform its political and socio-economic system in 1978. However, the institution had formed strong inertia and path dependence, and it was difficult to change it rapidly in a short time. Therefore, from 1978 to 1992, the state adopted a gradual reform policy, gradually reforming the old system and introducing new systems. In the field of education, the state had gradually reduced various restrictions on private education. From the initial acquiescence to its existence, it had gradually developed into a positive norm to guide its development and actively protect its rights and interests. At this stage, the evolution of private education policy showed obvious characteristics of gradual transformation, and the leading force to promote the system transformation was the government power.

##### **4.3. Gradual transformation led by both government power and market mechanism: 1992~2016**

In 1992, the state proposed to establish a market economy system, which became the third critical juncture in the process of private education policy evolution. A series of policies and legal texts encouraging the development of private education played a role in promoting private capital investment and running schools. Private education has achieved the fullest development with the help of market mechanism. In the process of advancing education reform and promoting the development of private education, the government had gradually transferred part of its power to the market mechanism. With the establishment and improvement of market mechanism, the market had gradually mastered the initiative to promote the development of private education. Under the market economy, the first batch of empowered private education subject had become the group of vested interests. They held the right of discourse that cannot be ignored in the later process of private education policy making, which had a profound impact on the trend of policy. However, the rapid development of private education has also brought some negative effects, including the expansion of education gap and the rising of family expenditure on education.

#### **5. Conclusion: build positive interaction between government power and market mechanism**

The development of private education is deeply influenced by state policies, and government power as well as market mechanism affect private education directly. Looking back on the history, the absence of either government responsibility or market economy will have a negative impact on the development of private education, so the article suggests that the state should further clarify the respective responsibilities of the government and the market mechanism to realize the positive interaction between them. The government should not only encourage the development of private education, but also take necessary supervision to prevent it from excessive profit seeking and damaging the education equity.

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## TEACHERS' OPINIONS ON PROFESSIONAL SUPPORT MEASURES FOR NOVICE TEACHERS IN LATVIA

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### Abstract

Retention of teachers in education system is a serious problem in Latvia. This is a challenging issue, especially for novice teachers. Professional support measures such as mentoring, in-service training or emotional support are crucial for novice teachers to remain and continue working in school. The aim of this research is to explore opinions of Latvian teachers about professional support measures that are both available and needed to be introduced for novice teachers. This paper presents a part of the research results which were obtained during an on-line survey (N=1258) conducted by the Latvian Trade Union of Education and Science Employees in 2018. The questionnaire comprised the statements on following measures of professional support: methodological, financial, material and technological. The statements were assessed by using 5-point symmetric Likert scale (strongly agree, slightly agree, neither agree nor disagree, slightly disagree, strongly disagree). The results witness about regional disparities mainly between the capital city Riga and other regions: there are statistically significant ( $p < 0.05$ ) differences in opinions of the teachers representing different regions of the country. The respondents agree that there is a lack of well-structured and uniform support system for novice teachers at national level. In many schools a mentoring is not provided at all, or mentoring is not a paid activity for those who support novice teachers. In general, the teachers are positive about availability of an emotional support and in-service training in the school they work. The most critical opinions are about material and financial support that novice teachers can access. The authors conclude that different professional support measures are available for novice teachers in Latvia, however, there is no support system in place to address which functions and support measures should be implemented at national, municipal or school level. Policy makers should focus on national teachers' support guidelines which would allow schools to ensure the most appropriate environment for novice teachers so that they would like to continue their careers in teaching profession.

**Keywords:** *Mentoring, novice teachers, professional support.*

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### 1. Introduction

First years of teaching are the most determining in a teacher's professional life influencing, for example, job satisfaction and the length of career. Understanding and definitions of a novice teacher are ambiguous. In most of the studies, a novice teacher is considered as the one with less than three years of teaching experience (e.g. Huberman, 1993; Petty, Good, & Putman, 2016), whereas, for example, in TALIS 2018 survey a novice teacher is defined as an educator with less than 5 years of in-service experience (OECD, 2019). As it has been revealed in previous studies (e.g. Buchanan et al., 2013; Ingersoll, Merrill, & May, 2014), many novice teachers leave teaching soon after their first in-service experience. Retention of educators, especially novice teachers, in education system is a serious problem in Latvia as well as in many other countries. According to Eisenschmidt, beginning teachers in school need support in professional, social and personal dimensions (Eisenschmidt, 2006). It means that teachers need to acquire their roles, develop self-confidence, professional skills and knowledge as well as become members of a school community through integration into a school and profession in general. Colleagues can help to understand internal norms, values, and structure of a school, and more experienced teachers normally contribute to developing professional identity of novice teachers and their teaching approaches. Most of the novice teachers face so called 'reality shock' (Blakley, 2006), because their expectations are often confronted by reality when working in the real classroom changes their initial conceptions and own philosophy. Successful induction programmes such as mentoring and nationally or locally organized

support systems are offered to strengthen coping ability of novice teachers. In different countries newly qualified teachers are offered different support (European Commission/EACEA/ Eurydice, 2015; Parker, 2010); lack of support is often reported as one of the factors influencing teacher's professional future. In almost two-thirds of the countries in Europe beginning teachers have access to structured induction phases of many different organizational patterns, however, Latvia is among those countries where the induction phase for fully qualified teachers does not exist (European Commission/EACEA/Eurydice, 2015) even though mentoring in Latvia is available. Novice teachers who had a mentor have better organizational skills and they cope with their responsibilities more easily (Fletcher & Mullen, 2012) what in turn leads to greater possibility of teacher retention in a school (Freiman-Namser, 2001; Kelley, 2004). According to TALIS 2018 survey, school leaders in all OECD countries believe that mentoring is important for both teachers' work and students' performance; nevertheless, only 22% of novice teachers in OECD countries and 16% in Latvia have had a mentoring (OECD, 2019). The most widespread types of professional development in OECD countries are courses and seminars. In Latvia, 95% of teachers have participated in that kind of activities, and 61% of the teachers have been involved in coaching activities (OECD, 2019). Still, the teachers have pointed out that in certain areas an offer of professional development opportunities should be improved and expanded, for example, there is a demand for additional knowledge and skills in communication and information technologies, teaching in multicultural and multi-language environment, and teaching children with special needs. From all above mentioned, Latvian teachers consider improved skills in information technologies as the most required. In general, according to the OECD data teachers in Latvia are satisfied with their professional development and 89% of them admit its practical usefulness.

Professional support measures such as mentoring, in-service training or emotional support are crucial for novice teachers to remain and continue working in school. Other measures of professional support such as financial, material, technological, methodological, and societal are also important. The aim of this research is to explore opinions of Latvian teachers about professional support measures that are both available and needed to be introduced for novice teachers.

## 2. Research methodology

This paper focuses on support for novice teachers by presenting a part of the research results which were obtained during an on-line survey conducted by the Latvian Trade Union of Education and Science Employees (LIZDA) in November, 2018. The questionnaire comprising statements on methodological, financial, material, and technological measures of professional support was developed and posted on the webpage *visidati.lv*. Information about the survey was disseminated via LIZDA homepage, trade union's member organizations in schools, social media, and website *eklase.lv*. The respondents were offered to assess the statements by using symmetric 5-point Likert scale (strongly agree, slightly agree, neither agree nor disagree, slightly disagree, strongly disagree). The research was conducted according to the methodological and ethical principles of the online survey (Toepoel, 2015). The data were processed and presented solely in an aggregated way thus ensuring anonymity of the respondents.

The research sample was made of 1258 teachers representing all five statistical regions of Latvia: Vidzeme (25%), Kurzeme (15%), Zemgale (18%), Latgale (24%) and Riga region (18%). More than half of the participants (68%) are LIZDA members. Most of the respondents (60%) represent rural municipalities, whereas 40% are from cities. Among the respondents, 94% are women and 6% are men. The respondents represent all levels of general education system in Latvia (preschool, elementary school, primary school, secondary school) and positions (e.g. teachers, school leaders); they are with different seniority and represent different age groups.

Standard deviation (SD) and mean (M) was calculated for the descriptive analysis of quantitative data by using statistical program SPSS (Statistical Package for Social Science v21). Independent samples t-test was calculated to analyse differences in opinions of the respondents representing different regions of Latvia.

## 3. Results

The survey results are outlined according to the statement groups related to methodological, financial, material, and technological measures of professional support. Generally speaking, the results show regional disparities mainly between the capital city Riga and other regions: there are statistically significant ( $p < 0.05$ ) differences in opinions of the teachers representing different regions of the country. For example, contrary to the comparison of all other regions, there are statistically significant differences ( $p < 0.05$ ) in teachers' opinions representing Riga and Latgale regions in assessment of importance of all

support measures: methodological support (Riga M=2.24; Latgale M=1.97), financial support (Riga M=1.90; Latgale M=1.92), material and technological support (Riga M=2.11; Latgale M=2.05). Methodological support as very important was mostly emphasised by the teachers in Latgale (51%) and Kurzeme (47%) whereas material and technological support was mostly assessed as the most significant by the respondents in Latgale region (43%). This can be partially explained by different regional socio-economic situation, wealth of local municipalities, and other specifics such as number of pupils in the classroom, workload and age of teachers.

As already mentioned previously, mentoring and support of more experienced colleagues is crucial for novice teachers to remain in teaching profession after their first years in school. Regarding integrated *methodological support*, the survey respondents agreed that there is a lack of well-structured and uniform support system for novice teachers at national level. As research results reveal, mentoring is not provided in many schools. This was indicated by 26.2% of the respondents while 13.2% of the respondents were not even informed about availability of mentoring in their schools as they could not answer this question. 44% of the teachers admitted that mentoring is not a paid activity for those colleagues who support novice teachers and 51.7% pointed out that teaching and regular workload for mentors is not decreased due to mentoring responsibilities. That in turn does not motivate teachers of greater seniority to become mentors. Another challenge is providing a mentor of the same school subject what novice teacher delivers. 78.4% of the respondents agreed (strongly agreed or slightly agreed) that mentoring for novice teachers is available in their schools during their first year of in-service. In general, the teachers were positive about availability of emotional support and in-service training in the school they worked. Opinions of the respondents on additional knowledge that novice teachers need are shown in the Table 1.

Table 1. Statements in the questionnaire on additional knowledge that novice teachers need in starting their careers.

Additional knowledge/ support that novice teachers need	Strongly agree		Slightly agree		Neither agree nor disagree		Slightly disagree		Strongly disagree		No opinion	
	No	%	No	%	No	%	No	%	No	%	No	%
Mentoring on the basis of respective regulations in every school	545	43.3	413	32.8	126	10.0	43	3.4	18	1.4	113	9.0
Knowledge on rights and responsibilities of teachers, parents and children	632	50.2	401	31.9	101	8.0	24	1.9	12	1.0	88	7.0
Knowledge on better cooperation with colleagues in a school	485	38.6	453	36.0	170	13.5	45	3.6	17	1.4	88	7.0
Knowledge on establishing positive communication with pupils and their parents	576	45.8	460	36.6	106	8.4	26	2.1	15	1.2	75	6.0
Knowledge on how to prepare teaching materials effectively	591	47.0	430	34.2	116	9.2	24	1.9	19	1.5	78	6.2

The survey revealed more critical opinions about *material, technical and financial support* that novice teachers can access. The teachers were asked to assess the statements related to remuneration and impact of the lower salary rate on the motivation of young people to engage in teaching profession. Nearly all teachers agreed (90%) that the lowest rate of wages for teachers set out in the regulatory enactments does not increase the prestige of the profession (92% of Riga teachers supported this statement). They also believed that the salary rate of the teacher cannot be lower than the average salary in the country, multiplied by a factor of 1.2 (93% of Riga and 94% of Vidzeme respondents). Regarding this statement, opinions of teachers in Riga and Latgale regions differ significantly ( $p < 0.05$ , Riga M=1.36, Latgale M=1.55), as well as those represented by the respondents from Riga and Zemgale regions ( $p < 0.05$ , Riga M=1.36, Zemgale M=1.46). In comparison to the respondents from other regions, the teachers from Vidzeme region more frequently strongly agreed or slightly agreed (97%) that teacher remuneration does not motivate young people to choose a job in this profession. Zemgale teachers more often (81%) than teachers in the country on average (75%) agreed with the statement that when students with special needs are integrated in general education institutions, teachers are not paid for any additional duties. Regarding this statement, regions of Riga and Latgale have statistically significant differences ( $p < 0.05$ , Riga M=1.36, Latgale M=1.64).

In Latgale, teachers more often (64%) than average in Latvia (58%) strongly agreed and slightly agreed that the costs of their professional development activities were covered by themselves during the period of the last three years. The regions of Riga and Latgale, contrary to the comparison of all other regions, had statistically significant differences ( $p < 0.05$ , Riga  $M = 2.87$ , Latgale  $M = 2.42$ ) regarding this statement. Normally in Latvia costs of the seminars and professional development courses for teachers are covered by municipalities. If this is mostly done by teachers themselves, it indicates on limited possibilities of municipalities.

In relation to the already available support measures, opinions of the respondents are presented in the Table 2. It is obvious that in most of the schools, particular material and financial support measures are rather poorly provided.

Table 2. Statements in the questionnaire on availability of support measures for novice teachers.

Availability of support measures at school / municipality level	Strongly agree		Slightly agree		Neither agree nor disagree		Slightly disagree		Strongly disagree		No opinion	
	No	%	No	%	No	%	No	%	No	%	No	%
Freely available methodological materials	236	18.8	363	28.9	236	18.8	208	16.5	145	11.5	70	5.6
Professional development courses and seminars	635	50.5	406	32.3	81	6.4	20	1.6	18	1.4	98	7.8
Emotional support provided by senior colleagues	431	34.3	508	40.4	144	11.4	47	3.7	27	2.1	101	8.0
Additional and paid working time for preparation teaching materials	57	4.5	62	4.9	166	13.2	132	10.5	486	38.6	355	28.2
Video training for getting started	34	2.7	70	5.6	163	13.0	119	9.5	503	40.0	369	29.3
Service apartments provided by local municipality	56	4.5	102	8.1	120	9.5	82	6.5	482	38.3	416	33.1
Transport compensation provided by local municipality	70	5.6	58	4.6	117	9.3	81	6.4	569	45.2	363	28.9

Regarding provision of health insurance there are statistically significant differences between the regions of Riga and Latgale ( $p < 0.05$ ); in the region of Riga 75% of the respondents have received health insurance, while in Latgale there were only 21%, which is the least result in comparison to all other regions. Approximately 40-50% of teachers in all regions had free catering in school; there were no statistically important regional differences in this.

