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INVESTIGATING PEDAGOGICAL PARADIGM SHIFT IN THE 21ST CENTURY TEACHING AND LEARNING IN SOUTH AFRICAN SECONDARY SCHOOLS

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ABSTRACT

The aim of this study was to examine if any pedagogical paradigm shift has taken place in enhancing authentic teaching and learning in secondary schools. It explored the pedagogical practices currently employed in secondary schools. The theory underpinning the study was the 21st century pedagogy for teaching and learning. A qualitative research design was adopted and data was generated from three secondary schools, consisting of 30 learners through focus group discussion and six teachers using semi-structured interviews. This sample was purposively selected by virtue of having and using digital computer technologies. An observation of 6 lessons was conducted and data was analyzed using an inductive thematic framework. By adopting an interpretivist paradigm, this data was collected using participant observation, as the main data-collection instrument for this study, triangulated with semi-structured teacher-and learner-focus group and interviews. The findings revealed that 'old' teacher-centered pedagogies continued unabated as the common instructional style and promoted learner-passiveness. It compromised on active learner-academic performance and making a meaningful significant intellectual achievement. This resulted in production of 'mediocre' human capital ill-prepared to face the fourth industrial revolution (4IR) challenges. This article recommends further research in areas pertaining to pedagogical shifts in line with digitalization of the world economy and education.

Contribution/Originality: This study helps to unveil the current pedagogical practices in enabling, and/or constraining, authentic instruction and learner-academic achievements in the wake of the 4IR world of work requirements. It further proposes the new pedagogical framework towards enhancing judicious and contingent guidance on educational practices during the 21st century era's unforeseen challenges surfacing due to the ever-changing ubiquitous digital technologies pervading socio-economic and educational platforms the world over.

1. INTRODUCTION

Current socio-economic demands and challenges posed by the fourth industrial revolution (Lesufi, 2017) requires an altogether new paradigm shift in our education systems. In corroboration, Goodwin (2019) propounded that shifts in pedagogical practices are necessary in alignment with pervasive digital technology in the interest of the changing times. With regard to these enlightenments, pedagogical strategies for teaching and learning have to transform alongside digitization as technology proved to be equally influential and pervading all spheres of our

lives the world over. Congruently, Mohamed (2014) and Lazarov (2018) posit that the aforementioned teaching strategic-shifts promulgates 21st century pedagogies that enable schools and surrounding areas to address issues of learners' engagement, challenges, achievement and disciplines so as to prosper in the 21st century world of work.

However, it was revealed, during the 6thTeaching and Learning Colloquium held in Durban (11 - 13 April, 2018) that our current teaching-learning system was overall marred by traditional model-kind of pedagogy characterized by teacher-centered approaches and its infrastructure of the classroom, the textbook and the assessment strategies. In spite of Kalantzis' (2018) observation that for decades now teachers and technologists have been acknowledging the "transformative power of technology in learning" in the USA, education was then still relatively untouched by technology. This surprisingly exposed a phenomenal 'no' shift in instructional pedagogy in general. Furthermore, such phenomenon served as prolongation of 'old' pedagogies, whereby the teacher's ability was based on how good one delivers the content without meaningful emphasis on teacher's pedagogical acumen; hence teacher's pedagogical capacity appeared secondary and basically emphasized direct instruction (Edutopia, 2014) in which case technology was insignificantly employed and was only meant to support and supplement traditional mode of instruction and learners' mastery of content. What perturbed the study was whether such generally revealed persistent teacher-centered methodologies, which constrained 21stcentury teaching and learning tactics, were prevalent in South African schools as well.

Nevertheless, new models of teaching view teacher's quality from the perspective of their pedagogical praxis' hence one's repertoire of teaching techniques and abilities to form partnerships (Lazarov, 2018) and/or professional learning communities (PLCs), with learners in mastering the process of learning, are taken into cognizance. More so, ubiquitous technology oscillates around the new models of teaching and supports the learner-mastering of content and enables deep learning (DL); thus basically promoting collaborative learning styles and critical thinking among peer-learners along with their teachers. Blended learning is a fascinating example of a shift to new pedagogical mode of instruction that provides a wider choice and sufficient learner-engagement (Mohamed, 2014). Hence it appears to be more effective and efficient in fostering student-centered learning thus facilitating effective and successful learner-academic performance. In concurrence with the above, past research has perceived the blended tactic as a reasonably self-paced, flexible and multimodal approach (Ultranet and Digital Learning Branch, 2012) that interlaces traditional face-to-face mode of teaching and digital technology-based teaching and learning.

Overall, subsequent to the foregoing highlights, 21st century pedagogies have developed the capacity to allow learners, in collaboration with their teachers, to discover and master content, create and use new knowledge (Lazarov, 2018) to counteract the fourth industrial revolution's (4IR) challenging world of work. In a nutshell, it is a crucial manifestation of a pedagogical shift fostering and nurturing partnerships among learners and further collaboration with their teachers thus promoting digital learning (DL) catalyzed by, and responding to, pervasive digital technologies. Corroborating with Fullan and Langworthy (2014) who asserted that "these developments have profound implications for curriculum, learning design and assessment," it is yet to see whether these developments enhance learning acquisition and develops critical and emotional intelligence, computational and communication competencies and dexterity in the 21st century generation.

