EMERGING TRENDS OF PSYCHO-TECHNOLOGICAL APPROACHES IN HEUTAGOGY

Dr A. S. Arul Lawrence
Dr M. Manivannan

Editors

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TAMIL NADU OPEN UNIVERSITY
577-Anna Salai, Saidapet, Chennai – 600 015
Tamil Nadu, India

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For orders and more information
TAMIL NADU OPEN UNIVERSITY
577, Anna Salai, Saidapet, Chennai – 600015, Tamil Nadu, India
E-mail: arullawrence@gmail.com; URL: www.tnou.ac.in

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About Tamil Nadu Open University (TNOU)

The Tamil Nadu Open University (TNOU) is the 10th Open University in the country, which was established by an act (Act No.27) of the Legislative Assembly of the Government of Tamil Nadu in 2002. As per this act, the University with its headquarters at Chennai and 12 Regional Centers in the major cities of Tamil Nadu are carrying out its academic activities all over Tamil Nadu. This university aims at benefitting the sections of people who have been deprived of and/or denied access to higher education. The community of the deprived includes the destitute, the physically challenged, the working men and women, the economically weaker and marginalised people, and the drop-outs owing to various reasons. In nutshell, it aims at reaching the hitherto unreached.

TNOU is the first University in the country which has got over 80 programmes approved by the UGC-DEB. Moreover, it is one among the few institutions approved by the UGC, New Delhi to offer Open and Distance Education (ODL) programmes in the entire State of Tamil Nadu. TNOU currently offers programmes from Short-term to Doctorate level. All 132 Government Arts and Science Colleges of Tamil Nadu have been declared as Learner Support Centres and Examination Centres of TNOU by the order of Govt. of Tamil Nadu. Within a decade, since its existence, the TNOU has remarkably catered to the learning needs of more than 5 lakh students with over 100 programmes, through 14 schools of study and 5 divisions. It has a well-knitted network of student support services with 12 Regional Centers & Constituent Community Colleges, 190 Learner Support Centres (LSC), 157 Learning Resource Centres (LRC), 253 Community Colleges, 3 Programme Study Centres (PSC), 14 General B.Ed. Programme Study Centres (B.Ed.-PSC), 14 Special B.Ed. Programme Study Centres (Spl.B.Ed.-PSC), 9 Special Centres in Prisons, 15 Work Centres.

TNOU's instructional system comprises of quality print materials in Self-learning format, digital content through stand-alone CDs, face-to-face contact sessions, and continuous assessment and term-end examinations. Most of the operations of the University have been brought under e-Governance for efficiency, accuracy and transparency. The university is poised to embark on technology enhanced learning environment. TNOU has been expanding opportunities for life-long higher education and democratizing education by making it inclusive. TNOU has adopted an innovative flexible skill training method to provide skill training to the unemployed youth in the State of Tamil Nadu which encourages rural learners.

From the Editorial Desk

Heutagogy is a modern idea that refers to self- determined learning. Stewart Hase and Chris Kenyon coined the term 'heutagogy' in 2000, which is derived from the Greek verb 'heuriskein,' which means 'to discover,' or in the first person, 'heursko (εὑρίσκω),' which means 'I discover or I find.' Heutagogy takes a holistic approach to developing learner capabilities, viewing learning as an active and proactive process and learners as the "primary agents of their own learning, which results from personal experiences." Heutagogy emphasises self-reflection and double-loop learning. In double-loop learning, learners analyse the problem, the subsequent action and outcomes, and how the problem-solving process influences their own beliefs and actions. Double-loop learning involves "questioning and testing one's personal values and assumptions" Self- determined learners must develop competencies and capacities. Competency is proven capacity to acquire knowledge and skills, whereas capability is learner confidence in his or her competency and the ability to "formulate and solve issues in known, new, and changing environments". In heutagogical methods, the learner is accorded a great deal more value and autonomy; hence, their level of maturity is automatically elevated. On the other hand, instructors have less influence over students, and students have the ability to select their own curriculum and structure their own course. The heutagogical approach is deeply entwined with both the psychological and technological paradigms in their many forms. The contemporary technological platforms are fostering the adoption of heutagogical methods such as collaborative learning, flexible and negotiated assessment, and adaptable curriculum.

The epidemic of COVID-19 has disrupted education in over 150 nations and harmed 1.6 billion children. As a result, a number of nations have introduced some type of remote learning employing technology and students were encouraged to engage in self-determined learning. Many Educational Institutions that previously resisted changing their traditional pedagogical method were forced to use online teaching and learning exclusively. Internet-educated kids who have never encountered this issue are unfamiliar with it. As a result, they are confronted with a number of psychological issues and are negatively impacting the health, social, and material well-being of children globally, with the poorest children, such as homeless children and children in detention, being the hardest hit. As a result, the editors came to the conclusion that it would be beneficial to issue a call for papers in order to discuss the difficulties and opportunities associated with the practise of heutagogy from the psychological and technological vantage points indicated in the title.