More than half of the respondents believed that novice teachers should have lower work load at the beginning of their career (28.7% strongly agreed and 29.7% slightly agreed) in order to complete all responsibilities duly and professionally.

In general, the survey results revealed that in the regions of Latgale and Riga teachers were more likely to assess all forms of professional support as important, so they felt the need for aid. There are no statistically significant differences in opinions of trade union members and other respondents.

#### 4. Discussion and conclusions

The authors conclude that different professional support measures are available for novice teachers in Latvia, however, there is no support system in place to address which functions and support measures should be implemented at national, municipal and school level. The TALIS 2018 survey indicated following the most common priorities for policy intervention reported by teachers: 1) reducing class sizes; 2) improving teacher salaries; 3) offering high-quality professional development for teachers, and 4) reducing teachers' administration load (OECD, 2019). Considering these priorities, Latvian policy makers also should focus on implementation teachers' support guidelines at national level. This would allow schools to ensure the most appropriate environment for novice teachers so that they would like to continue their careers in teaching profession.

Even though mentoring is available, still many teachers lack this opportunity. Also, teachers of greater seniority may lack appropriate support and motivation to become mentors as often mentoring is not a paid activity and is not included in teacher workload. Material and financial support measures such as transport compensation, increased remuneration, adequate professional development seminars would increase retention of novice teachers into education system.

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## EMPLOYER BRANDING AS RECRUITMENT AND RETENTION TOOL FOR THE UNIVERSITIES

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### Abstract

Increasing competition for the best employees calls for the search of the comprehensive strategies to attract and retain potential and current employees. Despite different business and academic work contexts, number of employer branding activities applied by business companies might be transferred to universities. Literature review shows positive associations between employer branding activities to attracting and retaining employees at various types of organisations. However, the implementation of various employer branding activities remains challenging for organisations and is insufficiently explored in the context of at higher education human resource management. The authors of this paper reflect upon the main aspects of the employer branding strategy, opportunities available and suggest insights into its practical implementation at universities.

**Keywords:** *Employer branding, recruitment, retention, employer value proposition.*

### 1. Introduction

Nowadays universities are increasingly competing on national and global markets not only for local and international students but also for academics management professionals. This tendency is paralleled by uneven and decreasing public funding for universities, increasing competition for best talents with other universities and business companies. Universities are driven by the need to find comprehensive strategies for effective human resource management (HRM) – recruiting and retaining the best employees, academic as well as administrative staff. Moreover, universities have to update their traditional human resource (HR) practices in order to be attractive enough for the young generation in academia, to be visible as potential employers among other players in the labour market. Employer branding (EB) is one of the HR instruments that proves to be effective with business companies and can be potentially applied at universities in spite of the increasingly complex academic contexts.

Ambler and Barrow (1996) defined employer brand as “package of benefits” provided by employment and identified with the employing organization functional benefits (e.g. training, career development, skills and other job related activities for development), economic benefits (e.g. reward and remuneration) and psychological benefits (e.g. identity, recognition and belonging). Employer branding shall be therefore considered as the blend of attraction, engagement and retention initiatives with company's positioning, attractiveness, and visibility as an employer on the other hand. From a job-market perspective, employer branding has been suggested as an effective way to position the organisation in highly competitive labour markets. Current trends in public pressure for the research and education quality, and performance based government funding intensifies the competition among higher education institutions (HEIs). As a result, they seek for innovative solutions to cope with emerging challenges in attracting and retaining talents, increasingly adopt a more business-like stance and utilise professional marketing practices (Veloutsou et al., 2015). In spite of the differences in business and academic work contexts, their organisational cultures, management strategies and funding opportunities employer branding strategy as whole or its distinct solutions could be successfully applied at universities.

A number of academic literature and research exploring the associations between development of employer brand in companies and performance (e.g. increasing employers' engagement and productivity and reducing turnover) has been published in past decades (Backhouse and Tikoo, 2004; Gilani and Cunningham, 2017; Lievens, F., Slaughter, J., 2016; Theurer et al., 2016). Recently more research dedicated to different aspects of employer branding at HEIs emerged (Bakanauskiene et al., 2011; Broši and Welpe, 2014; Erasmus et al., 2015; Hemsley-Brown et al., 2016, Hamidizadeh, Ali & Fadardi, Mansoureh, 2019). Although both potential and current employees are discussed in the most conceptualisations of employer branding (e.g. Lane, 2016), the majority of empirical research focuses on recruitment in particular. Similarly, the majority of research on EB at HEI explores the aspects of the branding activities aimed at attracting and retention of academics as a core HR group. EB focusing on administrative staff remains relatively under-researched.

## 2. Conceptualisation of employer branding

Since **employer brand** concept introduction by Ambler and Barrow (1996), this area received attention of the researches as well as HRM professionals. Further on the process of employer branding has been defined as an approach to recruitment and retention that “involves internally and externally promoting a clear view of what makes a firm different and desirable as an employer” (Lievens, 2007, p. 51). The concept reflects a broad spectrum of ideas related to the way in which potential and current employees interact with a company’s brand and, in particular, the company’s brand image as an employer (Ambler and Barrow, 1996; Ewing et al, 2002; Backhaus and Tikoo, 2004). Historically the branding concept has been developed in marketing area, but over time has become one of the important strategies of human resource management, especially in recruitment (Cable and Turban, 2001). Following the Sparrow and Ottaye (2015) creation of employer brand could be seen as a three-step process:

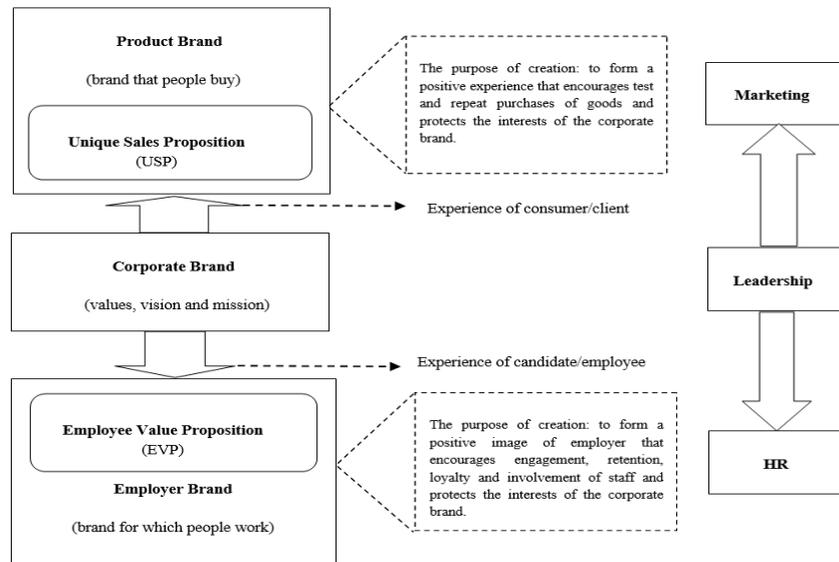
1. Development of the **employee value proposition** (EVP) based on information about organisation’s culture, management style, remuneration, training and career development opportunities, work-life balance, qualities of current employees, current employee image and impressions of product or service quality;

2. **External marketing** of EVP to targeted potential employees designed to attract applicants as well as support, align and enhance corporate brand;

3. **Internal marketing** aimed at carrying the “brand promise” made to applicants, embedding it into the organisation culture and ensuring commitment by employees to the values and goals encoded in the brand.

EVP is the core element of the employer brand (i.e. brand for which people work) and should be differentiated from the **unique sales proposition** (USP) that lies at the heart of product or service brand (i.e. brand that people buy). In the first case, the experience of candidate or employee matters and in latter case the experience of consumer/client matters the most. In spite of the differences of the two, both are linked via corporate brand concept, which represents the manifestation of values, vision and mission of the organisation. Relationship between the abovementioned concepts is represented in Figure 1.

Figure 1. The relationship between corporate brand, product brand and employer brand. Source: Mokina (2014).



The research and discussions over the EB is still evolving at the intersection of marketing, human resources management and organisational psychology. Consequently the academic literature and research approaches this phenomenon from different theoretical perspectives that results in lack of common understanding among academics and practitioners on the definition, underlying theoretical assumptions (Moroko and Uncles, 2005; Theurer et al., 2016) and deliverables of EB.

Since the initial concept of EVP expressed in terms of functional, economic and psychological benefits emerged, various authors have further explored and expanded the list of values that seem to predict favourable employee attitudes. According to Berthon et. al., (2005) and Uppal et. al. (2018) the following EB value attributes are generalised.

**Economic value** – the degree to which the employer provides above average rewards, compensation and benefits, job security and promotion. Researchers and HR practitioners quite unanimously agree on inevitable presence of this element in majority of motivation systems.

**Reputation value** – the degree to which the employer meets employees' expectations and perceptions, supports fair business relationships and holds unique intellectual property assets. According to the report by Thomson Reuters and Interbrand (2004) business's most valuable asset is its good name, its brand and reputation. University reputation is associated with international rankings (e.g. QS World University Rankings, Miltirank, Times Higher Education), especially having in mind that they incorporate the academic and employer reputation metrics. Working for the highly ranked university creates the added value for the individual CV of academic which is highly relevant for international mobility and employment pursuit.

**Development value** – the degree to which the employer provides recognition, self-worth, confidence, career-enhancing experience that serves for the future employability. Employer branding global trends study report (2014) refers to the career development as one of the most important attributes in attracting new talent to a company.

**Working environment value** - the degree to which the environment and conditions at work support the employee needs and expectations. One of the important aspects of this value of growing importance is related to the kind of balance between work and life could be arranged. Together with compensation (47,1%), work-life balance (41%) constitutes one of the top attributes influencing employer selection according to the Global Talent Monitor (2020). This particular attribute refers to the value creation for employee in terms of flexible work schedule, family holidays, consultation, childcare services as well as other means that could be offered by the employer in order to make sure better work-life balance.

### 2.1. University brand management

Ideas about employer branding goes beyond the initial focus on more effective management of recruitment and retention, thus is shaped in broader employer branding strategy characterised by the set of strategic activities. In spite of the spreading of the EB activities at companies in recent decade only 17% of companies who participated in the 2014 Employer Branding Global Trends Study had a clear employer branding strategy, 35% had the strategy, but felt the need of further development. "Across regions many companies are still in the early stages of their employer brand strategy" (Minchington, 2014, p. 12). The percentage of universities having the targeted employer branding strategy is expected to be even less. Companies experience certain difficulties with setting the indicators and measuring benefits of EB strategy. However social media participation (11%), defining EVP's (11%), talent development strategy (9%) and career website development (9%) are supposed to be the most effective activities to enhance the employer brand.

Employer branding is an example of how organisations convert their values and culture into EVP that makes them distinctive from other players in the market. This opens up the space for HR to become involved with marketing professionals acknowledging a key role in shaping the corporate brand (Sparrow and Otaye, 2015). It is argued that the head of HR should be seen as the main member of the branding team as it develops the policy that influences the creation of brand, in particular recruitment programs, adaptation of new employees, training and rewarding (De Chernatony, 2006). However, the EB strategy ownership in companies evolves with the time as well. Needless to say, that this is true to the business companies and does not take into consideration all peculiarities and realities of the university HRM policy and practices. The role of the university as an employer is rarely discussed (Matongolo et al., 2018, Hamidizadeh et al. 2019), much greater attention of the researchers is given to the university brand that is build and developed in order to attract potential students and the related topics (Chen, 2019; Maresova et al. 2020).

HR professionals' readiness to adapt and be the part of the more strategic approach is crucial as the process is characterised by complexity, conflict and lack of clarity in terms of how to apply it. Although HR literature argues that HR status has firmly established itself in terms of status and contribution to the organisation effectiveness (Armstrong, 2007), research shows that there is both role conflict and role ambiguity (Mansour et al., 2015). Researches received some evidence that, the role of HR at HEI has become increasingly strategic, proactive and intended to apply more business-like practices.

As it is shown in the Employer Branding Global Trends Study (2014), the employer brand strategy is increasingly managed by the marketing and communication professionals instead of leaving it in the sole domain of HR departments. It stresses the importance of the holistic approach to EB strategy that would be focused not solely on recruiting talents, but also on employee engagement and retention. This approach requires effective coordination and input from different units of the organisation.

### 3. Discussions

There are many EB activities characterised by high impact at relatively low costs that could be applied by universities. Therefore, we are suggesting the following four recommendations for the universities employer branding strategy development:

1. Discuss the place and scope of the EB in the university strategic plan (e.g. marketing strategy or/and HR strategy). It is advised to focus on 3-5 activities that are related to recruiting and retaining talents (ideally targeted at academic and administrative staff respectively);

2. Define your EVP based on distinctive university assets and most important attributes which target audience is seeking as employment experience;

3. Delegate the responsibility (decide on who will take the EB leadership – PR/Communication department or HR department and how the brand promise and its implementation will be coordinated);

4. Communicate your EVP to targeted audiences (applicants and potential employees, apprentices/trainees, current employees) via selected communication channels (social media, intranet, other) and brand ambassadors (prominent academics, administration representatives, alumni, other).

There is a need for the better clarity on driving motivators of attraction, engagement and retention of current employees and identification of the gaps between the aspirations, expectations of employers and employees about the employment experience.

It is important for universities to create their online presence and look after all key channels to engage with the key audiences. As is shown in Employer branding global trends study report (2014) social media (76%) is the main communication channel for promotion of employer brand. Universities must be ready to make sure the presence and communication of the brand via social media channels (e.g. Facebook for corporate communication media, social networking, service and LinkedIn for business and employment-oriented social media service for professional networking, including job posts and job seekers CVs). Building attractive and easy to navigate career page on your university website that include information on benefits of working for the organisation, testimonials of current employees, mentoring programmes for new employees, training opportunities, etc. would greatly contribute to EB.

In the course of the implementation the abovementioned recommendations universities should be aware of the differences that could be associated with the age, gender and current employment status of the target EB groups (Alniacik and Alniacik, 2012).

In order to take forward the discussion on university employer brand the complex context and nature of higher education institution shall be taken into consideration where academics constitute the core group of employees, administrative staff has different employment terms and conditions, and there is a special group of employees having a double role. The business model approach to employer branding seems to be potentially easier applicable to administrative staff, however this approach does not bring the holistic solution for university HRM.