Therefore, it is in interest of students to explore attributes of the current pedagogical paradigms, in terms of their constraints and how they promote authentic instruction(Butler-Adam, 2018; Lesufi, 2017) so as to prosper in the 21st century era. These findings could also provide some insights that would assist in realigning our teaching and learning strategies so that they would match 4IR challenges and requirements. Further to this the revelations would boost and instill confidence in the education decision-makers to seek authentic and practical strategies on how to integrate digital pedagogies, such as Learning Management Systems (LMS), in future teaching practices, which presumably could allow learner-intellectual accomplishments regarded worthwhile, meaningful and significant enough to prosper in the 21st century era.

In this study, our purpose was to explore pedagogical paradigm shifts in the 21st Century teaching and learning in South African secondary schools, by using participant observation methods. The classroom observation was thus the main data collection instrument as advised in Antwi and Hamza (2015), "reliable knowledge is based on direct observation of natural phenomena" under study. Nevertheless, to enhance cross-validation of elicited data, and in order to comprehend the realities of the current pedagogical practices dominant in our secondary schools, the researcher interlaced participant observation with one-on-one in-depth semi-structured interviews with teachers and focus-group discussions with learners.

The following part of this article details literature review starting with the theoretical framework underpinning this study, followed by empirical studies concerning pedagogies of the 21st century. The term '21st century pedagogy' has been used interchangeably with '4IR' or 'digital pedagogy' as the researcher views both terms as portraying one and the same thing.

2. THEORETICAL FRAMEWORK

Underpinning this study is the theoretical framework of the 21st century pedagogy whose theorist was Andrew Churches (2011) cited by Lazarov (2018). In a nutshell this theoretical framework postulates that learning and knowledge, as well as development of competencies and skills, are grounded in and nurtured through the diversity of opinions catalyzed through collaboration, use of enabling technologies, modern supervisory and assessment styles that enhance learner-motivation to wanting to learn and relearn more in line with 21st century world of work. Figure 1 below summarizes interconnected kind of relationships among features that define the 21st century pedagogy for teaching and learning.
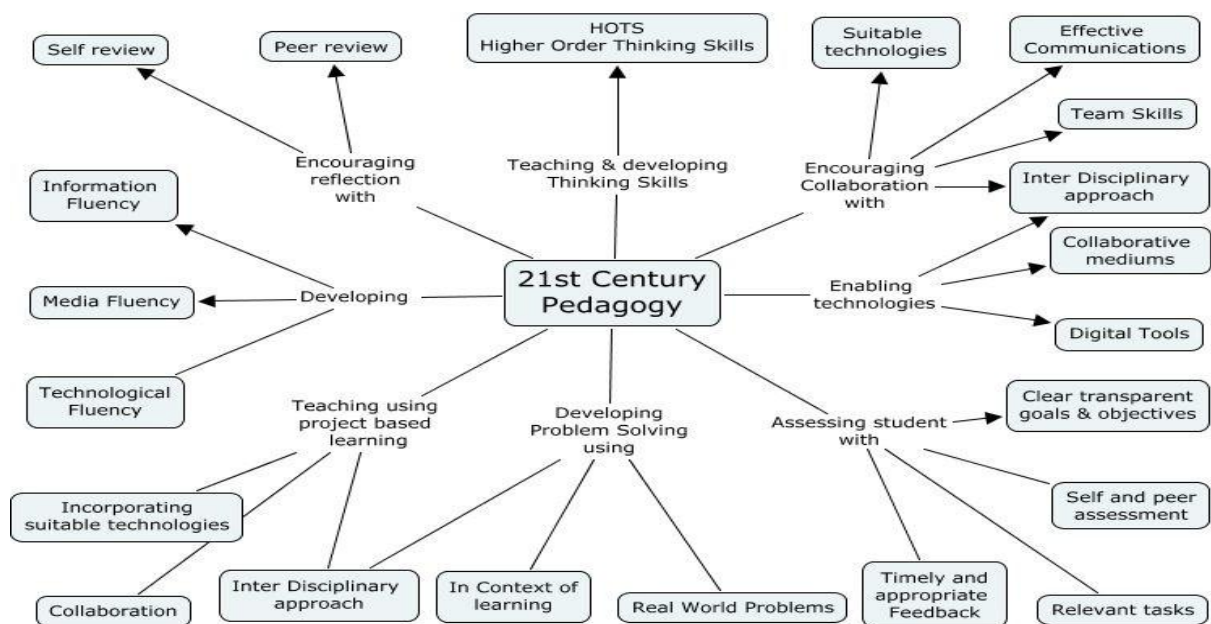

Figure-1. 21st Century pedagogy (Churches, 2011.http://www.educatorstechnology.com/2011/01/21st-century-pedagogy-teachers-should.html). Cited by Lazarov (2018).

This pedagogical framework came into being with due advancements in pervasive digital technologies, particularly social networking technologies (Burnes, 2019), which had the potential to change the whole 4IR educational framework. In line with the foregoing pedagogical framework, Lazarov (2018) pronounced that pervasive digital technologies, coming in the forms of computers, internet of things (IoT) and cloud computing (CC), play a significant role in defining the "environment in which young people learn and live;" hence 'dictates' change in a traditional teaching and learning environment.

However, irrespective of governments investing in information and communication technologies (ICT) for teaching and learning, current research (Lazarov, 2018; OECD, 2016; Padayachee, 2017; Wetering, Booij, & Bruggen, 2019) unveils that its (ICT's) integration is still irregular and insignificant. In corroboration, the Organization for Economic Co-operation and Development (OECD, 2016) cited by Lazarov (2018), further expatiated that the aforementioned futility, presumably, is a product of 'insufficient' practical pedagogical training on digital technology integration during the teaching process. This causes the conspicuous disparity between expectations and reality. The other reasons leading to futile ICT integration are lack of clarity in relation to educational mission and goals (Lazarov, 2018) i.e. lack of clarity on establishing levels of compatibility of ICT with the teaching and learning goals. Moreover, due to big gaps in terms of computer literacy, between teachers and students, it was difficult to select and find relevant high-quality digital learning resources, websites and software. It is hoped that the theoretical framework of 21st century pedagogy in this study would facilitate the unraveling of computational thinking on how to maneuver successfully in the 21st century education systems pervaded by digital technologies.