The call for papers was announced in the month of January 2022, and the submission deadline was extended to the last day of February 2022 in response to several requests from colleges and universities around the nation. Following a check for plagiarised content, 52 pieces were chosen from a total of 121 chapters submitted by authors from throughout the country. Even though many of the chapters do not meet the required quality, standards, and relevance, the editors include them in the book because it will pique the interest of and inspire the next generation learners.

We are grateful to the authorities of Tamil Nadu Open University, for their invaluable guidance and support. We are grateful to the Editorial team and peer-reviewing committee for their tireless efforts in ensuring that these volumes arrive on time. We owe a debt of thanks to all of the generous people who assisted us, for their great coordination and quick completion of this scholarly project.

Date: June 5, 2022

- Dr A S Arul Lawrence &
- Dr M Manivannan

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List of Contributors

Amritha Pavithran, K., *PGDDSA Scholar, Dept. of Information Technology, Kannur University, Kannur, Kerala*

Angelin Devakumari, J., *Research Scholar, School of Education, Tamil Nadu Open University, Chennai*

Anu Joy Singh, *Ph.D. Scholar, Union Christian College, Aluva, affiliated to M.G University, Kerala*

Arnold Robinson, D., *Assistant Professor, Department of Biological Science, Meston College of Education (Autonomous), Chennai, TamilNadu, India*

Arthy, R., *Assistant Professor, Thiagaraja College of Preceptors, Madurai, TamilNadu*

Arul Lawrence, A. S., *Research Supervisor, School of Education, Tamil Nadu Open University, Chennai, India*

Balakrishnan Velaiah IPS, *IG - Central Zone, Tamilnadu, India*

Balasubramanian, R., *Research Scholar, Tamilnadu Open University, Chennai*

Barathi, C., *Assistant Professor, School of Education, Tamil Nadu Open University, Chennai*

Bosco, K., *Research Scholar, Dept. of Psychology, School of Social Sciences, Tamil Nadu Open University, Chennai*

Catherin Jayanthy, A., *Assistant Professor, Department of Education, Alagappa University, Karaikudi*

Dhilip, S., *Doctoral Scholar, School of Education, Tamil Nadu Open University, Chennai, India*

Dhiraj Barola, *Research Scholar, Dept. of Psychology, School of Social Sciences, Tamil Nadu Open University, Chennai*

Diane Joseph, R., *Principal, Venkateswara College of Education, Puducherry*

Dominic Rajaseelan, P., *Doctoral Scholar, School of Education, Tamil Nadu Open University, Chennai, India*

Ebin Antony, *Assistant Professor, Department of Information Technology, Kannur University, Kannur, Kerala, India*

Gireesh K. Hari, *Ph.D. Research Scholar, Department of Economics, Periyar University, Salem*

Hema, G., *Assistant Professor, Department of Education, Periyar University, Salem, Tamil Nadu, India*

Indu, H., *Associate Professor and Head, Department of Education, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore*

Iyappan, D., *Lecturer in Mathematics, District Institute of Education and Training, Ranipet District, Tamil Nadu*

Jacob Antony, *MTech Scholar, Department of Mechanical Engineering, Srinivas Institute of Technology Mangalore, Karnataka, India*

Jayanta Mete, *Professor, Department of Education, University of Kalyani*

Jeyaraj, I., *Assistant Professor in Psychology/Guidance Counseling (Contractual), Department of Education, Regional Institute of Education (NCERT), Mysore, Karnataka*

Johnsi Priya, J., *Assistant Professor of Education, Meston College of Education (Autonomous), Royapettah, Chennai*

Kalaiyarasan, G., *Professor & Head, Department of Education, Alagappa University, Karaikudi, Tamilnadu, India*

Kannaki, K., *Senior Lecturer, District Institute of Education and Training, Uthamacholapuram, Salem*

Kowsalya, S., *B.Ed Student-Teacher, Krishna College of Education for Women, Elayampalayam, Tiruchengode*

Kumar, C., *Lecturer, DIET, Ranipet*

Lenin, I., *Assistant Professor in Education, College of Education, Alagappa University, Karaikudi*

Maanhvizhi Emayavaramban, *District Educational Officer, Ariyalur, Tamil Nadu, India*

Maheswari, G., *Ph.D. Scholar, Department of Education, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore*

Manikandan, K., *Assistant Professor, Venkateswara College of Education, Puducherry*

Manivannan, M., *Professor and Director, School of Education, Tamilnadu Open University, Chennai*

Manjula, A., *Research Scholar, Dept. of Psychology, School of Social Sciences, Tamil Nadu Open University, Chennai*