#### 4. Conclusions

The article has focused on employer branding conceptualisation and research findings that are associated with employer recruitment and retention. Ideas of EB research and implementation at business companies are generalised to provide insights into its practical implication at universities. It was claimed that universities could potentially implement a range of EB activities for recruiting and retaining talents – discussing the place, scope and ownership of EB in university strategic plan, defining and communicating employer value proposition to targeted audiences via selected communication channels. There is a need for differentiated EVP approach to academic and administrative staff based on the analysis of their needs and expectations. However, complex academic contexts should be seriously considered before taking the call for EB action at universities. Implementing the EB activities even at small scale could bring important strategic advantages to the universities HRM and vice versa – maintaining status quo puts universities at risk of poorer results in attracting and retaining the talents.

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# ANALYSIS OF CHINESE POLICY OF TUITION-FREE NORMAL COLLEGE STUDENTS: PURPOSE, CONTENT AND EFFECT

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## Abstract

The Chinese policy of tuition-free normal college students implemented in 2007 was replaced by the policy of “state-financed” (also tuition-free) normal college students in 2018. Thus it is necessary to review the process of the policy of tuition-free normal college students, the purpose of this education policy is to alleviate the social problems of the imbalance in the distribution of teachers, the shortage and low quality of rural teachers. The main policy content includes recruit students mainly from poor central and western provinces, and they must teach in their home province for at least 10 years after graduation. The process of policy implementation includes policy propaganda, policy decomposition, organization and material preparation, policy experiment and comprehensive implementation, coordination and monitoring. This article mainly uses document research and interview methods, plus analysis of relevant statistical data, and found that, the policy has basically achieved the expected purpose, but there are still many problems in the implementation process, such as the tuition-free normal college students’ studying motivation is weak, the low satisfaction of the tuition-free normal college students with the policy content, and graduates have a relatively higher percentage of defaults of contract.

**Keywords:** *Chinese education policy, policy of tuition-free normal college students, analysis of education policy, tuition-free normal college students, imbalance in the distribution of teachers.*

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## 1. Introduction

In May 2007, the Chinese ministry of education and other four departments promulgated the “*Implementation Measures for Free Education of Normal Students Directly Under the Ministry of Education (Trial)*”, and then the policy of free education for normal students began to be implemented. By July 2018, when it was replaced by the policy of “state-financed” (also tuition-free) normal college students, the policy had been implemented for 11 years. Policy alternatives means the end of a policy (Chen Zhenming, 2003). After the end of a policy, a comprehensive and systematic summary of it will help people to comprehensively review all aspects of the policy, However, since the end of the free education policy for normal students in 2018, there has been little review paper in this area by domestic scholars, so this paper intends to analyze the purpose, content and effect of this policy.

## 2. Policy problems and policy objectives

### 2.1. Policy problems

The policy of free education for normal students is mainly aimed at the social problems of unbalanced distribution of teachers, lack of rural teachers and low quality of rural teachers. For a long time, Chinese educational resources show a huge difference between urban and rural areas and between different regions. Rural-urban disparity and east-west disparity featured Chinese educational landscape. A large part of this disparity in educational resources are due to the differences in their teacher resources.

The imbalance of teacher team is first manifested in the surplus of urban teachers and the shortage of rural teachers. For example, in 2005, a special supervision and inspection of 109 primary and secondary schools in 15 counties of Jiangxi, Henan, Hainan, Guangxi, Sichuan and Qinghai by the state education supervision group showed that, the phenomenon of urban teachers overstaffed and rural teachers understaffed is common in the six provinces (National education supervision group, 2006). secondly, it also shows that the number of teachers in the eastern region is surplus while there are still a certain number of informal teachers (mainly called “supply teacher”, which outside the establishment) in the western region, the regional differences are still obvious. the third problem is the low quality of teachers in some rural areas. According to a survey, there are still more than 167,000 rural teachers who do not meet the national requirements as a qualified teacher in 2010 (Wu Yue, 2010).

In this context, the problem of non-benign flow of rural teachers makes the problem more serious. Many studies have pointed out that there has been a serious loss of teachers in rural primary and secondary schools in central and western China. For example, A scholar take two towns in, Kaifeng City,

Henan Province as research cases and find that from 2002 to 2005, 118 teachers flowed out of these two areas, with a loss rate of 11.2% (Ma Lili, 2007).

Therefore, the key to solve the imbalance of teachers lies in the supplement of rural teachers, especially to reduce the flow rate of rural teachers. The free education policy for normal students is one of a series of policies aimed to solve this problem. Among them, the provisions directly related to this problem are: the free normal graduates want to work in urban schools should first teach in rural compulsory education schools for at least two years. In this way, the state can directly supply teachers to rural areas through policies and regulations.

## 2.2. Policy purpose

In 2007, the policy text defined the purpose of free education policy for normal students as "to form a strong atmosphere of respecting teachers and valuing education, to make education the most respected cause in the whole society; to cultivate a large number of excellent teachers; to promote the education quality of teachers, to encourage more outstanding young people to be lifelong educators." but in fact, the purpose of the policy is not so simple and clear. The policy text clearly points out that, first of all, free normal students should not only promise to be engaged in primary and secondary education for more than ten years after graduation, but also those who work in urban schools should first serve as teachers in rural compulsory education schools for at least two years. Secondly, free normal students should return to their hometown to teach after graduation. It can be seen that the policy of free education for normal students is not only to cultivate a large number of excellent teachers, but also to promote the balance of educational resources, especially teachers' resources.

In academic community, some researchers pointed out that the main purpose of this policy is to promote the reform process of rural primary and secondary school teachers, and improve the overall quality of rural teachers (Lu Keliang et al, 2009). Even in the eyes of the media, free education for normal students is also aimed at achieving education equity by alleviating the shortage of rural teachers (Liu Hongxia, 2018). at the press conference held by the Ministry of education in September 2011, Xu Tao, then director of the department of normal education of the Ministry of education, also made clear that the focus of the free education policy for normal students was to "train backbone teachers for rural schools" (Henan Provincial Department of Education, 2012).

Therefore, this paper holds that there are two main purposes of the free education policy for normal students, namely, first, to promote the balanced development of teachers. The second is to train a large number of excellent teachers, and promote the quality of teachers through the reform of teacher education in some famous normal universities.

## 3. Policy implementation and policy effect

### 3.1. Policy implementation

The process of policy implementation mainly includes policy propaganda, policy decomposition, material preparation, organizational preparation, coordination and monitoring (Chen Zhenming, 2003).

**3.1.1. Policy propaganda.** In order to carry out the policy effectively, we must first unify people's ideological understanding. Policy propaganda is an effective means to achieve this goal. The policy implementation institutions involved in the free education policy for normal students mainly include the education department, personnel department and other relevant government departments and normal universities.

The publicity of the government departments is mainly through the government working conference, press conference and relevant media. For example, at the "two sessions" in March 2007, Premier Wen Jiabao announced in the government work report that the state will implement the policy of free education for normal students this year. (Wen Jiabao, 2007) Later on May 18, 2007, the Ministry of Education held a press conference to introduce relevant information.

The publicity of universities is mainly reflected in the enrollment process. For example, Shi Ningzhong, President of Northeast Normal University at that time, said that, Northeast Normal University sent 21 publicity groups to some key middle schools in Jilin Province to publicize the significance and policies of free education for normal students, in order to recruit a batch of good graduates. (Northeast Normal University, 2007)

**3.1.2. Policy decomposition.** Generally speaking, the launch of a policy usually only points out the basic direction to achieve the policy objectives. Therefore, it is necessary to decompose the policy objectives under these basic principles. The policy of free education for normal students involves many stakeholders, and the implementation process is very complex. The policy of free education for normal students can be broken down into enrollment policy, training policy, enter post-graduate school policy and employment policy.

In terms of enrollment policy, in May 2007, the Ministry of Education issued *Circular of the Ministry of education of the people's Republic of China on the enrollment of free education normal students in normal universities directly under the Ministry of Education*. which requires the provincial college enrollment committee and the normal universities directly under the Ministry of Education to seriously formulate enrollment implementation measures. The provincial departments take Fujian Province as an example. The Education Department of Fujian Province requires each city's education bureau to make the enrollment of free education normal students in advance. The accepted free education normal students must go to the city's education bureau where the students are from before entering university to sign the *free normal student education agreement* issued by the provincial education department (Fujian Provincial Department of Education, 2007). In other aspects, the steps of policy decomposition are similar. First, the central government issues their policies, and then the provinces and universities make their specific policies and implement them.

**3.1.3. Material preparation.** Material preparation is the economic basis to ensure the implementation of the policy. The material preparation of the free education policy for normal students is mainly the financial guarantee of the central government for the normal university implementing the policy. In December 2007, the general office of the Ministry of Education issued the *notice of the general office of the Ministry of education on arranging the free education funds for normal students in 2007*, (general office of the Ministry of education, 2007) which clarified the subsidy project, subsidy standard and allocation time of the free education funds for normal students in 2007. For the six normal universities directly under the Ministry, special funds from the central government shall be arranged. The allocation standard of free education funds for normal students is 12000 yuan per student per year.

**3.1.4. Organization preparation.** Organizational preparation is the guarantee mechanism for the implementation of policies, and the performance of organizational functions directly determines the degree of the realization of policy objectives. which including the establishment of policy implementation agencies, the establishment of necessary rules and regulations, etc.

In the central government departments, the State Council is responsible for the overall planning of the free education policy for normal students, with the Ministry of education as the main executive body. The Ministry of education is responsible for holding a conference on the implementation of free education for normal students every year, guiding universities to prepare the *free normal student education agreement* with the nature of administrative contract (Zhang Nan, 2011) and other policy texts.

In the provincial government departments, take Henan Province as an example, the work of free normal university graduates is coordinated by the relevant provincial government departments, and a working group composed of education, human resources and social security, finance and other departments, which is responsible for the formulation and implementation of employment policy.

As for the normal university, take Southwest University as an example, it first establishes the organization responsible for policy implement, including the establishment of the leading group for free education for normal students. Secondly, it carried out the overall mobilization and deployment. In May 2007, it held the implementation meeting of free education for normal students. Finally, a series of management rules and regulations such as "*Southwest University's opinions on the implementation of free education for normal students in 2007*" have been issued, which provides systemic guarantee for the full implementation of free education for normal students (Chen Shijian et al, 2007).

**3.1.5. Coordination and monitoring.** The coordination and monitoring of policies run through the whole process of policy implementation, which is the necessary condition to ensure the full implementation of policies. In the central government, the coordination work is coordinated by the State Council. The Ministry of education, the Ministry of human resources and social security, the Ministry of Finance and other four departments are responsible for the specific implementation. For example, on the eve of the first free normal students' graduation in 2010, the Ministry of education, together with other three departments, held a free normal graduates' employment conference in Beijing.

In the provincial government, the work coordination mechanism of free normal students is as mentioned above. Taking Shandong Province as an example, the provincial education administrative department, human resources and social security department, financial department and other provincial government departments, as well as the municipal and county governments perform their respective duties, and coordinate with each other in the implementation of the free education policy for normal students. The monitoring is mainly focused on the free normal graduates' employment work, (Wang Zhichao, 2013) for example, in terms of employment work, the provinces specially emphasized the responsibility of the local government where the students come from, and arranged the inspection mechanism for related work. Some provinces also clearly proposed to give "notice of criticism" (such as Guangdong Province) to areas where the arrangement of free normal graduates' employment is not effective, "reduce the number of free normal students enrolled" (such as Jilin Province) and other penalties.

### 3.2. Policy effect

The policy effect is the influence and effect on the object and environment after the implementation of the policy. From the perspective of stakeholders, the implementation effect of the policy can be more clearly understood its impact on different groups.

**3.2.1. Policy target groups.** The target group of free education for normal students is the students who at a growing age. This group is the most important direct stakeholders. Analyzing the impact of the policy on the target group can intuitively understand the effect of the policy.

First, policy content satisfaction. A scholar surveyed some free normal graduates from six normal universities found that in terms of the acceptance of the policy, 20% of the free normal graduates did not support the policy very much. In terms of the goal orientation of the free normal student policy, more than 30% of the students do not want to become a primary and secondary school teacher, and 44.7% of the respondents say they do not want to teach in primary schools for a long time. The goal orientation of the free normal student policy is not recognized by most graduates (Wu Peng et al, 2016).

Second, policy implementation satisfaction. From the perspective of free normal students, the satisfaction of policy implementation is mainly reflected in the training of normal universities and the learning program of free normal students. A survey of Beijing Normal University shows that 62.4% of the students are very satisfied with the teaching measures taken by normal universities (Yao Yun et al, 2009), but a survey of the learning motivation of free normal students shows that 39.1% of the students feel that they have no motivation to learn during their undergraduate period (Bai Beiyu, 2016).

Third, the degree of achievement of policy objectives. The premise of achieving the policy objectives is that all the free normal students can teach in the central and western regions after graduation, so the breach of contract is an important indicator to test the degree of achieving the policy objectives. Zhang Lijun found that only 48.11% of the students said they would not breach the contract (Zhang Lijun et al, 2010). From 2012 to 2016, six normal universities directly under the Ministry of education trained 52000 free normal graduates, with a contract employment rate of 96.5%, of which 90.3% went to primary and secondary schools in the central and western regions to teach (Jin Xiaoyan, 2017).

**3.2.2. Policy implementation groups (normal universities).** First, the training situation of free normal students. Many empirical studies have shown that some free normal students lie in the lack of learning motivation and unclear learning objectives (Jia Zhi et al, 2012). there are also institutional reasons such as the lack of corresponding competition and elimination mechanism, the free normal students don't have to worry about work after graduation. It can be seen from this that the implementation effect of the free policy for normal students does not completely depend on the implementation of the training program, the unreasonable employment policy may lead to deviation of the implementation.

Second, the employment situation of graduates. The balance of teachers is one of the important goals of the free education policy. In the subordinate Normal University, the report on the employment situation of graduates of Shaanxi Normal University (2013) shows that the number of free normal graduates in 2013 is 2866, all of whom are employed. The proportion of employment in the west is higher, reaching 71.39%; the proportion of employment in the middle is 18.49%; 10.12% of them are employed in the East; 22.40%, 38.24% and 39.36% of them are employed in provincial capital, prefecture level city and county level respectively (Shaanxi Normal University, 2014).

The free normal graduates from subordinate normal universities is mainly went to the central and western regions, but the proportion of these students teach in the county-level schools is low. Many empirical studies also proved this point, that is to say, the policy of free normal students in the subordinate normal university mainly solves the problem of imbalance teacher distribution between the eastern and western regions. In contrast, the main goals of free education for local normal universities are to solve the shortage of teachers in rural areas, such as Xinjiang (Wu Liang, 2014).

## 4. Summary

The free education policy for normal students began to be piloted in six subordinate normal universities in 2007, gradually implemented in local areas since 2010, and replaced by the policy of "state-financed" normal college students in 2018. The policy aims to solve the imbalance of teachers and the shortage of rural teachers, aiming to cultivate a large number of excellent teachers.