3. LITERATURE REVIEW

Empirical studies have also accentuated that the use of digital pedagogical strategies enable a learning climate that is conducive enough to encourage learners to think critically and computationally (Stover, 2018). These strategies simultaneously stimulate making collaboration with their peers and teachers and creatively engaging in real world problem-solving of some challenging tasks. This helps in understanding global landscape issues with the aid of ubiquitous digital technology within and outside the school premises. A closer analysis of the 21st century pedagogical framework (Figure 1) allows teachers to have deeper understanding of the current 4IR educational landscape challenges and requirements. That enlightenment, furthermore, encourages teachers to shift from teacher-centered pedagogies to instructional pedagogical practices that meet the learners' needs of today (21st century). Congruently, Lazarov (2018) posited that 21st century workplaces characterize knowledge-based societies that need 4IR workers with "many sets of special skills in order to succeed in work and life." Henceforward, from this perspective there is no doubt that 21st century pedagogies, in concurrency with Lazarov (2018), appeal upon the learners' zeal and interest to engage in experiential learning and own-construction of knowledge thus promoting student's interest in gaining 21st century skills and competencies.

Twenty-first century learning tactics requires such pedagogical paradigms shifts (PPSs)that can enhance authentic teaching techniques and allow the new generation to prosper in the 4IR era. Hence there are compelling arguments from varied literature to transform pedagogy (Ferguson et al., 2019; Scott, 2015) and promote development of DL skill-sets (TechUK, 2018; Wetering et al., 2019). Muniasamy and Alasiry (2020) posited that DL "involves algorithms that predict possible outcomes based on user data, which allow a computer to display behaviors learned from experiences" thus making every information received more intuitive. In line with the foregoing, Themis Christophidou, the Director-General for Education, Youth, Sport and Culture for European Union (EU), cited in the ET 2020 Working Group Schools (2018) postulating that:

> Schools face a range of changing educational demands - from learners, society and the labor market. To help them in their response, EU education ministers recently concluded that there is a need for contemporary approaches to teaching and learning and to the governance of school education systems.

Subsequently, above all, the rationale for shifting to new pedagogies rests upon the glaring and unfolding realities of boredom and frustration among learners as well as teacher burnout (Fullan & Langworthy, 2014) in order to dominate the teaching and learning arena around the world.

Furthermore, it is believed that digital pedagogies characterized by learner-centered instruction ignites learning (Snelling, 2018) as learners are kept active and engaged in construction of their own knowledge. Moreover, students need to be given meaningful room for engagement in classrooms thus promoting curiosity in

taking ownership of their learning (Snelling, 2018) and culminating it into DL. Congruous to the foregoing, Moate and Cox (2015) reveals that learner-centered pedagogy encourages students to "actively engage in and take ownership of their learning experiences inspiring students to think deeply about how they might apply what they are learning to their future practice." Contrastingly, as accentuated in the foreword by Sir Michael Barber, cited by Fullan and Langworthy (2014), archaic teacher-centered pedagogies promote 'flat lining' in the learning systems. Corroborating the foregoing enlightenment Professor Eric Mazur of Harvard University viewed such scenario as resembling learners '*being more asleep during lectures than when they are in bed*'. Irrespectively, "widespread use of this model continues" (Scott, 2015) to dominate, unabated, no matter how much the current literature exposes and how ineffective teacher-centered pedagogies are in failing to enhance crucial 21st century competences and skills.

Nonetheless, the lecture models (teacher-centered), synonymously referred to as 'didactic pedagogy' in this research, continue to prosper because teachers are presumably 'compelled' to pursue examination-oriented curricula guided by strictly standardized testing requirements as per the national policies intents of the Department of Basic Education (DBE). Concurrently, in a study about why the didactic pedagogy continues to dominate in today's classrooms in pursuance of inclusive education in Botswana, Mpho (2016) reveals that examination-oriented curriculum and overcrowding are main barriers to 21st century pedagogy. Subsequently, teachers pay little/no attention to new pedagogical paradigms that advocates learner-centered approaches more strongly. As observed by the ISTE (2018) in line with pervasive digital technology for instruction, "technology not only opens up new ways of teaching, it also brings about an array of new skills needed by educators" thus enhancing much more relevant and authentic student performance. Nevertheless, in spite of worldwide agreement that students need competences and skills such as critical thinking and the ability to communicate effectively which can enable them to solve problems through negotiation and collaboration, pedagogy has seldom adapted itself to address these challenges (Scott, 2015).

With regard to foregoing the current study advocates that 21st century pedagogy should be enforced by the DBE in accordance with e-Education and e-Learning policies intents so as to enhance a learning environment conducive enough to enhance students construct their own knowledge. Subsequently, this study also strongly propounds that realignment of competences alongside digital revolution is as crucial as rethinking pedagogies (Lesufi, 2017) that are in tandem with the 21st century work challenges and requirements. In this regard our 21st "educational systems should be outfitted with prerequisite of ICT both hardware and software resources, and curricula must be designed to promote a collaborative learner-centered environment to which students will relate and respond" (Boholano, 2017) because the generation of today is technologically compliant. Similarly, Moate and Cox (2015) argue that pursuance of learner-centered pedagogy may be a useful way to enable learner-acquisition of 21st century skills. However, for the 21st century pedagogy to work well the teaching fraternity should not discard completely the status quo unless problem of overcrowding of classes is resolved first; otherwise old pedagogy continues as the bedrock on which new pedagogy will sprout. Hence, digital pedagogies need to take center stage, as soon as possible, in line with challenges of the 4IR.