Maria Ugin Joseph, C., *Principal, A.K.T. Memorial College of Education, Neelamangalam, Kallakuirhi – 606213*

Maruthavanan, M., *Assistant Professor, Thiagaraja College of Preceptors, Madurai, TamilNadu*

Masuda Hasin, *Asst. Prof., Dept. of English, Dhubri Girls' College, Dhubri, Assam*

Merlin Sasikala, J. E., *Assistant Professor, AUCE, Alagappa University, Karaikudi, Tamil Nadu*

Mrunalini, V., *Assistant Professor(SG), Dept of Special Education, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore*

Mugil, M., *Manager – Business Development, Cognizant Technology Solutions*

Nagasharmila, P., *Research Scholar, Department of Education, Periyar University, Salem, Tamil Nadu, India*

Neethi Perumal, M., *Teaching Assistant, Department of Lifelong Learning, Alagappa University, Karaikudi*

Nigel Ecclesfield, *Fellow of the Royal Society of Arts (FRSA), London*

Packiam, D., *Lecturer, District Institute of Education, T.Kallupatti, Madurai, TamilNadu*

Philip Ecclesfield, *Southmead Primary School, Wimbledon, London*

Poongothai, R., *B.Ed Student-Teacher, Krishna College of Education for Women, Elayampalayam, Tiruchengode*

Prakash, N., *Research Scholar, School of Education, Tamil Nadu Open University, Chennai*

Preethi, V., *Doctoral Scholar, School of Education, Tamil Nadu Open University, Chennai, India*

Rahul Raj, P. V., *PGDDSA Scholar, Department of Information Technology, Kannur University, Kannur, Kerala*

Rajkumar, R., *Assistant Professor in Education, Krishna College of Education for Women, Tiruchengode*

Rama, S., *Assistant Professor, Department of Mathematics, Lady Willingdon Institute of Advanced Study in Education (Autonomous), Chennai, Tamil Nadu, India*

Ramesh Kumar Kandasamy, *District Institute of Education and Training, Salem, Tamil Nadu, India*

Rashmi Singh, *Assistant Professor, Dept. of Education, S. S. Khanna Girls' Degree College, University of Allahabad*

Revathi, B., *Assistant Professor, Vellalar College of Education, Erode, TamilNadu*

Revathi, D., *Lecturer (sr) in Special Education, National Institute for Empowerment of Persons with Multiple Disabilities, Kovalam Post, Kancheepuram district, Tamilnadu*

Sahin Sahari, *Asst. Prof., Department of Education, Belda College*

Saji Sebastian, *MCA Scholar, Department of Computer Application, SJCET Palai, Kottayam, Kerala, India*

Samidass, S., *Assistant Professor in Education, Krishna College of Education for Women, Tiruchengode*

Saradha, S., *Research scholar, Department of Education, Madurai Kamaraj University, Madurai*

Sarala, A., *Ph.D Scholar (Part time), AUCE, Alagappa University, Karaikudi, Tamil Nadu*

Saranya T. Jaikumar, *Educational Psychologist, Westminster Healthcare, Chennai, India & Member, State Commission for Protection of Child Rights, Tamilnadu*

Saravanan, D. P., *Assistant Professor, Department of Educational Planning and Administration, Tamilnadu Teachers Education University, Chennai*

Seema Yadav, *Assistant Professor, BSSS, Bhopal*

Selvam Muthusamy, *Principal, District Institute of Education and Training, Salem, Tamil Nadu*

Senthamizh Pavai, R., *Research Supervisor, Faculty of Education, Dr. M.G.R. Educational and Research Institute, Chennai*

Senthilkumaran, M., *Assistant Professor, Department of Educational Technology, TNTEU, Chennai*

Shirley Moral, C., *Assistant professor, Department of Education, Madurai Kamaraj University, Madurai*

Shyla Gnanam Ebenezer, J., *Ph.D. Scholar, School of Education, Tamil Nadu Open University, Saidapet, Chennai.*

Shylaja, P., *Asst. Professor, Dept. of Information Technology, Kannur University, Kerala, India*

Sivakumar, G., *Assistant Professor in Education, College of Education, Alagappa University, Karaikudi*

Sreeshma, K. S., *B.Ed. Student-Teacher, Krishna College of Education for Women, Elayampalayam, Tiruchengode*

Sudhakaran, M. V., *Professor, Dept. of Psychology, School of Social Sciences, Tamil Nadu Open University, Chennai*

Sumathi, D., *Assistant Professor, School of Education, Tamil Nadu Open University, Chennai*

Sunitha, S., *Ph.D. Research Scholar (Full-Time), Department of Education, Alagappa University, Karaikudi*