This paper finds that the results of the policy are quite in line with expectations, in which the free education policy for normal students under the Ministry mainly solves the problem of unbalanced regional distribution of teachers, and the free education policy for local normal students mainly solves the problem of lack of teachers in local villages. But at the same time, the process of policy implementation is also unsatisfactory, such as the learning motivation of free normal students is not strong, and a certain proportion of free normal graduates' default. There are many reasons for these problems, such as the student's lack of understanding of the policy content and the inflexible employment policy.

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# POSTERS



# SUBJECT TEACHERS AND ENHANCEMENT OF STUDENTS' ENGLISH PROFICIENCY IN SELECTED SENIOR SIX CLASSROOMS IN RWANDA

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## Abstract

This study was conducted in two public and two private secondary Sixth Form schools in Huye District of the Southern Province in Rwanda. The researchers' concern was that most secondary school leavers enter university with low English language proficiency whereas this language is the sole medium of instruction in Rwanda. This lack of competence in English constitutes a hindrance to the students' academic performance. The researchers chose to focus on subject teachers because they are the ones who spend much more time with students as subject-related courses are allotted more hours than English, and they are supposed to support students across the curriculum (Mora-Flores, 2019). Therefore, this study aimed to explore whether subject teachers offered any assistance in helping enhance their students' English proficiency. The study drew on Language across the Curriculum (LAC) approach. LAC stipulates that all teachers are language teachers, that subject teachers and language teachers should work jointly, and that language should be taught across the curriculum (Lughmani, Chan, Gardner, & Wong, 2017). For validity and reliability purposes, the current study made use of both qualitative and quantitative data collection and analysis methods. Emerging themes from observations and interviews were inductively analysed and numerical data from questionnaires interpreted. The findings of the study revealed that only some of the subject teachers used strategies that could help promote their students' English proficiency. The findings also indicated that content and English language teachers did not collaborate to inform each other on more appropriate ways to scaffold their students' learning, which hindered the latter's acquisition of English skills. In accordance with these findings, recommendations were made.

**Keywords:** *English proficiency, subject teachers, teaching strategies, sixth form students, secondary schools.*

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## 1. Introduction

In Rwanda, the language-in-education policy stipulates that Kinyarwanda, the mother tongue, is the language of instruction from Primary 1 to Primary 3 while English, a second language, is studied as a subject and becomes medium of instruction from Primary 4 onwards. Proficiency in English from Primary 4 is, thus, a prerequisite for Rwandan students to deal with their studies successfully.

However, the researchers' language teaching experience in Rwandan tertiary education is that secondary school graduates admitted at university are not proficient enough in English to cope with their academic subjects delivered in this language. They lack both Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP) as described by Cummins (2008). The researchers decided to conduct their study in secondary Sixth Form classes where students' success in the end-of-year national examinations determine their admission to higher learning institutions. Furthermore, the researchers' choice of subject teachers as research participants is that in secondary school advanced level (Forms 4, 5 and 6), content subjects are allotted much more time (280 minutes) than English (80 minutes). The researchers, hence, believe that subject teachers should devise strategies to help their students develop proficiency in this language of instruction, which would equally promote their academic performance.

## 2. Objectives

The primary aim of the study was to assess whether subject teachers in the selected schools played any role in the development of their students' proficiency in English. The secondary objectives were to determine (1) whether subject teachers used any learning strategies to promote their students' English

proficiency, (2) whether they informed English language teachers on suitable material to design for their students, (3) whether English teachers informed subject teachers about how to assist their students to improve their English language skills, and (4) whether the students were proficient in English.

### **3. Research design**

The present study used case-study design. Case-study design allows a researcher to conduct an in-depth investigation into a real-life phenomenon and in its real setting (Ridder, 2017). The researchers in this study observed the phenomenon from different subject classrooms in different schools so as to obtain more reliable and more valid data.

### **4. Research methodology**

#### **4.1. Setting and participant selection**

The study was conducted in four secondary schools (two public and two private) in Ngoma Sector, Huye District in the Southern Province of Rwanda. Researchers chose this setting because of the proximity of the schools to their workplace. This allowed them to conduct the study and to fulfill their academic activities at the University of Rwanda, where they are lecturers. For the sake of anonymity, the schools were labeled School 1, School 2, School 3 and School 4. The researchers used purposive sampling and visited Biology and Mathematics classrooms as they were the only common subjects in the four schools. The subject teachers (Biology and Mathematics) from these schools were respectively given the pseudonyms T1 and T2, T3 and T4, T5 and T6, T7 and T8.

#### **4.2. Research methods**

The researchers made use of both quantitative and qualitative paradigms to gain more understanding of the phenomenon under study. Quantitative approach is used to answer research questions that require statistics, and qualitative approach for questions requiring words (William, 2007). Both approaches enabled them to apply various research techniques. The quantitative method allowed them to administer and obtain data from questionnaires. With the qualitative method, the researchers conducted observations and semi-structured interviews for the sake of data triangulation.

### **5. Discussion**

The findings emerging from the research data provided answers to the research questions. The predominating learning strategies used were pair and group discussions and presentations, question-answer technique, teacher talk, and code-switching. Pair and group discussions normally allow students to engage in peer interactions wherein the more knowledgeable students scaffold their group mates with low English skills. For peer interactions to be effective, teachers have to monitor the group activities and make sure everybody is involved. During classroom observations, the researchers noted that only some teachers (T1, T2, T3, T4, and T6) managed the group activities well.

Presentations are another learning technique that promotes students' confidence, their ability to exchange ideas in the target language and their critical thinking ability (Brooks, 2015). In T1's, T2's, T3's, T4's, T5's and T6's classrooms, group discussions resulted in interactive presentations. This was not the case in T7's and T8's classrooms where students had difficulties expressing themselves in English. Both T7 and T8 should have tried various activities requiring students' interactions in English.

The question-answer technique is normally used by teachers to test their students' knowledge and understanding of lessons. These should mostly be questions that stir up students' critical thinking and problem solving skills. However, questions that most of the subject teachers put to their students were not challenging and did not give them enough opportunities to express their thoughts in English. The teachers should also have given their students more opportunities to ask questions using English.

Researchers observed that teacher-talk was another dominant technique that was used by six teachers (T3, T4, T5, T6, T7 and T8). Lei (2009) argues that teacher talk can have good or bad impact on students' communication depending on the quality rather than on the quantity of talk. He explains that good teacher talk should foster students' communicative interactions in class. Nevertheless, these teachers' questions did not aim at promoting the students' communicative skills but rather tested their understanding of the course content.

The triangulated data indicate that teachers and students also made use of the code-switching practice. In a bilingual or multilingual environment, code-switching appears to be a natural phenomenon that helps in raising students' voice, that is, in incorporating their input into the lesson (Alam & Ghani, 2020). In the observed classrooms, some teachers shifted to Kinyarwanda to make their students understand

better while a number of students also used this mother tongue during group discussions to negotiate meaning and construct common knowledge. However, code-switching should not be overused as it would hamper acquisition of the target language.

Collaboration between subject and English language teachers was lacking. This constituted a hindrance to the development of students' English proficiency. As far as students' English proficiency was concerned, four teachers (T1, T2, T4, and T5) confirmed that they were satisfied. Most students also affirmed they had good English skills while answering the questionnaires. However, findings emerging from classroom observations and students' interviews disclosed that many students had difficulties understanding teachers' explanations, interacting and writing in English.

## 6. Conclusions

The research findings showed that the main strategies used in the visited subject classrooms were pair and group discussions, presentations, question-answer technique, teacher-talk, and code-switching. In some classrooms, these techniques were properly used whereas they were not in others.

De Vos, Strydom, Fouche, and Delport (2002) purport that limitations are unavoidable in any research. The current study also had imitations in scope and time. The researchers wished the study to be conducted in more than four schools, to observe more subject classrooms, and for a longer period of time, yet their tight teaching workload and little availability of secondary Sixth Form students were an impediment.

## 7. Recommendations

Content-subject teachers should feel concerned about their students' proficiency in English and use appropriate strategies to allow them to both acquire knowledge of scientific concepts and develop their English skills. The Rwanda Ministry of Education should organize trainings on how subject teachers can help students develop their English skills and increase the hours allocated to the English course in secondary advanced level classrooms. Further research should also be conducted in English language classrooms to explore whether teachers help promote their students' basic interpersonal communication skills and cognitive academic language proficiency.

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# THE EFFECTS OF LOCAL-SPECIALIZED CAREER EXPERIENCE PROGRAMS ON KOREAN STUDENTS' CAREER MATURITY AND COMMUNITY AWARENESS<sup>1</sup>

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## Abstract

The purpose of this study was to examine the effects of the Local-Specialized Career Experience programs (LSCE) in South Korea on adolescents' career maturity and community awareness. In 2015, the Korea Congress passed the Career Education Act (CEA), and the CEA was launched on December 23, 2015, which governs the Republic of Korea (South Korea) K-16 career education policy. To achieve the CEA goals, the Korean Ministry of Education established an infra-structure for K-16 students to explore and experience various careers as part of experiential learning. One is Local-industry based career exploration and experience project. The Korean Ministry of Education and 17 local educational departments support the LSCEP to provide secondary school students with the career experience opportunities with collaboration with key local industries and career experience centers as a consortium. Before and after they participate in the programs, students' career maturity and community awareness were assessed to examine the effects of the LSCEP on the study variables. A total of 4,638 secondary school students who participated in the LSCEP in 2019 provided usable data for this study. The independent sample t-test was employed to analyze the data. The findings revealed that the values of the variables after experiencing the programs scored higher than those before. The results of the study suggested that the LSCE programs can promote adolescents' career maturity and community awareness.

**Keywords:** *Career exploration, community-school-consortium based career education, career maturity, community awareness.*

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## 1. Introduction

The paradigm of contemporary career education in South Korea is changing to work- and experience-based education that emphasizes direct work experience and career experience (Jyung et al., 2015). Students in their adolescent stage can expect to improve their career preparation capabilities through proper career experiences (Jyung et al., 2015). The relevant competence is indicated by career maturity (Jung, 2016). The Local-industry based career experience programs are a project which is supported by the Korea Ministry of Education and local departments of education from 17 cities. The project is implemented by consortiums consisting of local public and private sectors from 17 cities and provinces across South Korea to provide elementary through high school students with career experience programs to help them better understand core industry values in their community (Park et al., 2019). Students who participate in these programs expected to increase their career maturity and raise their awareness of their community. The Local-Specialized Career Experience Programs were into practice in 2016 as a pilot project and have been promoted step by step since then (Park et al., 2019). The main goal of the 2019 project was to increase the quality of each program and advance the overall operating system of the consortiums (Park et al., 2019). The 2019 phase aimed for autonomous operation based on the growth of the quality and quantity of career experience programs in each consortium (Park et al., 2019). In addition, the 2019 project was to examine the operation status of various types of career experience programs and suggest the directions and policies for future career experience programs (Park et al., 2019). Thus, this study was to examine the effects of the Local-Specialized Career Experience Programs (LSCEP) in South Korea on adolescents' career maturity and community awareness. Specifically, the degrees of participants' program satisfaction, career maturity, and community awareness were compared between pre-and post-participation in the programs.

<sup>1</sup>This work was based on the findings of the research project done by Park, H. et al (2019). *2019 진로체험지원센터 운영 3. 지역특화 진로체험 프로그램 운영 지원 및 컨설팅*[Support and consulting of Local-specialized career experience programs]. Project No. 2019-18-3, 한국직업능력개발원[Korea Research Institute for Vocational Education & Training]. Sejong: South Korea.

## 2. Method

### 2.1. Sample

The sample of this study consisted of secondary school students who participated in the LSCE programs in South Korea from April to October in 2019. A total of 4,638 were used as a final data set. The demographic information of the participants is presented in Table 1.

Table 1. Demographic Information of the Participants ( $n=4,638$ ).

School Type	Grade	Pre-Male	Female	Post-Male	Female	Total
Middle School	1	682	650	682	650	2,664
	2	160	176	160	176	672
	3	142	138	142	138	560
Sub total		984	964	984	964	3,896
High School	1	94	110	94	110	408
	2	47	72	47	72	238
	3	25	23	25	23	96
Sub total		166	205	166	205	742

### 2.2. Measures

**Career maturity.** To measure career maturity, 10 questions developed by the Korea Education Longitudinal Study (the KELS) were used, consisting of two factors: Factor 1 for measuring one's self-understanding and Factor 2 one's level of preparation and planning for career decisions (Kim et al., 2014). Examples include, "I know what I am doing well" (self-understanding), and "I think about what I should do now to achieve my future goals (career planning)." All items are rated on a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). Reliabilities (Cronbach's  $\alpha$ ) of the scales of career maturity, self-understanding, and career planning were .94 ( $M=3.95$ ,  $SD=.72$ ) .90 ( $M=3.95$ ,  $SD=.78$ ), and .89 ( $M=3.95$ ,  $SD=.74$ ), respectively.

**Community awareness.** To measure participants' community awareness, the authors developed three items: "I know that there are various occupations in the community I belong to. I think that the industries in my community are developing because of various workers. If I do my best, I expect that I will be able to commit to my community development". The three items used a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). The reliability coefficient  $\alpha$  was .85 ( $M=3.98$ ,  $SD=.76$ ).

### 2.3. Data analysis

First, a crosstabs analysis was performed to identify the distribution of participants by the program type and the time type spent. Next, an independent  $t$ -test was performed to examine the difference between the pre- and post-participation for participants' career maturity and community awareness through the local specialized career experience programs. Finally, the effect size, Cohen's  $d$ , was calculated.

## 3. Findings

In the distribution of time types, middle school students and high school students participated in the day-time program the most (middle school students = 90.2%; high school students = 92.2%; total = 90.6%), the series-based continuous type (5.5%), the in-stay type (3.9%). Next, for the distribution of participants by the type of the program content, the results revealed that most students participated in the workplace experience type and the department of higher education experience type, 52.2%, and 22.1%, respectively. Specifically, for the middle school students, 56.7% participated in the workplace experience programs, 17.8% did the experience programs of the department of major in higher education institutes, 9.2% participated in the career-camp programs, 9.1% did the field-trip programs, 7.1% did the real job-related-task experience programs, and 0.1% participated in the lecture-and talk-based programs. For the high school students, 45.0% of the students participated in the experience programs of the department of majors in higher education institutes, next 28.6% participated in the workplace experience programs, 12.1% did the career-camp programs, 11.3% the field-trip programs, and 3% participated in the lecture- or talk-based programs. No high school students participated in the real job-related-task experience programs.