Furthermore, the researchers of this study concur that Problem Based Learning (PBL) and Project Based Learning (PjBL) should be taken, in line with the current literature on digital pedagogies Fullan and Langworthy (2014), as some of the new pedagogical approaches can stimulate critical and computational thinking skills as well as collaboration amongst students and their teachers. It is also strongly proposed in this study that the aforementioned pedagogical perspective have the potential to culminate into DL and develop emotional intelligence skills crucial for the young generation to face the challenges of the 4IR.

In partnership with researchers from the Norway's Centre for the Science of Learning and Technology (SLATE) (Ferguson et al., 2019) explored forms of new techniques of teaching, learning and assessment that could promote inculcation of DL competences and skills suitable for the 21st century work requirements. Regarding this, they proposed a summary of ten sketches of new pedagogies, already in currency although found to be superficially

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in use. The new educational theories and practices proposed are: *learning with robots, drone-based learning, learning through wonder, action learning, virtual studios, place-based learning, make thinking visible, roots of empathy, playful learning and decolonizing learning.*

Among the above-mentioned pedagogical tactics, the researchers of this study find *drone-based* pedagogy to be very interesting as it is ideal for geographical, environmental and scientific studies. This strategy is also useful for exploring the phenomena of areas regarded "inaccessible" on foot (Ferguson et al., 2019; ISTE, 2018) thus enriching learner-exploration of many physical spaces in collaboration with their teachers. Another strategy of *action-learning* also promotes meaningful learner-engagements, partnerships and collaboration of learners-group diversity with teachers to promote cross-pollination of ideas and opinions and address real and immediate problems of the interactive world. Moreover, by regularly collaborating and sharing varied perspectives, learners can constructively find and apply solutions (Ferguson et al., 2019) to solve problems concurrently encouraging sharing of experiences and strategies. This shows that digitized pedagogies play a crucial role in 21st century education systems. This study therefore concurs with Boholano (2017) who sets forth that "technology in the 21st century serves as an extraordinary tool to shape and enhance the learning environment" in supplementing high quality instructional methods. Hence, every teacher's 21stcentury pedagogical repertoire should include a meaningful technological domain.

The foregoing part of this study reviewed, in detail, issues pertaining to the 21st century pedagogies. In doing so a number of related studies were profoundly consulted in line with their pros and cons taking cognizance of the 21st century challenges and world of work. Overall the literature revealed that, although teachers and technologists acknowledge the crucial role played by technology in transforming instructional pedagogies in line with required 21st century pedagogies, traditional teacher-centered approaches continued to dominate unabatedly the teaching and learning platforms. Continuity of the status quo (traditional pedagogy) was found to be compromising on learner-acquisition of the 21st century knowledge and skills. Furthermore, the literature reviewed insignificantly unveils specific reasons leading to why shifts to the 21st century pedagogies is not meaningfully realized, especially in developing countries of which South Africa is not spared. The theoretical framework of the 21st century pedagogy (Lazarov, 2018) is discussed at length and found to be suitable enough to guide this study. To come to grips with reality surrounding the foregoing enlightened problem (lack of pedagogical shifts in alignment with 21st century teaching and learning requirements) the next part details the methodology used to carry out this research.

4. RESEARCH METHODOLOGY

This research was conducted in order to determine if any pedagogical paradigm shift has taken place in enhancing authentic teaching and learning in South African secondary schools and to examine how effectively the current pedagogical practices promote authentic instruction and learner academic performance so as to prosper in the 21st century world of work. Therefore, in carrying out this research an interpretivist paradigm was employed in concurrence with a number of experts like Creswell (2013); Creswell. (2014); Denzin and Lincoln (2018); Kumar (2014); Mohajan (2018); Pham (2018). Such a paradigm enhances better understanding of people's values, attitudes, perceptions, prejudices, perspectives and experiences, in their natural settings, and help in getting a deeper insight of particular phenomena under study. Creswell (2007), cited by Pham (2018), reiterates that the application of interpretivist perspective allows researchers "to gain a deeper understanding of the phenomenon and its complexity in its unique context instead of trying to generalize the base of understanding for the whole population." This is useful in coming to grip with the relative reality concerning specific educational challenge(s) and problem(s) that need policy makers and educational planners' proactive, contingency attention and informed input.

Further making reference to importance of interpretivism, Pham (2018) posits that "valuable data collected will provide researchers with better insights for further action later" thus promoting validity and transferability of the research outcome. Contrastingly, Chowdhury (2014) observed that "while interpretive research is recognized for its

value in providing contextual depth, results are often criticized in terms of validity, reliability and generalizability." Hence a need is felt to triangulate the methods of data collection and improve the degree of trustworthiness and dependability of findings. Taking cognizance of foregoing critique, this study triangulated participant observation with teachers' and learners' focus group interviews to solicit qualitative data pertaining to current pedagogical practices so as to ascertain their effectiveness to 4IR challenges.