Tamil Selvan, P., *Research scholar, Department of Education, Alagappa University, Karaikudi, Tamilnadu, India*

Umamaheswari, M., *Lecturer, DIET, Namakkal, Namakkal District, Tamil Nadu*

Usha Nandhini, R., *Research Scholar, Faculty of Education, Dr. M.G.R. Educational and Research Institute, Chennai*

Vaithianathan, V., *Asst. Professor, Department of Economics, Periyar University, Salem*

Vijaya Bhanu Kote, *ZP High School, KH Wada, Payakaraopeta, Visakhapatnam District, Andhra Pradesh, India*

Vijayalakmi Shankar, S. V., *Senior Lecturer, DIET, Uthamacholapuram, Salem*

ஐயப்பன், த., விரிவுரையாளர், மாவட்ட ஆசிரியர் கல்வி மற்றும் பயிற்சி நிறுவனம், இராணிப்பேட்டை

கோவிந்த பிரகாஷ், பெ., முதுநிலை விரிவுரையாளர், மாவட்ட ஆசிரியர் கல்வி மற்றும் பயிற்சி நிறுவனம், உத்தமசோழபுரம், சேலம்

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Thematic Papers

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Digital learning, innovative learning strategies for modern pedagogy, self-directed learning

Vijaya Bhanu Kote
ZP High School, KH Wada, Payakaraopeta, Visakhapatnam District, Andhra Pradesh, India

Philip Ecclesfield
Southmead Primary School, Wimbledon, London

Nigel Ecclesfield
FRSA

Introduction

One of the issues in preparing this paper has been in the identification of an uncontested definition of the terms psycho-technological or psycho-technology. Lexico offers *psychotechnologyas: -*"any technology designed to alter thought or behaviour by manipulation of brain function; the study or development of such technology."Ammerman offers psychotechnology as "technology that influences people psychologically by deploying artificial intelligence through digital media. Its four components are described as personalization of information, the science of persuasion, machine learning and natural language processing." The Collins English Dictionary states – "the body of knowledge, theories, and techniques developed for understanding and influencing individual, group, and societal behaviour in specified situations".

The authors contend that none of these definitions could be considered to be definitive and that,as we will try to show, such definitions hide the more contentious assumption, derived from the current operations of social media and, what Zuboff (2019) calls "surveillance capitalism"i.e. that teaching and learning involve behavioural control with little, if any, consideration of the learner agency that is considered to be essential to self-determined learning e.g. see Hase and Blaschke (eds) (2021). Furthermore, Wikipedia states very clearly that "The page "Psycho-technology" does not exist. You can ask for it to be created, but consider checking the search results …. to see whether the topic is already covered."What is telling, is that psycho-technology does not appear in Wikipedia as a separate topic in the form used in the call for papers for this book or in related forms such as psychotechnology or PsychoTechnology, for instance, although there is reference to the work in Russia in the 1930s.

If the initial definitions for psycho-technology provided by Ammerman and Lexico are generally accepted, they would appear to form approaches to teaching and learning that are techno-centric, rather than learner-centric and in opposition to the approaches described and explored in the following publications: Luckin et al (2010), Hase and Kenyon (2011), Ecclesfield and Garnett (2020) and Hase and Blaschke (2021).

The Lexico definition seems to be remarkably close to the description of the instructional/manipulative approach to education provided for Zuboff (2019) – "As the chief data scientist for a much-admired Silicon Valley education company told me, "Conditioning at scale is essential to the new science of *massively engineered human behaviour (authors' emphasis).* He believes that smartphones, wearable devices, and the larger assembly of always-on networked nodes allow his company to modify and manage a substantial swath of its users' behaviour. As digital signals monitor and track a person's daily activities, the company gradually masters the schedule of reinforcements—rewards, recognition, or praise that can reliably produce the specific user behaviours that the company selects for dominance: The goal of everything we do is to change people's actual behaviour at scale. We want to figure out the construction of changing a person's behaviour, and then we want to change how lots of people are making their day-to-day decisions. When people use our app, we can capture their behaviours and identify good and bad [ones]. Then we develop "treatments" or "data pellets" that select good behaviours. We can test how actionable our cues are for them and how profitable certain behaviours are for us." (Zuboff op cit Loc 5393 of 15931) In the following accounts, as in previous work Ecclesfield, Bhanu-Kote and Ecclesfield (2021) we seek to set out descriptions of practice in two very different settings. Both accounts focus on learner needs and learner agency, drawing on ecologies of resources Luckin (2008), that include digital learning technologies, the outdoors environment, parents, co-workers, local community resources and, most importantly, the collaboration and cooperation of learners. It is worth our noting that this work takes place in public education settings where there are national and state curricula and frameworks that prescribe content and methods of assessment. Nevertheless, we believe that our practice helps to identify and support the learner-generated contexts discussed by Luckin and her colleagues Luckin et al (2010), which enable learners to incorporate learning technologies into the ecologies of resources supporting those contexts and

in doing so minimise the control of learning through surveillance and instructional technologies whose actions are described in the preceding paragraph.