Table 2. Distribution of the Participants' by the Program Types (n=4,638).

Program Type	Middle		High		Total (%)	
	n	%	n	%		
Time	Day-time	3,516	90.2	684	92.2	4,200 (90.6)
	Series-based continuous	198	5.1	58	7.8	256 (5.5)
	In-stay	182	4.7	0	0.0	182 (3.9)
Content	On- the- job work experience	2,210	56.7	212	28.6	2422 (52.2)
	Real job-related-task	276	7.1	0.0	0.0	276 (6.0)
	Field-trip	356	9.1	84	11.3	440 (9.5)
	Department of majors	692	17.8	334	45.0	1,026 (22.1)
	Career-camp	358	9.2	90	12.1	448 (9.7)
	Lecture- or talk-based	4	.1	22	3.0	26 (.6)

The scores of the post-survey of the program experience in Career maturity ( $t = -9.75, p < .001, d = .29$ ) and community awareness ( $t = 14.45, p < .001, d = .42$ ) of the participants were higher than those of the pre-survey. The scores of both self-understanding ( $t = -7.19, p < .001, d = .21$ ) and career planning ( $t = -11.41, p < .001, d = .34$ ) increased after participating in the local-specialized career experience programs.

Table 3. Independent t-test and Effect Size (n=4,638).

Variable		Total (n=4,638)		Pre (n=2,319)		Post (n=2,319)		t	d
		M	SD	M	SD	M	SD		
Career Maturity	CM	3.95	.72	3.84	.69	4.05	.73	-9.75***	.29
	SU	3.95	.78	3.86	.77	4.03	.78	-7.19***	.21
	CP	3.95	.74	3.82	.72	4.07	.74	-11.41***	.34
Community Awareness		3.98	.76	3.82	.74	4.14	.75	-14.45***	.42

\*\*\* $p < .001$ . CM = career maturity, SU = self-understanding, and CP = career planning.

#### 4. Conclusions and discussion

It was concluded that the understanding of participants themselves in terms of career maturity as well as their community has increased through the local-specialized career experience programs. The results of this study imply that the local-specialized career experience programs have increased the effectiveness of the quality of the programs and the goals of the project. In the future studies on career experience programs, it is necessary to examine the effectiveness of other career experience programs and compare their effectiveness with those of the local-specialized career experience programs.

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## ACTIVE METHODOLOGIES AND AWARE EDUCATION FOR FUTURE SECONDARY SCHOOLS TEACHERS

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### Abstract

This experience focus on the use of teamwork techniques such as cooperative learning in conjunction with flipped learning and some computers tools like clickers and digital portfolio as a methodology of learning, reflection, tutoring and evaluation. To promote Aware Education, mindfulness strategies has been used as a way to improve attention and to practice some techniques that can be very useful not only for them but also for their future students when they use them as secondary school teachers.

The experience has been carried out in a subject of the Master Degree in *Secondary School Teachers* at the University of Almeria (Spain) called *Active Methodologies of Teamwork*. In this subject, the learning material is based on the different methodologies they are going to learn and practice. Therefore, they are going to learn what cooperative learning is practicing it in small groups. They are going to learn what flipped learning is practicing it and preparing a video about their subject (maths, biology, etc) for their future secondary schools students. They are going to learn what clickers and portfolio are using them and even preparing some quizzes for their future students, and finally, they are going to learn how aware education (mindfulness) can be incorporated to the subject, practicing different meditations during the class as well as formal and informal practices as homework.

The results show that students are more engaged with the learning process and they have developed a greater responsibility not only with their own learning but also with their classmates learning. Also, an increase in the number of students that have passed the subject has been shown. The Mindful Attention Awareness Scale (MAAS) has been carried out at the beginning and at the end of the course to measure the evolution of the students in different items related to mindfulness. These results show that program efficiency has been proven in the 15 items evaluated, with an average increase of 21%.

**Keywords:** *Cooperative learning, flipped classroom, gamification, computer tools, aware education.*

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### 1. Introduction

Teachers of the different educational levels increasingly show different aspects related to low motivation of their students, ease of losing attention during the class, lack of comprehension of the theoretical contents, difficulty relating what they are studying with the real world and in general, a reluctant attitude towards study in general (McKeachie, 2006). It is intuited that this is due in large part to the methods used for teaching, mainly the traditional instruction. Thus, in traditional instruction, teachers spend most of the in-class time giving lectures, and students rarely have chances to apply knowledge, or even interact with their peers. Therefore, the need to innovate and use new and disruptive tools that have the ability to capture the attention of students and maintain it during the development of the different activities is more evident than ever (MacManaway, 1970). New instruction systems are based on the use of active methodologies that encourage the active participation of students, making them the core of the entire educational process (Johnson, 1991). Thus, these methodologies stimulated students not only studying the contents of the subjects, but also acquiring skills that are beneficial for their personal and work future (Gil, Baños, Montoya, Alcayde, Gil, Herrada, & Alvarez, 2018). On the other hand, the consolidation of ICT in Education has meant that, in addition to its use for purely audiovisual purposes (for example, to view transparencies or previously prepared videos), its use as powerful communication tools between teachers and students has allowed breaking the temporal and spatial barriers associated with traditional teaching-learning models, to the point that ICTs have stimulated the consolidation of active methodologies (Gil, Alcayde, Montoya, Baños, Herrada, & Gil, 2018). Also, the proposals of the so-called "Integral Approach" (Gallifa, 2019) defends the need to connect the cognitive, affective, moral and spiritual dimensions in the teaching-learning processes, based on an active teaching methodology that promotes the (self) awareness of the participants.

The aim of this work is to analyse a practical experience carried out in a subject of a Master Degree in *Secondary School Teachers*, in which, future secondary school teachers are trained in different active methodologies. This experience is designed based on previous experiences in learning contexts that make use of active methodologies, such as cooperative learning (Gil, Montoya, Herrada, Baños, Montoya, & Manzano, 2011) and flipped classroom (Gil et al., 2018). This study aims to show how disruptive and innovative active methodologies, together with ICTs (Information and Communication Technologies) and aware education (García, Gil, Gil, Pulido, Inieta, & Aguila, 2019) promote an integral education with a more meaningful and long-term learning. Finally, values, competencies and mainly, a more positive attitude towards learning and life in general, have also been developed.

## 2. Design and methods

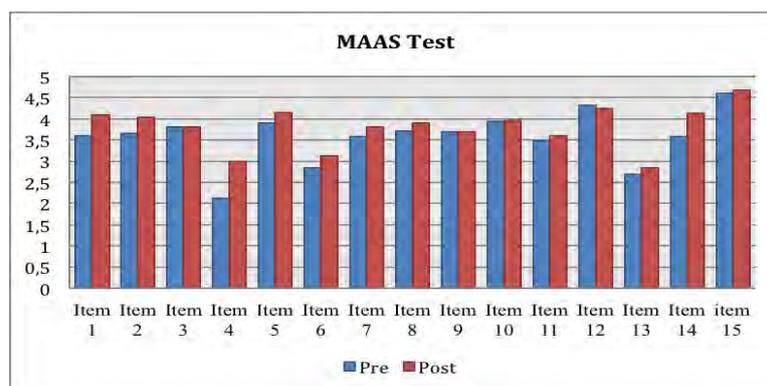
The methodology is based on learning the subject using the same methodologies they have to learn. That is, learning cooperative working methodologies by working cooperatively, using the puzzle technique (Johnson, 1991), research groups (Johnson, 1991), gamification through team tournaments (Burke, 2014) and problem based learning for the final project (McKeachie, 2006). Flipped classroom has been used to learn the theoretical knowledge. At the beginning of the next face-to-face session, clickers have been used to know if the students have watched the videos. For this purpose, a tool called ZquizUALbot (Gil et al., 2018) developed by our research group and based on the telegram message application, has been used. Clickers have also been used to evaluate groups after performing some activities. The digital group portfolio has been used to make visible the activities carried out by each group, their reflections, group regulations (Gil et al., 2018) and the self-evaluation and co-evaluation within each group. Different rubrics have also been used for the evaluation of transversal competences (teamwork and oral communication). Each group has presented orally its final project and the rest of the groups have evaluated them (co-evaluation) using the corresponding rubric.

Also, as part of an “aware education project” (García et al., 2019) where this subject is included, a 6-week mindfulness program has been implemented. It includes short meditations in class (five minutes) and formal and informal mindfulness activities for practicing outside the classroom. The following practices have been carried out: 1) Formal mindfulness: meditative practices of attention to breathing, attention to the body and attention to thoughts, 2) Informal mindfulness: practices to bring attention to any activity of daily life, paying attention to breathing and body sensations, 3) Emotional development and self-inquiry: practices to recognize automatic and reactive patterns. For example practicing “active listening” when they are working in groups or “observing mobile phone dependence”, counting and being aware of the number of times they need to look at their mobile phone (including social network, message applications, etc).

## 3. Discussion and results

This experience has been implemented with approximately 65 students. All students have been assigned to a cooperative group and have satisfactorily developed all activities (in-class and out-of-class). The results have been evaluated through different indicators. The first indicator has been the number of students who have passed the subject, 99% in 2019-2020 academic year, compared to 97% of the previously academic years (Gil et al., 2018). Another indicator is a specific quiz with different items and questions about the methodologies of the subject (Gil et al., 2018). The students have rated very positively the use of different active methodologies of teamwork such as cooperative learning, in addition to flipped classroom and gamification. They have also positively assessed the use of computer tools such as e-portfolio to improve teamwork, reflection and self-evaluation, and using clickers to know the degree of monitoring of flipped classroom for the main concepts of the subject.

Figure 1. Average results for the MAAS test (pre and post) for the 15 items.



The last analysed indicator during this course is related to mindfulness experience. All students who have attended classes have completed formal mindfulness practices. Mindfulness practices outside the classroom have not been mandatory, but more than half of the students have completed them. The Mindful Attention Awareness Scale (MAAS) (Brown, & Ryan, 2003) has been used at the beginning and at the end of the course to measure the evolution of the students in different issues (items) related to mindfulness. It is a scale that evaluates and records, in a global way, the ability of an individual to be aware of the experience of the present moment in everyday life. It consists of 15 items that are scored according to a Likert scale with a range between 1 (almost always) to 6 (almost never). The final result is obtained from the arithmetic average of the total items. Figure 1 shows these results for 33 students who have completed the MAAS test. Lower scores show lower levels of Mindfulness (related to high levels of stress or anxiety) and the highest show high levels of mindfulness. An increase in the average values of mindfulness is observed in 12 of the 15 issues, with an average increase of 21%.

#### 4. Conclusions

It has been shown how this integration between cooperative and flipped learning, gamification and Mindfulness can revolutionize the way the students learn, by putting the student in the core of the learning process. This integral aware educational model can be applied at any level, including primary, secondary and university levels. It has been observed states of well-being, creativity and mental calmness that promote more creative, motivating and meaningful learning both in terms of knowledge, skills, competences and especially values such as empathy, tolerance, compassion and kindness. At the same time, student are given tools to handle stressful situations, complicated emotional situations, both for themselves and so that they can offer them to their future secondary school students. The results obtained in this work make evident the need to apply mindfulness programs within the educational context to improve the well-being states of the students, which also directly influences their academic performance. The results of the MAAS test applied before and after the program support these conclusions. There has also been a significant change in the students involved in the full program, improving the way they interact with peers, facing problems, etc. We conclude with an invitation to those educators with some meditation experience: please find ways to share this gift with your students. And for those educators who are not familiar with any mindfulness practice, we deeply recommend to explore it as an option for their own well-being and growth, as well as for the growth and well-being of their students.

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## A SYSTEMATIC SCOPING REVIEW ON SKILLS VARIETY FOR VET IN THE INDUSTRY 4.0

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### Abstract

In the wake of the 4th industrial revolution, the prospects about new jobs and workers' skills, and competence appear to be uncertain. There is a large agreement about the view of the current revolution as characterized by an embedded exponential evolution which will affect the labor transformation as well as future workers' curriculum. Therefore, researchers and practitioners in the field of vocational and educational training (VET) are questioning about which skills and abilities will be the core of the third-millennium jobs 'profiles. Accordingly, the present poster intends to present the results of a systematic scoping review in order to offer a knowledge-based description of VET in the 4.0 industry. By the use of this method among three main databases, the contribution purposes a synthesis of  $n=13$  items by which three classes of competences emerged, namely, scientific-, transversal- competences, and technical skills. All of these classes resulted to be relevant for the futuristic workers to compete in the diverse, and plural world of the 4th revolution of work. Moreover, the present paper offers possible applied implications in VET sectors of training and development as well as a forward perspective for human resources management.

**Keywords:** *Industry 4.0, competences profile, systematic review, VET.*

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### 1. Introduction

The last decade has been characterized by the huge impact of technological progress in all the working sectors leading to an exponential evolution of work. The recent changes regard the so-called *4<sup>th</sup> industrial revolution* – or *industry 4.0* – commenced through the preliminary introduction of artificial intelligence and automation in many different working sectors. Conceptually, the current revolution builds on the progress of the 3<sup>rd</sup> industrial revolution marked by the digitalization process, whose spread and velocity of changes are its core aspects. It has a global impact disrupting all the working sectors, systems and working level. In this vein, looking to the implications of industry 4.0 for market industry, VET researchers and practitioners, are questioning about how and to what extent the industry 4.0 will affect workers profile curriculum. More precisely, there's a lack of a comprehensive view about how to sustain and support workers and organization in terms skills and abilities needed for the third-millennium jobs 'profiles (Loveder, 2017; Moldovan, 2019; WEF, 2019).

The goal of the present paper is to try to propose an answer to the questions about how to provide forward workers with sufficient competences and skills needed in the wake of the industrial revolution. Therefore, the contribution intends to present the preliminary results of a systematic scoping literature review in order to answer the following questions:

- In the wake of the 4<sup>th</sup> industrial revolution, which competencies are required by workers to deal with the automation and digitalization of work processes?
- What are the core aspects of VET trainers and practitioners in order to sustain workers profile curricula in the industry 4.0?

The article consists of three main sections. Firstly, the method of the systematic scoping review is presented as well as the data collection procedure according to the research questions. Then, results are presented in the second section followed by the discussion in the last section.

### 2. Method and data collection

Briner and Deyner (2012) argued that a systematic review can constitute an opportunity for theory and research. It helps to summarize the literature around a specific topic and to create a comprehensive synthesis which can help researchers and practitioners in the field of work and organizations. According to the research questions, the present paper authors referred to the line-guides of Briner and Deyner in order to propose a tentative answer to questions on competencies and skills for Industry 4.0 workers. Notwithstanding the word systematic, these line-guides suggest that a systematic review in the field of research about work and organization turns to broaden principles rather than strict procedures in order to propose a coherent and organized state of the art about a specific subject.