A major tenet of interpretivist paradigm is manifest through its enhancement of profound understanding of phenomena through the meanings that people assign to them (Bricki and Green,2017) which motivated the researchers to employ it in this study. Subsequent to the foregoing, the researchers also strongly felt that application of this paradigm, in this study, would presumably promote meaningful and authentic understanding (Gadamer, 1970) of the pedagogical paradigms currently in use. It was also assumed that such an application will enhance 'authentic' instruction and promote the development of grade-appropriate learner-competences and skills that would allow them to prosper in the 4IR challenges and world of work. The study also made use of a case study design method for which data was collected through participant observation (classroom observations) technique and triangulated with in-depth semi-structured interviews for teachers and learner-focus group discussions. This method prove d useful to cross-pollinate elicited information and ensure validity and trustworthiness of the study outcome(s). Each and every teacher was observed delivering their subject content with the aid of computer technology tools to ascertain the postulation that digitization promotes pedagogical innovation in student-centered learning environments (Rampelt, Orr, & Knoth, 2019). It helped in determining the extent to which such a paradigm shift enhanced the quality and relevance of teaching and learning congruent to the 21ˢᵗ century challenges.

4.1. Target Population and Sampling Procedures

The target population of this study comprised grade 10 and 11 secondary school teachers and learners, from Durban North West circuit in KwaZulu Natal province. The researchers narrowed further the target population to teachers and learners from only KwaMashu Central and Mafukhuzela Ghandi Clusters in Pinetown district. This ensured a much more profound qualitative data from a small delineated area. Purposive sampling technique was used to select three schools by virtue of having and presumably using computers for teaching and learning across the curricula. From the three schools 30 learners (15 grade 10 & 15 grade 11), and six teachers teaching grade 10 and 11 (2 teachers per school) were purposively selected to constitute the sample of this study. Summarily, the study sample constituted 3 schools, 6 teachers and 30 learners.

4.2. Data Collection Procedures

Participant observation, done through classroom observations, was the main data collection instrument used to ascertain the pedagogical practices employed by teachers to deliver their subjects content using computer technologies across the curriculum. The rationale for taking participant observation as the main instrument, in this study, besides semi-structured teacher interviews and learner focus group discussions was to see the teachers practically teaching in classroom and to ascertain whether it was learner-centered or vice-versa.

Antwi and Hamza (2015) asserted that "interpretive paradigm is underpinned by observation…thus to observe is to collect information about events, while to interpret is to make meaning of that information by drawing inferences or by judging the match between the information and some abstract pattern". Furthermore, it was also expatiated that "reliable knowledge is based on direct observation or manipulation of natural phenomena" Antwi and Hamza (2015) thus making it imperative to interpret the phenomenon under study from a practical perspective. Bertram and Christiansen (2016) seem to concur with Antwi and Hamza (2015) when they asserted that "it is well documented that most teachers often teach in different ways to how they say they teach" hence the researcher perceived observation as the *key* instrument to study the pedagogical paradigms used by participating teachers in

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their classroom situations. In this regard, one lesson was observed for every participating teacher to make use of lesson-observation template and to enhance capturing of pertinent information in order to make the analytic process easier in understanding specific themes. A total number of six lessons were observed in this study.

To make the study findings valid, dependable and transferable the researchers triangulated participant observation with in-depth semi-structured interviews for both teachers and learners focus groups. Each of the six teachers was interviewed for duration of 20 minutes to 1 hour, depending on how much information the participant wished to dispense. Interviews were voice-recorded and transcribed verbatim and subsequently thematically analyzed. Learners were interviewed in groups of 5 students; each learner was identified by a letter (A-E) so as not to compromise on confidentiality and anonymity of the participants.

4.3. Data Analysis

The qualitative data collected was subjected to thematic analysis process, which involved in-depth analysis of transcripts, a process which was immediately done after interviews and classroom observations. The analytic process involved identification of significant themes and then categorizing them in accordance with their characteristics. Tendency of pseudonymity was observed to uphold the ethical principles of participants' rights to privacy, confidentiality and anonymity. This was accomplished by identifying both participating teachers and learners with abbreviated initials, for example, 'Teacher AC' meant a teacher from school A and identified as teacher C; and 'Learner B10A' was a learner from school B and identified as learner A in grade 10, and so on.

5. FINDINGS AND DISCUSSIONS

This case study aimed to explore the effectiveness of current pedagogical practices towards development of skills and competences which can allow learners to prosper in the 21st century era. This new era is characterized by disruptive digital technologies such AI, IoT, cloud computing and like. The thematic analysis of the qualitative data took cognizance of these issues and determined the extent of ICT integration in the sampled schools. According to the current literature reviewed, pedagogical paradigms advocated to shift over to alignment with exponential changes in digital technologies (Ferguson et al., 2019; Lazarov, 2018) since these paradigms conspicuously pervade the educational and economic structures the world over. Therefore, this study succinctly reflected on the extent of digital computer technology integration as an indispensable supplement of the21st century pedagogical practices. Accordingly, data was collected by means of participant observation (classroom observations), triangulated with semi-structured teacher interviews and learner-focus group interviews, which yielded the following findings, categorized into three themes, in relation to current pedagogical paradigms in South African secondary schools namely: 1. Importance of digital technologies as pedagogical supplements; 2. Irregular, insignificant and biased computer usage towards enhancement of 21st century pedagogies; 3. Scant stakeholder support and suggestions for nurturing 21st century pedagogies.