We realise that, for some readers, the idea of learner self-determination at the ages of 2 years to 11 years is not generally recognised or supported within national education systems as they are currently managed/overseen despite emerging evidence from Vijaya Bhanu-Kote's work in AndhraPradesh and accounts emerging from nursery self-assessments and inspection reports in Englande.g., Whitebread (2010) op cit.

Heutagogic practice and theory has an extensive history, drawing on thinkers as various as Montessori, Neill, Vygotsky, Kolb, and others, before its more recent formulation by Hase and otherse.g., Hase and Kenyon (2011). We will provide references and links to these resources in the references below as space precludes a more detailed consideration of this history. It is worth noting that these thinkers did not explicitly or implicitly consider behavioural or neurological modification(in the sense given by the definitions used above) in their consideration of learning and teaching. They all saw learners as active and needing to be engaged in the co-creation of learning in spaces that are facilitated rather than managed or controlled by teachers, whether that is a traditional 'classroom' or in virtual learning environments.

Vijaya Bhanu Kote's work has, for the last twelve years, been in two rural primary schools in Andhra Pradesh where, currently she is the head teacher of one. The following is a short account of her approach to learning and teaching as an adopter of digital learning technologies who has embedded the use of those technologies in all aspects of her practice and developed her ideas of learning and educational self-determination based on her own learning and evolving practice. This work with technology has been recognised by her State Government, Microsoft, and in international conferences. As a result, she and her pupils have presented at conferences in India and around the world as well as producing their own publications, including "Letha Akasalu (Tender Skies)".What follows is a selection of quotations from an introduction to her work on heutagogic learning and teaching practice, setting out her view of learning and of the use of technology to support self-determined learning with her pupils, her colleagues, parents and the wider community in which her school is situated.

"We had a Hindi teacher named Shobha in my primary school. I was new to the subject in my Grade IV when I joined the school. She was a living angel for me. She asked me to stay calm and took at least 10 minutes time every day, outside her lessons, to motivate me to learn Hindi as she was too busy with her regular teaching timetable at other times. I invented my own methods to learn Hindi and within six months, I reached the level of my classmates who were reading and writing in Hindi lessons. It was this experience that prodded me to teach self-learning techniques to my kids later when I was becoming a teacher.

Here is a short account of self-determined learning drawing on the learners and accommodating their needs within a curriculum, but not bound by prepared content or a fixed timetable.

Recently, when I visited the class in the morning, the children, as usual, brought lesson resources to the class. To my surprise, I saw that everyone carried Datura flowers. I could sense that they might have seen the blooms on their way to school and had plucked them (This is their self determination to learn about the Datura flower).

I asked them to sit in a circle. I asked them what do they want to do now? They said they wanted to study the flower and name the parts. Anatomy of a flower was a lesson due a few months away in our syllabus. We don't mind that! The children started studying the parts of the flower. One said he wanted to see what was inside the flower, another was already tearing the flower carefully to see the bottom part of the flower(They know the skill of knowing how to learn and tried their own ideas in this context).I gave a hint that they could bring a magnifying glass, a blade and water to study the structure in greater detail (Here I moved into the world of the learner). Within a few minutes they arranged the required things from their personal property boxes, which hold their own learning resources. They started exploring the world of the flower from inside. (Here the process is given its due importance rather than the content determining the parameters of the learning.) Suddenly two kids discussed something. They asked my permission to go to the school playground. They returned with other different flowers.

Now the real learning started! They dissected the flowers with my minimal help. They started drawing the parts of the flower looking at the real parts of the flower. Then they started comparing the other flowers with the Datura. They could see so many differences and discussed this among themselves, seeking my help sometimes, or using online resources. (We can see that there is no teacher-centred learning here;learners explored and learned from self-chosen and self-directed action. This is unlike programmed learning where content and context are set by the parameters of the programming and the mode of delivery). It is worth noting here that the ground for much of this learning is the collaboration between learners and the approach influenced by heutagogy that sees learners as co-creating their learning with what Luckin (2008) calls "more able partners" who may be teachers, but who could also be parents relatives, or neighbours as well as peers.

Once they had dissected the flowers and came to know many facts about flower structures and pollination, they went to their little group fields and prepared the soil for the next day's activity. Next

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morning, each group brought one flower plant or seeds and sowed them in their respective farms(each group has a little bit of ground which they manage as a field or farm). They grow vegetables in those little farms, looking beyond their immediate groups to work together in teams. When the vegetables are grown, they are given for mid-day meals in the school. When the flowers bloom, they are distributed amongstlearners and teachers and, if many roses bloom, they are dried and powdered to make rose powder to use in bathing water.