Moreover, Briner and Denyer (2012) argued that in the synthesis process, authors can consider a methodology based on the aims of the literature review. In this vein, the scoping synthesis process (Arksey & O'Malley, 2005) offers a useful way to interpret the results. Arksey and O'Malley (2005) argued that the scoping synthesis focuses on topics and sub-topics of contribution extracted by the literature review and it aims at finding the relations between themes in order to map the knowledge around the topic.

Following the methodology presented, the literature review commenced with the keywords extraction for data collection within the academic databases of Scopus, Web of Science and Eric. By the combination of words as "Competence", "Industry 4.0", "VET" and linked words, the first stage collected  $n=1,199$  items which have been analyzed by the researchers according to the criteria developed. Then, only items published after 2011, in English and within the research field of adult education and vocational education and training, VET have been included ( $n=91$ ). The extracted items have been analyzed by the three researchers involved in the study which used a specific form of analysis consisting on three main questions about (a) the relevance of the item, (b) the quality of the item, and (c) the coherence with the research questions. By this process,  $n=13$  items were included for the synthesis process among which,  $n=4$  items are literature review,  $n=3$  book chapters or research report and  $n=4$  official documents produced by international institutions and organizations, e.g., CEDEFOP.

### 3. Results

The three researchers worked individually in order to syntheses and interpret all the contributions collected referring to the themes and topics discussed. Then, they compared they result in order to propose a final comprehensive view of the contributions extracted. Two main topics emerged during the synthesis process. Firstly, authors of the items extracted agreed about the definition of industry 4.0 as the result of the current industrial revolution, characterized by an embedded exponential evolution which will affect the labor transformation as well as future workers' curriculum. Secondly, the workers of the third millennium will need of mix competences combining scientific knowledge and soft skills. In fact, by the comparison of each syntheses, the three researchers agreed to consider three main classes of competences, namely, scientific-, transversal- competences, and technical skills. In the present section the core aspects of each classes will be presented in the view of the VET sector.

#### 3.1. Classes of competence for industry 4.0 in VET sector

*Scientific and technological competence:* the first class of competence regards the group of scientific, technological, engineering and mathematical knowledge (Moldovan, 2019; Molla & Cuthbert, 2019; Payton, 2017; Plutenko, Leyfa, Kozyr, & Haletskaaya, 2018; VET 4.0, 2019). Authors presented these competences referring to higher levels of qualification learned in higher education programs. Mainly, this class of competences regards the ability to data analysis and data scientists, and besides, the knowledge needed for technological innovation and artificial intelligence. Therefore, this class of competence is more linked to specific jobs and roles in organization although authors discussed their relevance logical thinking and problem solving linked to STEM even for those workers who have different roles and job tasks (Cedefop, 2018; Loveder, 2017; Payton, 2017; Plutenko et al., 2018; Pfeiffer, 2018).

*Technical and digital abilities:* The second class regards the technical and digital abilities and the know-how of workers. These represent a significant broad class of abilities related the new job places. On the one hand, organizations and smart industries will need workers able to deal with the automated systems in terms of maintenance and repair. In fact, all the machines that will implement the industry will need the human interaction for their functioning in order to reduce the costs and increase the production. (Fraser et al., 2019; Huang & Chang, 2011; Sangmeister, et al., 2018). Moreover, all the organizational figures involved at the level of organization will need to be able to deal with data management and digital systems. In this vein, all the professional figures need a sufficient knowledge to address the constant evolution of artificial systems (Avis, 2018; Winterton & Turner, 2019; Umachandran, & Della Corte 2019)

*Transversal Competence:* The last class emerged as a comprehensive class of all the aspects discussed within the contributions that do not refer to the class of scientific competences and digital abilities. In fact, some authors reported the relevance of (a) interpersonal skills for team climate and team building, others presented (b) the ability to react to current in process and resist emphasizing the emotional competences as well as (c) the self-agency for life-long learning (ILO, 2017; Moldovan, 2019; VET 4.0, 2019; Umachandran, & Della Corte 2019). What twist and turn will take the industry 4.0 is still a contested debate to which authors are not able to give a sufficient answer. However, all the contributions analysed sustained and promoted a positive point of view with which human-interaction technology is seen as an opportunity for workers to develop new job profile and knowledge as well as to invest in interpersonal relations and personal development (Symon & Whiting 2019).

#### 4. Discussion

In the wake of the industry 4.0, the VET practitioners and researchers are called to sustain and promote the workers' curriculum of the future. In this term, the present analysis of the literature have found a possible framework to classify the abilities and competences according to the different job sectors. In fact, answering to research questions, our aim was to propose a comprehensive view of the literature in order to (a) shed light around the subject of competences for the industry 4.0 and (b) to propose a possible framework for training programs.

As seen, the mix of competence calls for a deep attention to the job sectors and role aspects. In this vein, practitioners and researchers need to understand the characteristics in order to turn the training programs according the different needs of workers and organizations. In contrast, the class of transversal competences support the large need of soft skills and interpersonal competences. Among all the reviewed items, a common agreement regarding the necessity to provide sufficient support to people relations and internal aspects as the ability to adapt to the current changes and to deal with the new technologies.

Finally, the present literature review has inevitably some limitations. Although the method used is sustained in literature and largely used, only a few contributions have been extracted and analyzed and we are not sure if there any other relevant contributions. Forward research could try to investigate devising more inclusive criteria as well as including empirical examination of the evidence produced by the literature review.

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# ICT COMPETENCIES OF FIRST-YEAR UNIVERSITY STUDENTS

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## Abstract

University students need to be able to work with the information resources that they find for the purposes of their learning activity critically and have the competencies in resolving scientific issues in projects and studies independently. Also, they need to be able to use information effectively regarding its various forms. In recent years, the level of digital literacy among students has not been questioned. The students of higher education often consider themselves as competent users of information resources since they grew up in a world saturated with information and communication technologies (ICT). However, without a thorough study, it is difficult to identify the ways and means of improving the level of digital literacy of university students. The aim of the article is to assess digital literacy skills among the students at the Agriculture Academy of Vytautas Magnus University in Lithuania. The article presents the empirical results of the survey performed in autumn 2019 among first-year students. Data were collected through the completion of self-evaluation questionnaires and the assessment of the exam results. A possible limitation was the validity of student reflections regarding their abilities related to ICT competencies. The results show that although many first-year students had prior experience in technologies, a need to educate students on the basic ICT literacy skills needed at the university level remains. The study results are useful as curricular guidelines.

**Keywords:** *ICT competence, digital literacy, first-year students, university.*

## 1. Introduction

The basic ICT knowledge and skills that an ICT literate person should have are constantly being improved. Due to the rapid development of information and computer technologies, we are more and more frequently faced with the term *ICT literacy* and the broader meaning of the concept of information literacy, which constitute the fundament for modern society development. ICT literacy becomes an important precondition for socialisation and professional career. (Ivankovića A., Špiranec S., Miljko D., 2013). For university students, it is necessary to have knowledge and skills in the field of ICT to be able to use information effectively concerning its various forms. Among the reasonable factors of having ICT competency is the possibility for learners to access and obtain information from unlimited sources, communicate via computer and manage particular information for various purposes, for example, performing the tasks, for presentations, and data analysis.

The increasing demand for computer skills not only comes from many IT-producing jobs, such as computer hardware engineers and software programmers but also from the IT-using jobs, which encompass virtually every other job (Peng, 2017).

Information technology (IT) courses in Lithuania schools are mandatory for the 5–10<sup>th</sup> grades for approximately 1 hour per week, respectively 35 hours per year. There are some optional modules as well (e.g., Programming). During the classes, integrative nature of the subject is being stressed: students are prompted to see parallels with other subjects, to employ modern methods, to differentiate contents, etc. Students of upper secondary schools (11<sup>th</sup> and 12<sup>th</sup> grades) can choose from advanced optional modules and have to learn the content defined in the course curriculum (Dagienė V., Stupuriene G., 2016). ICT skills are significantly crucial to many learners in higher education institutions. Students from rural areas do not always have favourable conditions for ICT learning, i.e. there is no opportunity to choose a school, it takes more time to reach the school or the lack of a motivating learning environment. Therefore, generally, more students who enter the Agriculture Academy have lower ICT skills compared to those who enter other institutions of higher education.

The aim of the article is to assess the ICT literacy skills among the students at the Agriculture Academy of Vytautas Magnus University in Lithuania.

The t-test is applied to evaluate the statistically significant differences between the groups. Correlation analysis is performed to detect associations between variables. The data were processed with the statistical programme *R*.

## 2. Results

The study was carried out at the Agriculture Academy of Vytautas Magnus University. The data were collected in the Autumn semester of 2019 from evaluations of the introductory test, survey, interim assessments (quizzes) and results of examination (10-point grading system). The participants of the study were 109 first-year students from different faculties of the Agriculture Academy, 55.67 % were male and 44.33 % were female. 52.58 % of students completed *Information Technologies* classes in 10<sup>th</sup> grade, and 39.18 % of students – in 12<sup>th</sup> grade.

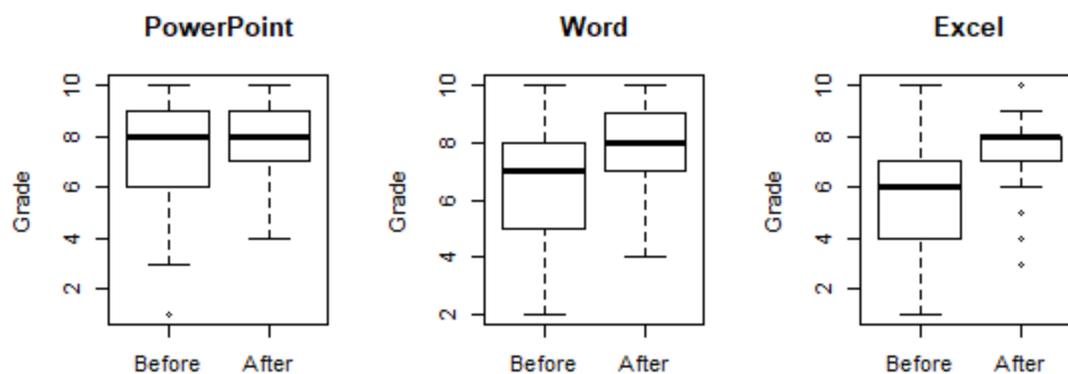
At the beginning of the semester, students ( $n = 90$ ) took the short online introductory test. The median of answers was 5.1 from 10. Only 4.5% of students received a grade of at least 8. This result can be explained by the fact that students started a new course after a summer holiday and they were unprepared. Besides, many students did not remember the fundamentals of the IT course due to the break after 10<sup>th</sup> grade.

Further during the semester, the students ( $n=108$ ) took two practical *Excel* quizzes. The first quiz included a number of questions related to the use of *Excel* formulas and its useful functions. The median of answers was 7, mean – 7.14, and standard deviation – 1.93. The second quiz focused on creating and managing *Excel* tables and graphs. The median of answers was 8.5, mean – 8.20, and standard deviation – 1.47. A paired t-test ( $t = -5.9849$ ,  $df = 106$ ,  $p\text{-value} = 0.0000$ ) shows the statistically significant differences between results of the first and the second practical tests.

During the semester, the students had to prepare a *PowerPoint* presentation and *Word* document (creating a table of contents, references, bibliography, style customising, etc.). The analysis of students' works showed that the students have good skills in *PowerPoint* programme and moderate skills in *Word* programme. This result can be explained by the fact that students prepare presentations not only during the IT classes but also during the classes of other subjects. Therefore, students usually get comments and suggestions for improvement from their teachers. Nevertheless, the teachers of other subjects do not check the formatting of the *Word* document, they are rather interested in the content.

At the end of the semester and before the exam, the students were asked to answer anonymously the online survey for self-evaluation purposes. The students self-assessed their competencies of *Excel*, *Word*, and *PowerPoint* programmes before and after the course (Fig. 1). The respondents have indicated that the lowest level of their skills refers to the *Excel* programme while the highest – to *PowerPoint*.

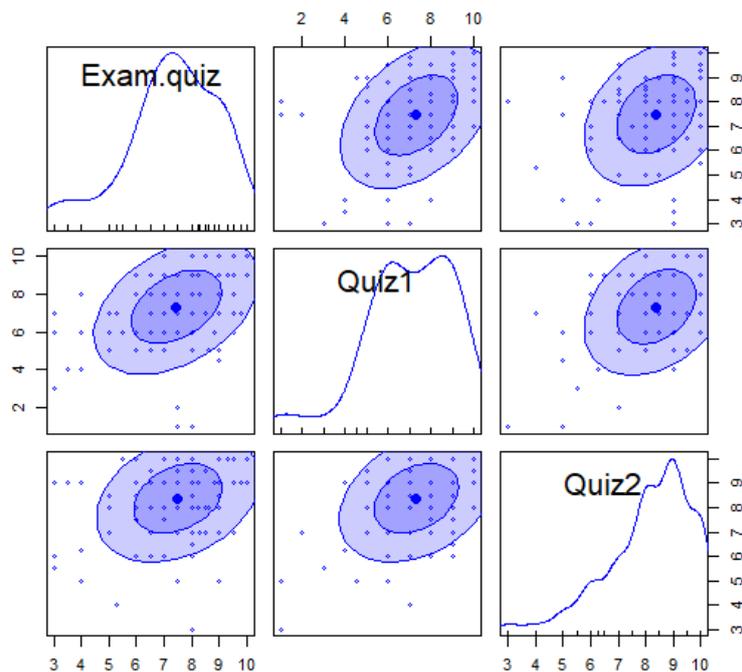
Figure 1. Results of students' self-evaluation.



The respondents indicated that there was a significant improvement in their *Excel* and *Word* skills after the completion of the course.

Finally, the students took the exam. The exam consisted of the following parts: an online test and the practical quiz. The correlation between the results of the practical exam quiz, the first, and the second practical tests (Fig. 2) was low, i.e. 0.39 and 0.28 respectively ( $p < 0.05$ ).

Figure 2. The relationship between the results of the practical exam quiz, the first, and the second practical quizzes.



No significant differences between the exam results and students' self-evaluation were found. Also, no significant difference between the results of an online exam test and the results of the practical quizzes was detected.

No significant differences between the results and the self-evaluation according to sex were found.

### 3. Conclusions

The results regarding students' perceptions of their competencies in ICT indicate that they express an intermediate level of skills in ICT. No significant differences between the exam results and students' self-evaluation were detected.