5.1. Importance of Digital Technologies as Pedagogical Supplements

The findings reveal that both teachers and learners accepted that digital technologies enhanced authentic teaching and promoted meaningful learner-engagements in the process of learning in line with challenges of the 4IR. In corroboration teacher BA posited: *"One (teacher) knows that learners are different; some of them are visual learners; some are much faster in learning than others; therefore, use of computers as pedagogical tools sparks interest in the learners; and especially as we are approaching the 4IR, one needs to be creative and innovative when teaching; it (computer) just brings that curiosity which learners have when they are learning. So, I've seen a lot of improvement, especially when it comes to the issue of learner motivation, engagements and discipline. So, I use ICT when teaching; I use computers almost every day because of its importance nowadays (21st century)"* [Teacher BA].

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Such narratives reflect that teachers are aware that digital technologies are crucial 21ˢᵗcentury pedagogical supplements and that they play a significant role in enhancement of authentic student performances. Teacher BA's response strongly resonates with ISTE (2018) allusions, as quoted earlier in this study, that obtrusive digital technologies open up new avenues of teaching and enhances much more relevant learner-academic performance in line with 4IR world of work and challenges.

Learner-participants generally concur amongst themselves, and with their teachers' views, especially, when asked about the role played by computer tools for learning. They express that computer tools play a crucial role in promoting meaningful learning. Congruently, the learner B11E explains: *Yeah; when using the computer tools like internet you get more information than what you get from your teachers; videos show us information in 3Ds unlike information given to us by teachers on black and white papers of which you can't understand much better; we're tired of seeing BLACK & White! So the heart is Black? You can't see what the teacher is saying. No-o! but the videos are just showing 'everything' while it's moving again and you even imagine; makes you feel like getting interested, you know; you even feel like you are a doctor or something else; so such experiences gives more experiences to learn and understand better; in this era (21ˢᵗ century) young ones we learn better and faster using this technology in harder subjects like Life Sciences, Geography, Physics and Maths."[Learner, B11E].*

Besides arousing learners' interest and engagement, the above-named learner also indicates that teacher-instruction blended with ICT integration makes 'harder' subjects easier to understand. Thus, B11E's appellations seem to echo the idea of Ferguson et al. (2019) whose pedagogical tactic asserted that '*learning through wonder'* and '*action learning* approaches promote imagination and motivation and encourage much more meaningful learner-engagements, partnerships and collaboration.

Discussing about importance of computer tools to enhance better instruction, and in concurrence with other learner-participants, A11E asserted that *"some teachers talk non-stop and it becomes boring; so I sleep. Later I'll use my computer at home to study further for understanding."* This implies that the use of digital technologies enhance 21ˢᵗ century instructional strategies and encourage learner-engagements in order to promote authentic learning. The foregoing narrative is similar to the observation by Fullan and Langworthy (2014) who observed that a continuous use of lecture method (teacher-centered pedagogies) culminates in 'flat lining' and learners degenerating into insignificant learning.

Thus it was clear that participant teachers and learners alluded to the importance of computer tools for teaching and learning and succinctly accepted the goals of the 21ˢᵗ century pedagogical framework (Lazarov, 2018) underpinning this study. This also suggests that the aforementioned theoretical framework accentuates the importance of meaningful pervasive technological integration to promote the pedagogical paradigm shifts in tandem with 4IR work requirements. Furthermore, these highlights strongly convince the researchers that the current generation cannot prosper in the 4IR world of work unless the theory of the 21ˢᵗ century pedagogical framework is strategically implemented from an informed perspective.

As cited above, pertinent information pertaining to phenomena under study thus can be sought better through observation (Antwi & Hamza, 2015). The study also found out that teachers failed to use computer tools meaningfully and to the advantage of learners' academic performance. This is completely inconsistent with what they alluded during the interviews of doing. Teachers were observed displaying surprising levels of computer illiteracy. The lessons observed during this study confirmed why laptops were simply used to project notes on the white-board. Therefore, the researcher concluded that the use of a computer, in such observed situations, caused more harm than good as learners appeared somehow confused throughout.

5.2. Computer Usage towards Enhancement of 21st Century Pedagogies

It was also observed that, although 4IR attributes indicated shifting to 21ˢᵗ century pedagogies (Butler-Adam, 2018; Lesufi, 2017), it could be a reasonable avenue to take for relevant educational dispensations. It means that

teachers hardly did integrate ICT effectively to enhance better learner academic performance except in lessons of Computer Applications Technology (CAT) and Mathematics. In other courses, teachers displayed very superficial levels of computer efficacy. This however was a surprising situation in the 21ˢᵗ century. Five out of six participant-teachers admitted that they simply used and manipulated their laptop to project their notes on the white board without meaningful guidance and control of learners throughout the 1 hour-lessons. This presumably results in a majority of learners showing little or no interest and not benefiting at all. Learner-computer ratio, in this instance, was virtually zero – a surprising discovery.

Worse still, it was evident that teachers display superficial knowledge and skills in classrooms on how to seek and use relevant websites and content information for their lessons. This was evident in the work projected on the boards for learners' 'consumption'. Accounting for such phenomenal lack of computer literacy, the teacher CA, in her early 50s, expressed: *"I was never trained on how to use a computer. As I've said, we need to be taught basic computer skills; training, training and training can take us out of this calamity; I can't emphasize this anymore."*

Computer illiteracy as a problem was also revealed during learners' focus group discussion. For instance, learner C10C can be verbatim-quoted: *"I use computers for typing and 'counting' in maths but when I am home. I understand better through maths App."* This suggests that learners do not acquire any even the simplest technical terms in computer studies in classrooms. In this regard learner C11A further laments: *"myself I've never used a computer because I am not a 'computer application' (CAT) student so I only use my cell phone when I need to browse or conduct research."* However, a few learners from well-to-do families indicated vast knowledge of digital technologies, which entailed a big digital divide among learners, and even between learners and their teachers. Hence this study discovered the regularity of ICT integration for 21st century teaching and learning is limited.