As readers will see, content in this context can be rapidly changed to meet the needs of the moment, the learners, and the context. Learning outcomes are not pre-prescribed, but emergent from the process learners and teacher engaged in and these outcomes can be correlated with curriculum requirements by learners and their teachers. In this work there are many parallels with the initiatives taken by Sugata Mitra, see Mitra (2019). My school has a digital classroom which offers Internet access and a range of digital tools and media, but the technology is not provided to meet a limited set of learning objectives, it is there to assist learners to explore and develop their learning as an adjunct to their activities Bhanu-Kote (2022 – forthcoming).

Working with a technology development company in India I have been involved in producing "The Heutagogy App" which enables learners to become self-determined and collaborative, recording their ideas, activity and its outcomes and sharing them with their teachers, parents and peers. Heutagogic practice is not technophobic, but the use of technology supports rather than governs or disciplines learning to prescribed ends."

Philip Ecclesfield's practice has been developed through his experience of primary school teaching in inner-city London, individual tutoring in Austria, outdoor nursery education and early years teaching in South London.

"Self-determined learning, heutagogy, are terms more widely employed in the description of learning processes that are engaged in by learners from post sixteen education. See Hase and Kenyon (2013) and Ecclesfield and Garnett (2020). That is not to say that younger learners do not have the capacity to direct and control their own learning. The work of Whitebread (2010) highlights the ability of young children to show metacognitive skills and abilities, which sits alongside the ideas of self-determination (learner agency) of heutagogy. The ability for children of an early age to develop metacognition is built around learning through play and crucially, for the very earliest of learners, through experiential learning in the strictest use of the term - learning through experience or more prosaically, "learning by doing."

Using technology with early years learners is no substitute for learning through their own experience as they may not be able to relate their digital experiences to the wider world of reality. In the UK, one of the most significant developments in children's learning, which reinforces the importance of experiential learning, are initiatives in outdoor education e.g., forest schools. By putting learning outdoors, the learning environment is immediately broadened in relation to the natural spaces utilised and the increased range of experiences that can be offered to learners. Often the environments are coupled with curriculums that are predominantly play-based, putting learning back into the hands of the learners.

This outdoor, experiential heutagogy can often be seen as at odds with technological learning, for such mundane reasons as the need for more rugged and weatherproofed technology, as well as the lack of environmental services that would allow the use of larger and more static pieces of interactive technology: there are a distinct lack of electrical sockets lying around outside buildings. That being said, there are still learning technologies that can be provided for learners who are utilising outdoor environments, supplementing the learners' exploration and engagement. Such tools are both quotidian and readily adapted or configured to learner purposes e.g. waterproof covers for mobile phones and tablets to allow for the easy use of apps and internet use outside (signal permitting) and can be left in the surprisingly capable hands of early learners. Plant identification apps (such as "Leafsnap") allow for quick results of new finds and operate using just the phone's camera, with other additional functionalitynot needed. Although there may be language barriers to be overcome with the responses that apps may return to the learner, the educators of early years education are more numerous within the learning setting allowing for quick checking and translation for their learners and therefore removing this as an insuperable obstacle to learning.

Digital technologies aside, heutagogy in the early years is widely recognised (if not always called the same thing) as the methodology by which learners make their first and important steps into learning. Whole practices of learning support are built around heutagogic principles. Montessori education has a key concept of practitioners supporting 'auto education' (Montessori, 2012). This method relies on educators laying out the foundations for learners to discover things for themselves with resources that will enable them to independently test, succeed, fail, and review what they are engaging with. Technology is simply one resource type that is at practitioner's disposal to bring to bear in an ecology of resources.Combining this resource acquisition with planning, particularly retrospectively, provides a wider and deeper collaborative process between the learners and the educator. Retrospective planning involves the recording of the self-determined learning and play that the learners engage in each day and using that to organise resources and plan for activities that provide a continuity of learning as well as building next steps for the

development of learning from the recorded activity. By planning in this way, learners' learning progresses rapidly because they are interested in the activities they have chosen and they are taking part in and the technologythey are using (if they do not like an activity any longer, then they find something new to do) while being nurtured with questioning and new ideas by the educators facilitating the activity. As Vygotsky (1978) points out, a child's play allows them to exhibit behaviour beyond the expectations of their chronological age, which further facilitation can then support to bring on. Mitra (2019) op cit makes similar points in demonstrating how in Self-Organised Learning Environments (SOLEs), children of school age can show attainment beyond their chronological ages.