First-year students of the Agriculture Academy were skilled at simple programmes like *MS Word*, *MS PowerPoint*, and searching and browsing the Internet. However, they are less skilled at using *MS Excel*.

The study team considers that the data obtained from the study can be used as a basis for further studies on ICT literacy among students of Vytautas Magnus University and in the processes of identifying needs and interests of the university students to improve their ICT literacy.

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## **EUGENICS TODAY: AN INTERDISCIPLINARY TEACHING FOR HIGHER EDUCATION**

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### **Abstract**

Eugenics involves the application of scientific practice to promote selective breeding in the human population. Notably, although considered unethical and outdated many science papers on the topic are still heavily cited. In the present study, a lesson plan has been produced for an English for Academic Purposes/English for Scientific Purposes (EAP/EScP) course in a Biology Department in Higher Education, to be held on the occasion of the International Holocaust Remembrance Day (27th of January). In a two-fold approach, students are first introduced to the history and background of the eugenics movement and then presented with current relevant bioethics issues. In the first part, students watch video footage, discuss on archive material and are subsequently asked to produce posters and audiovisual material on seminal eugenics cases. In the second part, students are randomly assigned to one of two groups and a debate is held on the topic of embryo designing and the possible risk of a modern eugenics rise. The activities chosen for this lesson promote interdisciplinary education, student-centered practices and active learning. Importantly, the topic lends itself to the coupling of science communication and humanities, also referred to as biomedical humanities. Post-lesson responses to a questionnaire reveal that although initially largely unaware of the issues discussed here, the students form clear views on the importance of historical memory and bioethics education.

**Keywords:** *Eugenics, higher education, science communication, biomedical humanities, interdisciplinary education.*

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### **1. Introduction**

The term eugenics was coined by Francis Galton (Barnett, 2004), cousin of Charles Darwin, but the ideology dates as far back as in ancient Greece (Galton, 1998). It involves the attempt to regulate human procreation based on scientific findings from the field of genetics. Although nowadays these practices have been abandoned and are deemed unethical, paradoxically, several outdated science papers are still being cited (Cohen, 2017). In this paper, in the context of an English for Academic Purposes/English for Scientific Purposes (EAP/EScP) course, we introduce students of a Biology Department in Higher Education to the historical background of some seminal eugenics cases. We also discuss cutting-edge research techniques, such as CRISP (Clustered Regularly Interspaced Short Palindromic Repeats) (Ormond et al., 2017) and current concerns that the unmonitored application of this technology may spark a eugenics movement revival (Knoepfler, 2015; Verlinky, 2005). Importantly, we ask students to engage with the topic in activities that promote interdisciplinarity (Moss, Osborn, & Kaufman, 2008), critical thinking (Chowning, Griswold, Kovarik, & Collins, 2012) and active learning (Freeman et al., 2014). Furthermore, the lesson plan boosts visual literacy and technology literacy via the use of Web 2.0 tools and relevant audio-visual material (Andreou, 2019).

### **2. Methodology**

Subject area: Biology, English for Academic Purposes/English for Scientific Purposes (EAP/EScP), Topic: Eugenics, International Holocaust Remembrance Day, Age group: 18+, Duration: 2 teaching hours.

## 2.1. Purpose

On the occasion of the International Holocaust Remembrance Day (27<sup>th</sup> of January) a lesson plan is devised to educate science students regarding the practice of eugenics. The purpose of the educational micro-scenario is to inform them about the eugenics movement, past applications and possible future implications of recent science achievements such as embryo designing.

## 2.2. Educational aims

Through this teaching approach we aim to: 1. Inform students about the eugenics movement and possible present and future applications and risks, 2. Familiarize students with interdisciplinary teaching (e.g. Biology, EAP/EScP, History and Bioethics), 3. Highlight the ethical implications of controversial science applications and discuss bioethics, 4. Encourage students to adopt a responsible attitude towards controversial scientific practices, 5. Help students improve their collaborative skills, 6. Practice debating on a subject and promote critical thinking, 7. Encourage artistic expression and 8. Promote students' technology and visual literacy via the use of Web 2.0 tools and relevant audiovisual material.

## 2.3. Materials

1. Video projector, 2. IT classroom with internet connection and 3. Student Smartphones / Tablets / Laptops

## 2.4. Procedure

The present micro-scenario comprises of Information Technology (IT)-enhanced micro-activities that involve issues on eugenics and bioethics. The micro-activities span over two teaching hours. In the first hour, we provide an introduction on eugenics and the background of the movement. In the second hour, we focus on the bioethical implications of recent science advancements in Biology.

**2.4.1. 1<sup>st</sup> phase (duration: 45 minutes). 1<sup>st</sup> micro-activity (duration: 15 minutes).** Introduction to eugenics using a teamwork activity.

1. Warmer: Students watch a short video by Cold Spring Harbor Laboratory on forced sterilization during the American eugenics movement (<https://www.cshl.edu/dnalcmedia/forced-sterilization-during-the-american-eugenics-movement-james-watson/#description>). They then read an extract published online by Cambridge University Press on the Lebensborn breeding plan (<https://www.cambridge.org/core/journals/central-european-history/article/lebensborn-and-the-eugenics-policy-of-the-reichsfuhrerss/45858920D4BF64CAD2DC33A5D8DB8655>) (Thompson, 1971). A discussion is held with a reference to selective breeding and bioethics.

2. Students are directed to the Auschwitz Museum website (<http://auschwitz.org/en/>) and to the Medical Experiments section. They are asked to identify representatives of the eugenics movement. We interact with the students and answer questions on the information collected.

3. Students are requested to produce as homework, in teams, a short video compilation on the Vyond online platform (<https://www.vyond.com/>). The videos should be featuring images, audio and text produced by the students on the topic of seminal eugenics cases.

**2<sup>nd</sup> micro-activity (duration: 30 minutes).** Poster activity.

1. Warmer: we introduce students to open source material and direct them to the Wikimedia Commons repository (<https://commons.wikimedia.org/>).

2. We instruct students to search for audiovisual material on eugenic practices that they may use for their posters.

3. Students produce their posters on the online app Glogster (<https://edu.glogster.com/>). They are instructed to use at least one feature of each of the following categories: audio, video, text, image.

**2.4.2. 2<sup>nd</sup> Phase: (duration: 40 minutes). 3<sup>rd</sup> micro-activity (duration: 40 minutes).** Debate on the topic of introducing CRISPR technology to embryo genetic engineering (Ormond et al., 2017).

1. Warmer: We discuss the CRISPR technology in connection to human genome editing. We distribute double-sided (YES; green, NO; red) cards to the students and we quickly hold a poll by asking them to vote whether they consider genetic modification of embryos ethical. A vote count takes place.

2. We project excerpts (6:08-12:36 & 15:10-18:00) of Paul Knoepflers' TEDx talk "The ethical dilemma of designer babies" (Knoepfler, 2015). We ask students to read the transcript of the entire talk.

3. Regardless of their personal views, students are randomly assigned to two groups using the Random Integer Generator (<https://www.random.org/>). Team 1 is in favor of embryo genetic modification and Team 2 is against it.

4. Students are allowed a 10-min brainstorming session to prepare their arguments.

5. The debate lasts about 10min, consisting of three sessions of arguments and counterarguments. The debate ends with a fresh vote count.

6. In the remaining time, a plenary discussion is held on science communication. Students are encouraged to elaborate on means of communicating controversial biology topics to the general public.

**2.4.3. Evaluation (duration: 5 minutes).** Students were requested to complete an exit ticket before leaving class (<https://code.org/learn>). The exit ticket evaluation sheet comprised of three fields: “Today I learned:”, “Today I experienced:”, “Today I felt:”

### 3. Discussion

Feedback from the students shows that, although largely unaware of the issues discussed in the present lesson plan, they became increasingly interested in the topics and appreciated the importance of historical memory and bioethics education. Furthermore, when prompted to discuss the communication of controversial science topics, especially to a general, non-expert audience, they express their appreciation (Fischhoff & Scheufele, 2013). Importantly, the topic of eugenics lends itself for interdisciplinary educational approaches, a combined approach of science and the humanities. This paper is thus in line with studies in the field of biomedical humanities (Fried, Madar, & Donley, 2003).

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## BUILDING INTEGRATED PATHWAYS TO INDEPENDENCE FOR DIVERSE BIOMEDICAL RESEARCHERS: PROJECT PATHWAYS

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### Abstract

Diversity of backgrounds and life experiences on scientific teams is known to lead to more innovative ideas and better scientific products. However, in the United States, the percentages of individuals from underrepresented racial and ethnic groups who obtain doctoral degrees in the Sciences continue to be significantly lower than their percentages in the population. This has resulted in the need for nation-wide initiatives to remedy this inequality, and consequently produce more productive teams of scientific minds. Xavier University of Louisiana is a historically Black and Catholic university that is widely recognized in the US for the success of its undergraduate Science, Technology, Engineering, and Mathematics (STEM) programs. *Project Pathways* at Xavier is one of ten federally-funded Building Infrastructure Leading to Diversity (BUILD) programs with the overarching goal of diversifying the Biomedical research workforce. *Project Pathways* is designed as a holistic, integrated, and coordinated program across Biomedical academic departments, student academic and career support offices, and the University's faculty development center.

The overall hypothesis of *Project Pathways* is that if individuals from groups underrepresented in scientific research careers are provided with a) early awareness and deepening exposure to Biomedical careers, b) supportive relationships as they move through the pathway, c) suitable infrastructure, and d) meaningful engagement in Biomedical research experiences and adequate research resources, then a higher number will succeed in entering and successfully completing graduate programs, leading to increased diversity in the Biomedical research workforce. Here, the significant strides of this program during its first five-year funding cycle are presented.

**Keywords:** Diversity, student research training, biomedical workforce.

### 1. Introduction

Xavier University of Louisiana is a mission-driven, minority-serving, liberal arts institution, and is also a national leader in the number of its STEM alumni who go on to receive doctoral degrees in Medicine, Science, and Engineering. In Fall 2019, approximately 81% of the 2,512 undergraduate students enrolled in the College of Arts and Sciences at Xavier were Black/African American, and about 72% of undergraduates majored in the Biomedical Sciences (Bioinformatics, Biochemistry, Biology, Chemistry, Computer Science, Data Science, Mathematics, Neuroscience, Physics, Psychology, Public Health Sciences, Sociology, and Statistics) (Data provided by Xavier University's Office of Institutional Research and Decision Support). The University is ranked second in the nation in the number of Blacks/African Americans who earn bachelor's degrees in the Physical Sciences, and fourth in the number earning bachelor's degrees in the Biological and Biomedical Sciences ("Top 100 Degree Producers 2018"). A 2013 National Science Foundation report ranks Xavier as first in the nation in producing Black/African American graduates who go on to receive Life Sciences PhD degrees, fifth for those who go on to receive Science and Engineering PhD degrees, and seventh for those who go on to receive Physical Sciences PhD degrees ("Baccalaureate Origins of U.S.-Trained S&E Doctorate Recipients"). The 2012 Diversity in Medical Education report published by the Association of American Medical Colleges (AAMC), ranked Xavier as first in the number of Black/African American alumni who successfully complete their Medical degrees ("Diversity in Medical Education").

Despite recent progress, there is still a significant disparity in the percentage of individuals from underrepresented groups (Blacks/African Americans, Hispanics/Latinos, Native Hawaiians/other Pacific Islanders, American Indians, and Alaska Natives) who obtain doctoral degrees ("Annual Estimates of the Resident Population"). The 2017 US Census Bureau data showed that these individuals made up 39.3%

of the US population, however, according to the National Science Foundation, National Center for Science and Engineering Statistics (2017 Women, Minorities, and Persons with Disabilities in Science and Engineering Report), these individuals only made up 30.5% of doctoral degree recipients in all Biomedical fields. Based on these reports, there is a more significant disparity between the percentage of Blacks/African Americans in the US population (13.4%) and their percentage obtaining doctoral degrees (in all Biomedical fields (6.7%); Life Sciences (6.5%); Physical and Earth Sciences (2.5%); Mathematics and Computer Science (2.8%); Engineering (3.9%); and Psychological and Social Sciences (7.7%)). Nationwide initiatives are required to address this equity and social justice issue which is deeply threatening to the nation's progress and long-term social and financial well-being.

Xavier is one of ten institutions in the United States that are receiving competitive funding from the National Institutes of Health's (NIH) National Institute of General Medical Sciences (NIGMS), Division of Training, Workforce Development, and Diversity (TWD) under the BUILD Program. BUILD's ultimate goal is to increase the diversity in scientists pursuing Biomedical research careers, and thus the NIH-related workforce ("Building Infrastructure Leading to Diversity"). The ten BUILD programs work closely with the National Research Mentoring Network (NRMN) and the Coordination and Evaluation Center (CEC) under the Diversity Programs Consortium umbrella.

## 2. Objectives

The BUILD Program at Xavier, *Project Pathways*, aims to transform Xavier's educational and support systems to better educate and engage students on the pathway to a Biomedical research career, particularly those students at high risk of not entering or of exiting this pathway.

## 3. Methods

The Program is comprised of four cores that work together to achieve the Program's goals. The Student Training Core (STC) engages students in hands-on mentored research experiences on- and off-campus and provides them with research skills training, exposure to various Biomedical research areas, and opportunities to attend and present at local and national meetings. The Research Enrichment Core supports: curriculum development activities tailored to enhancing students' research skills and improving Biomedical curricula at Xavier leading to enhanced student preparedness and competitiveness for graduate studies; faculty and staff mentor training; post-baccalaureate training to enhance recent graduates' skills and competitiveness for graduate school; and pilot research project funding and grant writing workshops for faculty. The Institutional Development Core (IDC) provides students with foundational knowledge of Biomedical careers as well as extensive academic and career development support mechanisms available to all Xavier students; the IDC works closely with the STC to coordinate activities. The Administrative Core oversees and unifies the overall project initiatives. Additionally, through partnerships with a number of research intensive institutions, the BUILD Program provides Xavier students with enhanced research experiences that prepare them for entering graduate programs at such institutions with the skills to be successful once there. The Program initiatives are evaluated internally by program evaluators, and externally in the context of the DPC by the CEC. In addition, each BUILD site is assigned an NIH team that provides input and closely follows the Program's progress.

## 4. Discussion

The first five-year cycle of BUILD Program funding ended in June 2019 and has had significant impacts on Xavier and its students:

- Most students come to Xavier with Medical or Pharmacy careers in mind, and are not familiar with Biomedical research careers and opportunities they provide. New initiatives have been implemented to introduce Xavier students *and their parents* to careers in Biomedical research as early as during New Student Orientation events.