Nevertheless, teachers showed a lot of interest in trying to use digital technology to enhance 21ˢᵗ century pedagogies by buying own computers with their hard-earned money. In this regard the participants revealed, during interviews, that those available (computers) in their schools were meant for CAT and, in some cases, maths learners and teachers only. *"Therefore, I decided to buy my own and use it to do 'whatever' when I am free; we've no access to the ones in the school; so I bought mine. plus I bought also Modem and data, which is very expensive in South Africa."[Teacher CB].*

Therefore, through participant observations, the researcher observed that computers were insignificantly used in support of 21ˢᵗ century pedagogies. Such phenomenon is similar to what Antwi and Hamza (2015) and Bertram and Christiansen (2016) observed, that when carrying out a qualitative study reliable knowledge is evidenced through direct *"observation or manipulation of natural phenomena"* as teachers may teach differently from the way they claim during interviews of doing them.

5.3. Stakeholder Support and Suggestions for Nurturing of 21st Century Pedagogies

Learner-computer ratio observed was basically zero. Teachers observed, in all the three sampled schools, used their own-sourced laptops and data projectors in poorly furnished and overcrowded classrooms (no whiteboards and insufficient furniture). Making reference to reasons leading to lack of computer integration across the curricula, teachers and learners concurrently were dissatisfied over least technological support accorded by the responsible authorities. In corroboration teacher BB expressed that: *"To be frank, one has never received any support from any of the stakeholders mentioned in the question, including the teacher unions themselves; I've not been assisted enough, if at all. It seems as if people in these structures, these stakeholders, do not understand in any way the importance of using technology in the classrooms. You can see even by the way people will be looking at you; they do not know what importance this (laptop) has for the lesson and the learners themselves in this century (21ˢᵗ century). So one hasn't received any support at all; the environment is not favorable – no computers, no support, nothing. So it's very sad." [Teacher BB].*

The above expressions, by teacher BB, clearly puts to the fore why teachers were found sticking to old pedagogies (teacher-centered) resulting in teachers struggling and not succeeding to teach in accordance with 4IR

work requirements. Lessons observed conspicuously supported the aforementioned scenario. As was unveiled in Padayachee (2017) study "teachers are uncertain with respect to the enforcement of e-Education while being encumbered by poor infrastructure and lack of skills" due to lack of support in those areas of need.

Furthermore, teacher participants indicated that training and up-skilling of teachers to use computers for teaching and learning in line with 21st century pedagogical requirements was conspicuously biased towards CAT, sciences and Maths courses while for other courses teachers covered their own expenses. In corroboration, one of the maths teachers was quoted suggesting that: "*If we (maths & science teachers) had a three-month's workshop in maths and sciences, and came back with laptops, the Department of Humanities should also have the same thing. Indeed, this bias should stop; it doesn't promote teamwork in schools.*" [Teacher AB].

To ensure that teachers understand the 21st century pedagogies, which they should employ to the advantage of authentic student learning, teacher AA posited: "*There's a lot that needs to be done in terms of integrating technology into teaching and learning. 1. Training of educators; 2. providing enough security in all schools so that if there's infrastructure that's been bought in the school, it's not going to be stolen. This will allow IT to be taught across the curricula; and the teachers need to be told that we're living in the world of digital technology and that most things nowadays will be done digitally. And some of the teachers are not realizing that in years to come learners won't need to have textbooks in front of them; maybe they'll be served by gadgets.*" [Teacher AA]

Learner B11A also gave a congruous suggestion just like teacher AA above. Specifically the learner propounded that: "*I also think that we need to improve security in the school if all computers arrive; there's only one security guard and cameras are here but they are not working; they're just for decoration; the government needs to invest in digital technology just like Japan and USA so that we can face the challenges of the 21st century just like any other human being; so my conclusion is that they should invest in meaningful digital technology because there's no industrial development without education.*" [Learner, B11A]

Teacher AA in concurrence with his colleagues and learner-focus groups gave a wholesome picture of what needed to be done in terms of support. The South African government seemed to express the same views (Nkosi, 2019) when it was indicated that "the government intended to drop the chalk board for e-Learning" which is strongly perceived as a plausible inroad towards embracing pedagogies of the 21st century. However, the researchers opine that government's aspirations cannot be phased out soon given the overcrowding situation prevailing in our secondary schools; one class having at least 50 learners; it is so overwhelming indeed.

In light of the foregoing observations, coupled with research participants' views and experiences captured during interviews in the schools studied, blended learning (combination of physical [face-to-face] and virtual environments) is the only feasible way forward at this juncture (4IR era) to improve learning and teaching in South African secondary schools.

6. LIMITATIONS OF THE STUDY

This study encountered a number of limitations in the course of the study. Since only the qualitative paradigm, i.e., interpretivist approach, was employed in carrying out this research, it was the first limitation of this study. Hence the research findings cannot be generalized to portray a wholesome picture of the secondary school population in South Africa. Another limitation is that purposive sampling method was used to select the sample of schools for this study, and by virtue of their having and using computers. In this case, researcher-subjectivity could compromise on validity of findings. Moreover, the study made use of *only* 6 teachers and 30 learners, as a small sample size which henceforth constituted a weakness. Therefore, the rigor of the research outcome could not be generalized. Furthermore, because the researcher is a full-time teacher, time allocated and expended for the research was also a constraint. Despite the foregoing highlighted limitations, the study managed to collect sufficient qualitative data through triangulation of participant observation, one-on-one semi-structured teacher-interviews

and in-depth semi-structured focus group interviews with learners; and systemically analyzed the data thus enhancing validity, trustworthiness and transferability of the findings.