Both Vijaya and Philip are practitioners who are competent users and evaluators of technology and the wider environment to stimulate and support learning by children and they use such tools in their day-to-day work. However, they are cautious about uses of digital technologies that seek to reduce or minimise learner agency through the "shaping" of behaviours through conditioning and where the technology and the content are used to produce prescribed outcomes and behaviours set by programmers or service providers. Their concerns, shared by all authors of this paper, are heightened by the operations of social media and tech companies using digital technologies in manners that are detrimental to personal agency e.g. Facebook/Meta, whose own research indicates that their operations are harmful to children and young people, promoting anti-social and extremist behaviours as well as self-harm through the use of surveillance technologies and data analytics among other tools to maintain the user's personal presence in "always on" services, regardless of those reported consequences. The Congressional testimony of Frances Haugen in October 2021 details these harmful practices and their results. This testimony has now been accepted as a cause for concern by the UK Government, among others.

With no unequivocally accepted definition of "psychotechnology", those that are widely quoted e.g., that offered by Lexico – "psychotechnology as: -"any technology designed to alter thought or behaviour by manipulation of brain function; the study or development of such technology"would seem to be anathema to those engaged in experiential learning where a pre-requisite is the encouragement of learner agency and, in heutagogic practice, where engagement in collaborative activities sees learning as an emergent Johnson (2002) rather than prescribed outcome. It seems to us that learner-centric pedagogies, especially heutagogy should challenge any instructional/learning programming that relies on shaping behaviour and neurology without there being the most rigorous ethical and technical scrutiny and control of such technology. Currently, as with many learning technologies, such a scrutiny is limited by Intellectual Property Rights, Copyright and Patents with a result that learners and teachers i.e. those most likely to be affected by psychotechnology, are barred from examining the programming and assumptions behind such technology e.g. the reliability of AI despite much evidence to the contrary, see Greenfield (2017), Seymour (2019), Zuboff (2019) and Ecclesfield and Garnett (2020).

Equally, psychotechnology claims to be based on a scientific understanding of neurology despite the many reservations held by neurologists about the simplistic relating of neuroanatomy to function and our very incomplete knowledge and understanding of the growth, moderation and maturation of the human nervous system and its emergent properties arising from learning and experience.

We do have knowledge of learning through experience that comes from practice in heutagogy – see Luckin (2010), Hase and Kenyon (2011), Blaschke, Kenyon and Hase (2014), Hase and Blaschke (2021), Ecclesfield and Garnett (2020) and the publications on practice from Vijaya BhanuKote(2019, 2021 and 2022 (forthcoming)). These show how and why a focus on learning and learners rather than instruction or conditioning provides the means to develop and enhance learning for supportive collaborations that build learner confidence and engagement in education.

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Heutagogy - Every child's dream

Vijaya Bhanu Kote
ZP High School, KH Wada, Payakaraopeta, Visakhapatnam District, Andhra Pradesh, India

Philip Ecclesfield
Southmead Primary School, Wimbledon, London

Nigel Ecclesfield
FRSA

Introduction

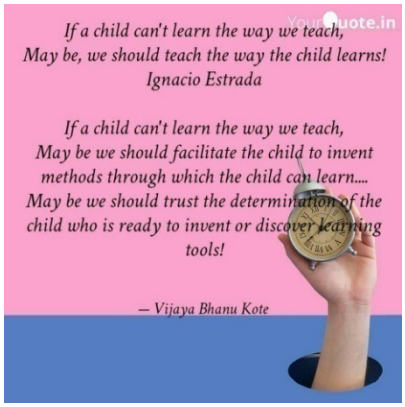
This story starts from my childhood. We had one grammar teacher. She always used to use the word "Bloody Buggers" for the students who skipped her class and hide in school library room pretending reading library books until her class was over or for the students who could not do well in English grammar. I don't know why but I thought the spelling of the word "grammar" was "grammer". May be due to the pronunciation. One day she saw my notes where I had written "grammer notes" on my notebook label. It was the first time that I heard her "takiya kalam (habitual word from the mouth)" for me. I couldn't take that and was so upset. My thoughts went this way….
"How nice it would be if she had told me the reason why the spelling I have in my mind was wrong"
"How good it would be, if she stops belittling kids and scolding them so seriously"

I went home. I scrupulously introspected my fear for the so called English Grammar and why I hide behind library books during her period. I thought it would be better if I could be self motivated or interested in Grammar, so that there was no need to be scolded for mistakes. However, English Grammar was one of my horrific subjects until I got over the fear through self determined learning to an extent.
We had a mathematics teacher. He continued to be our Mathematics teacher from Grade IV to IX. He sat in the chair, turned to the black board and scribbled two, three problems on it and asked us to note them in our book. He never explained the problem but asked us to do the remaining sums in the textbook on our own. I somehow never had a chance to run into the library during his period. I hated attending tutions. So, I could never get over the confusion with Mathematics.