- To further introduce and interest students in such careers, research shadowing opportunities are provided. In the first funding cycle, research shadowing was only offered to freshmen and sophomore students, however, due to its success, all students are now eligible for participation in this activity.

- The Program has led to increased availability of hands-on Biomedical research opportunities for Xavier students and recent graduates, both on- and off-campus (on-campus: 162 pre-BUILD to 208 in Year 4 of the Program), as well as an increased number of students who are pursuing Biomedical graduate degrees (a 57% increase observed for the 2016-2017 graduates compared to the 2013-2014 graduates). During the first five-year cycle:

- **82** undergraduate students participated in hands-on, mentored research experiences under the BUILD Program;

- **78%** of the Program's alumni matriculated into graduate and professional programs;

- **41 recent** Xavier graduates participated in one-year post-baccalaureate research training as technicians to improve their competitiveness for graduate studies in Biomedical fields; and
  - **69% of** the technicians who completed the Program entered graduate programs in Biomedical **disciplines** (the percentage is **83%** if we include graduate, Medical, and Pharmacy programs).
    - Initiatives have been implemented to improve and synergize the academic and career support resources, and the Biomedical curricula to increase student success rates.
    - The Program has led to increased research productivity through faculty support (faculty release time, grant writing workshops, and funds for supplies, equipment, travel, and research infrastructure improvement):
      - **17** research publications;
      - **133** research presentations at regional and national conferences; and
      - **49** research proposals submitted by faculty; **26** funded and **4** pending review at the end of the fifth year.
    - Faculty development initiatives have been implemented in the form of interdisciplinary pedagogical, grant writing, and mentor training workshops and seminars.
    - 110 (out of 223) faculty members from all disciplines and 53 research and program staff have completed the formalized mentor training program, leading to a significant improvement of the mentoring culture across the campus.
    - A robust network has been established with 16 research-intensive partner institutions providing students with research and graduate school opportunities and faculty with new collaborations.

## 5. Conclusions

The second phase of *Project Pathways* was funded in July 2019 for a second and final five-year cycle, and has been designed to respond to the findings of the first cycle by identifying the initiatives which are most impactful, cost-effective, sustainable, and transferable, and widely disseminate the findings to the greater academic community. The outcomes of the first cycle have already proven the *Project Pathway's* hypothesis by identifying effective and transferable initiatives for increasing diversity.

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## **BRAIN MUSIC: INTRODUCING RESEARCH THINKING TO THE SECONDARY EDUCATION CURRICULUM**

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### **Abstract**

Streaming music services are becoming increasingly popular especially among the younger population. Interestingly, this topic is somewhat connected to neurobiology as recent PET and fMRI studies have shown. The present lesson plan aims to educate about the impact of music on the human brain and how it can possibly affect mental health. More specifically, the neural basis for the impact of music on emotions is described along with a peak on brain data and the function of the tools used for imaging the living brain. Students are directed to platforms such as Spotify and YouTube to engage in activities that combine leisure and science in a digital medium. They are asked to record their emotion in relation to the music and to later form a hypothesis that explains their data. This Biology lesson is intended for teenagers and young adults and is designed to promote technology literacy, student participation and initiative. Importantly, the generation of new research ideas and research thinking are actively encouraged.

**Keywords:** *Biology, secondary education, active learning, technology literacy, research culture.*

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### **1. Introduction**

“Music...perception involves the mapping of sound onto meaning (and emotion) ...This processing must include feedback as well as feedforward systems as well as making contact with stored memories and experiences as well as emotional systems” (Baars & Gage, 2014). In the present study, we teach the impact of music to the human brain and mental health in a series of activities that promote research thinking (Rinatovna, 2017), active learning (Handelsman, Miller, & Pfund, 2007) and technology literacy (Andreou, 2019).

### **2. Methodology**

Subject: Biology - Topic: The impact of music on the human brain. - Age group: teenagers and young adults - Time: 90 minutes.

#### **2.1. Educational Goals**

Through this teaching approach we aim to: 1) Promote science literacy and technology literacy in secondary education, 2) Encourage students to engage in active learning and critical thinking activities, 3) Promote students’ research thinking, 4) Help students develop collaboration skills, 5) Educate students on neuroscience topics, 6) Introduce the concept of mental health, 7) Educate on the importance of emotional and mental health, 8) Encourage students to appreciate listening to music as a leisure activity.

#### **2.2. Materials**

Video projector, IT (Information Technology) classroom with Internet connection.

#### **2.3. Procedure**

The present lesson plan spans over two teaching hours. In the first hour we focus on formulating a research hypothesis and researching scholarly literature. In the second hour, students assess their understanding and evaluate the lesson.

**2.3.1. 1<sup>st</sup> Phase: (time: 45 min). 1<sup>st</sup> micro-activity (time: 35 min).** Educating on the impact of music on the human brain and its link to mental health. Students form a research hypothesis:

1. Students are requested to listen to several music tracks on the platforms Spotify (<https://www.spotify.com>) and YouTube (<https://www.youtube.com/>) and to record their emotional responses to the music by filling-in a spreadsheet that is handed out to them.

2. Once finished, students are instructed to work in teams to compare their results and to produce a short description of their main findings.

3. Following their feedback, the instructor poses the following questions: "Why certain music tracks tend to correlate with the production of certain emotions? Also, how can the disparity of emotional responses between individuals may be accounted for?" Discuss this question with your team and generate a hypothesis. Try to include to your hypothesis your previous knowledge of higher cognitive functions of our brain, e.g. audition (hearing), memory, emotion.

4. At a next step, students are invited to hold a plenary discussion, each team aiming to convince others that their hypothesis is correct.

5. The activity is concluded with a discussion on recent research evidence employing brain imaging techniques that shows a link between music and strong emotional responses (Chen et al., 2017) and how these may differ based on stored memories or depression (Lepping et al., 2016).

**2<sup>nd</sup> micro-activity (time: 10 min).** Introducing the concept of mental health and reviewing technological advances that aim to address mental health disorders. Students research science literature:

1. Introduce students to a mobile health (mHealth) Android application (Psychologist in a Pocket; PiaP) that monitors mobile users' electronically inputted text and screens it for depression symptoms (Cheng et al., 2016).

2. Request that students use the Google Scholar search engine (<https://scholar.google.com/>) to research for relevant literature, namely scholarly science papers.

3. Students will prepare a Canva presentation (<https://www.canva.com/>) and give a 3 min talk in class in the following week on their findings, limited to their top 3 papers of interest. Key points, major challenges and cutting-edge technological methodologies should be included in their presentation.

**2.3.2. 2<sup>nd</sup> Phase: (time: 45 min). 3<sup>rd</sup> micro-activity (time: 35 min).** This is an activity that prompts students to collaborate in order to solve an "escape room" type of challenge. The activity is designed to promote and assess students' understanding of the biology of the human brain (Nicholson, 2018).

1. Warmer: Introduce students to a fictional storyline, where they need to solve puzzles in order to escape from a "room" and get a reward (e.g. first team out may choose next class excursion destination). To complete their mission in this educational game, they will have to answer questions correctly about the human brain and the impact of music on brain activity.

2. Educational Escape Room Activity:

a. Randomly allocate students to groups of 4-5 people with the help of a Random Sequence Generator (<https://www.random.org/sequences>) based on their Student ID number.

b. The escape room puzzles comprise of 5 types of exercises (multiple choice, true/false, matching, gap filling and a crossword). Upon providing successful answers students will obtain 5 different "keys" so that they may "escape" the room.

c. Puzzles and "locks" will be accessible to students via Google Forms (<https://www.google.com/forms/about/>).

d. Escape room study material will also be available on the class shared Google Drive folder (<https://www.google.com/drive/>).

**2.3.3. Evaluation (time: 10 min).** The following steps are employed to assess students' comprehension:

1. Reflect on new knowledge acquired on cognitive neuroscience and hold a plenary discussion on students' prior perception of the issues introduced here and whether this has shifted as a result of the lesson.

2. Before leaving class, check students' reception of the lesson by asking them to provide short answers on an Exit Ticket (Andreou, 2019).

### 3. Conclusions

The need for innovations in teaching Biology has been well-described in recent reviews of educational research (Wood, 2009). In this study, we aim to activate prior science knowledge (Andreou, Aletra, Athanasopoulou, & Psarropoulou, 2018) and promote active learning (Handelsman, Miller, & Pfund, 2007). Importantly, in the present paper, we introduce and encourage the incorporation of research thinking in biology teaching in secondary education. In a series of activities, students engage in data collection and interpretation, scholarly literature, and science communication. By means of using digital media familiar to students (Schriewer & Bulaj, 2016), we activate prior science knowledge and promote motivation for learning. An investigation of the student experience and the learning outcomes as compared to traditional lecturing will help shed more light to the degree of the effectiveness of such an educational approach.

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## AUTHOR INDEX

Aada, K.	221	Foroozesh, M.	483
Adesokan, R.	370	Franceschinis, I.	100, 474
Agrati, L.	63	Gaetani, F.	423
Albu, A.	136	García Albaladejo, E.	216, 226
Alfaro-Gervon, F.	236	Gargallo-Aguaron, P.	236
Ali, S.	309	Giguette, M.	483
Allen, A.	291, 409	Gil, C.	471
Anderson, N.	291, 409	Gilabert Cerdá, A.	216, 226
Andreou, L-V.	480, 486	Gil-Montoya, M.	471
Argyropoulos, V.	271	Gómez-Puerta, M.	281, 389
Armie, M.	73	Gonçalves, G.	353
Barroso, R.	334, 344	González-Beltrán, B.	173, 183
Bazán, P.	358	González-Brambila, S.	173, 183
Belardo, R.	339	Grandits, P.	286
Bernsteiner, R.	178	Grinfelde, A.	448
Brasili, S.	394	Gulya, N.	29
Brebera, P.	48	Hathazi, A.	271
Brevi, F.	423	Hilliard, A.	150
Bucolo, O.	53	Husabø, E.	256
Cámara-Estrella, A.	193	Iskandaryan, R.	433
Cardona-Moltó, M.	389	Jia, S.	385
Chatzikonstantinou, K.	141	Jiménez-Sánchez, C.	236
Chen, G.	127	Johanson, K.	483
Chilingaryan, K.	261	Ju, Y.-J.	155
Chiner, E.	281, 389	Kalaitzi, C.	211
Collins, M.	291, 409	Kalemi, A.	480
Comparetto, E.	53	Kaloo, R.	309
Costa, I.	113	Kamati, V.	159
Cui, T.	24, 34	Kanari, C.	271
Cutting, D.	291, 409	Kasimatis, K.	58, 131
Dias, D.	334, 344	Kerr, R.	231
Díaz-Pareja, E.	193	Kontostavlaki, A.	480
Dilger, T.	178	Kouloumpis, D.	131
Dillon-Lee, F.	241	Ku, J.	468
Dima, F.	136	Kylén, E.	428
Efstathiou, E.	480	Kyriacou, M.	271
Escobar, M.	329	Kyrkjebø, D.	256
Fehérvári, A.	29	Kyte, L.	188
Figueroa-González, J.	173, 183	Lavy, I.	81, 91, 246
Fojcik, M.	122, 206	Leite, I.	188
Fojcik, M.	122, 206	Li, C.-H.	155
Fomina, M.	251, 349	Li, J.	39
Foose, R.	150	Li, Y.	443

Liao, X.	203	Perini, M.	100, 474
Liu, J.	24, 34	Phindane, P.	380
Liu, Q.	24, 34	Piergallini, R.	394
Lledó Carreres, A.	216, 226	Pinto, J.	353
López-Royo, M.	236	Ploder, C.	178
Lorenzo Lledó, A.	216, 226	Pollen, B.	122
Lorenzo Lledó, G.	216, 226	Popescu, F.	433
Makura, A.	370	Qazi, M.	329
Malliou, A.	486	Radzevičienė, A.	453
Man, Y.	295	Ramaila, S.	3, 12, 20, 68, 77, 86, 96, 105
Manaka, T.	145	Ramnarain, U.	414
Matsuya, A.	375	Ramothwala, M.	12
Matzakos, N.	131	Rimkuvienė, D.	477
Mavuru, L.	145, 159	Rodríguez-Ponce, E.	419
McDowell, A.	291, 409	Rom, A.	324
Membrive, V.	73	Rozou, V.	131
Mengual-Andrés, S.	281	Ruiz Esparza Barajas, E.	16
Merciai, I.	231	Sage, P.	291, 409
Mesén-Hidalgo, R.	319	Sánchez-Guerrero, L.	173, 183
Miron, D.	53	Sande, J.	188, 256
Mokhothu, K.	164	Sandí Delgado, J.	319, 358
Montebello, M.	168	Sartori, R.	474
Monteiro, M.	113	Scarlat, C.	266, 276
Morais, C.	113	Seloane, P.	86, 96
Morgan, K.	483	Setlaltoa, W.	363
Moutsios-Rentzos, A.	131	Shilenge, H.	3
Mphafudi, J.	68	Shriki, A.	81, 91
Mugirase, G.	465	Shyti, B.	304
Nachshon, M.	324	Silva, A.	353
Ndimurugero, S.	465	Skarupská, H.	299
Nikolarazi, M.	271	Sokolova, A.	453
Nikolova, N.	304	Spathi, A.-E.	480
Ntladi, K.	20	Staňková, I.	299
Ogegbo, A.	414	Starja, D.	304
Ortega-Tudela, J.	193	Stenholm, J.	428
Ota, C.	314	Suleimanova, O.	349
Papageorgiou, T.	58	Supsakova, B.	404
Papazafiri, M.	271	Svensson, A.	428
Park, C.	118, 366	Tacconi, G.	100
Park, H.	108, 118, 366, 468	Takahashi, C.	375
Paula, L.	448	Thurston, L.	329
Pavignano, M.	53	Tommasi, F.	100, 474
Pedraja-Rejas, L.	419	Tseng, H.	8
Peksa, J.	241	Umesh, R.	399
Penn, M.	399	Vanaga, I.	448
Pérez Vázquez, E.	216, 226	Vaxevanidi, S.	486

Vicente, S.	353
Villegas, E.	281
Vlada, M.	136
Vodyanitskaya, A	44, 349
Volioti, C.	211
Wang, C.	24, 34
Weber, T.	433
Weerathai, T.	339
Wilkins-Green, C.	483
Wong, M.	198
Yaremenko, V.	349
Yuankang, X.	458
Zhang, Y.	39, 438
Zich, U.	53
Zondi, S.	105
Zunga, R.	77
Zvereva, E.	261
Zwane, M.	363