7. RECOMMENDATIONS

On the basis of the aforementioned findings, the researchers make the following recommendations: The Government, through the DBE should provide computer equipment and subjects-specific software to enhance teaching and learning in tandem with 21st century world of work and challenges. Regular and ongoing training and up-skilling of teachers in digital technology integration should be prioritized. Moreover, both the teachers and the students should be enlightened on the importance of digital citizenship alongside the best ways of using ICT in teaching and learning to produce grade-appropriate graduates that can prosper in the 4IR era. Finally, all stakeholders (DBE, parents, community, Non-Governmental organizations and teacher unions) should give all the necessary support in terms of infrastructure provision, supply and security of ICT resources, training and up-skilling of teachers in alignment with the 21st century pedagogical paradigm shifts so as ensure effective and efficient ICT integration for enhancement of effective teaching and learning that corresponds with 4IR e-knowledge society.

In line with the aforementioned recommendations the researchers propose the following new pedagogical model, to be considered for the 21st century teaching and learning; the proposed strategy, assumedly, can reasonably promote enhancement of acquisition of skills and competences that allow new generations to prosper in this era (21st century). More so in designing the following model (Figure 2): New Pedagogy for the 21st Century which was adapted from the ideas of Fullan and Langworthy (2014) and those of Blended and Flipped Learning (Mohamed, 2014) and then was blended with the empirical appellations of the aforementioned current literature reviewed together with the research participants' views articulated in this study. The proposed new 21st century pedagogical framework (Figure 2) is illustrated below.
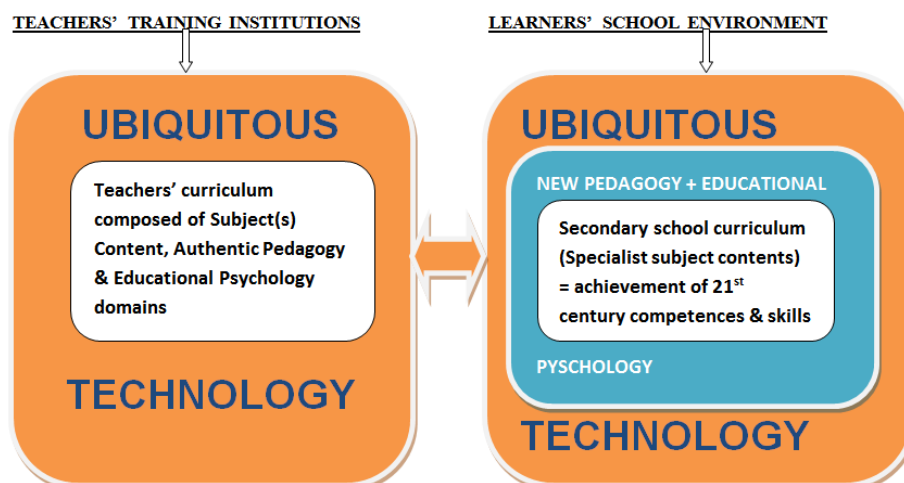

Figure-2. New pedagogy for the 21st century model (Ideas in Figure 2 adapted from Fullan and Langworthy (2014) and Mohamed (2014).

Figure 2 above illustrates the researchers' proposed model enshrining what should be prevalent in both teachers' training colleges and school environments; portrait of the perceived relevant 4IR teachers' repertoire (subject[s] contents, authentic pedagogical techniques and educational psychology knowledge and competences pervaded by ubiquitous digital technologies). Such quality of teachers are expected to diligently facilitate secondary school curricula using new pedagogies, covering "specific features that would cover every learning aspect" (Lazarov, 2018) as alluded to in Figure 2 above, coupled with educational psychology approaches that are fully supported by conducive school environments (infrastructures) and ambience, including outside of schools environments, pervasive of ubiquitous digital technologies. The use of such a 21st century model could facilitate production of

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human capital prepared enough to train them as diligent teachers of the 21st century, and/or serve efficiently in any other socio-economic structures of the world.

Furthermore, it is perceived as a 'simple' portrayal of new pedagogies (digital pedagogies) which when employed meaningfully, DL goals could be achieved inevitably. In a nutshell, this scenario involves 21st century pedagogical strategies that presumably could catalyze "the creation of and use of new knowledge in the real world" (Fullan & Langworthy, 2014) nurtured through teacher-student partnerships and active student engagement manifesting through "mutual discovery, creation and use of knowledge". The researchers' opinion on effectiveness of this proposed model for teaching and learning strongly resonates with the perspectives of Fullan and Langworthy (2014) postulation of new pedagogies necessary for the 4IR work requirements and challenges.

Finally, the researchers' suggest that further studies be carried out on 'feasible e-Learning Learning Management Systems' (LMS) and pedagogical approaches required for a smooth flow of teaching and learning across countries in the event of global outbreaks of pandemics that would force nations to be in lockdown.'

8. CONCLUSION

Having carried an in-depth study on the current pedagogical practices in teaching and learning processes in South Africa, making use of participant observation and semi-structured interviews as data collection instruments, the researchers rationally conclude that digital technologies are insignificantly integrated to enhance 21st century skills and competences development. More so literature reviewed and the research participants' perceptions highlighted, concurrently, indicate the lack of support in terms of training, computer hardware and software provision and necessary security in the schools. Such phenomenal scant and irregular computer usage has resulted in derailment of proper implementation of the 21st century pedagogies to enhance authentic instructional and learning strategies in line with 4IR challenges.

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