We had a Hindi teacher named Shobha. I was new to the subject in my Grade IV when I joined the school. She was a living angel for me. She asked me to stay calm and took at least 10 minutes time every day to motivate me to learn Hindi as she was too busy with regular teaching. I invented my own methods to learn Hindi and within six months, I reached the level of my classmates who were reading and writing Hindi lessons. This was the root cause that prodded me to teach self learning techniques to my kids later when I was born as a teacher. Every adult will have at least one such story from her/his school days. I was happy that I would be doing IAS but I had to take up teacher profession due to personal reasons. I always tried to see that kids learn on their own or do experiments on their own during my block teaching practice or teaching practicals.

The school I first entered as a Government School teacher, was a literal agony filled surprise for me. I couldn't ever dream of a school like that which was situated in a small village with mearge population. The building was in the most devastating condition. The kids attended school whenever they wished to. Ironically, there was no school bell which was told to be stolen by someone. After giving lot of pressure, I could see a railway ironpiece as a school bell. I could do nothing as I myself was so much confused and was on probation period that gave me a salary of just 1200 rupees per month.

Figure 1 Teacher's Perspective on the learning of children



But, I could not compromise with the education of the kids. I always remembered how I suffered with few subjects when I was a student. So, I was absolutely inclined towards teaching of self-learning techniques to students, which was actually a weird thing as a teacher can do in view of the parents or for the other teachers, it may differ. I encouraged kids to learn on their own, do projects on their own and create personalized learning spaces at school as well as at home. Evaluation, according to me was something different. I preferred individual evaluation with separate evaluation tools. Moreover, for me, it gave immense joy when kids tried my method of self-evaluation.
Then, I started doing little experiments. I started doing independent research about different education systems in

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different countries. I studied the geological, social, political and finacial systems of different countries and went through various websites like UNICEF, UNESCO etc.,. This research increased its stretch when I started writing the subject Biology for a renowned newspaper as an academician and then writing for IAS aspirants in Government magazine, "Yojana".

Methodology

I succeeded in raising to the level of kids and implementing class schedule as per their wish every day. I always had one thing in my mind. "Just like kids rushed into the play ground to play though you never persuade them to do so, the same way, they should dance in rejoice to learn. The strong desire should come from within."

Then, during my independent research on internet, I found "Heutagogy". This was so close to my thoughts and my experiments in education. Here starts the story of transformation in a strategic method:
We all know about Pedagogy. Some know about Andrologogy. But few know about Heutagogy.

Observations:

Let's have a look at the differences between these three gogy's:

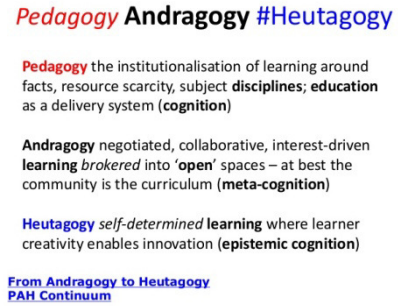

Table 1. The pedagogy, andragogy and heutagogy (PAH) continuum (from Luckin, et al., 2010, p 78)

	Pedagogy	Andragogy	Heutagogy
Locus of control	Teacher	Learner	Learner
Education sector	Schools	Adult education	Doctoral research
Cognition level	Cognitive	Meta-cognitive	Epistemic
Knowledge production context	Subject understanding	Process negotiation	Context shaping

Now, as you have read the above differences, your eye might have caught the line that the education sector of Heutagogy is Doctoral research. Yes! You are right. Founders of Heutagogy, Dr. Stewart Hase and Dr. Chris Kenyon has first experimented Heutagogy for Post Doctoral Fellows. Then, how come I am talking about Heutagogy for Primary, Secondary and infact any level of education? Can congnition level- Epistemological possibilitybe attained with small kids?

I happened to visit blogs of Dr. Stewart Hase. The more I study his papers and blogs, the more I grew confident on its feasibility to implement Heutagogy in my classroom. My staunch belief that every infant is a self determined learner that takes the support of a little finger called handholding, was as if becoming more validating.

Teacher in Heutagogy

> *"In Heutagogy, the instructor facilitates the learning process by providing guidance and resources, but fully relinquishes ownership of the learning path and process to the learner, who negotiates learning and determines what will be learned and how it will be learned (Hase & Kenyon, 2000; Eberle, 2009).*

Teacher is a compass in the method of Heutagogy. My classroom becomes my laboratory. My kids became my teachers. My experiments were small. I took ample time for each experiment. If that was not satisfactory, I tried inventing another method. I interviewed kids on their dreams about education. I took their opinion on how to learn together. Drawing, drama, role-play, gardening, music and dance emerged as the tools for learning. My soul mate Madhuri Jonnalagadda and I took care of their health by providing nutrition powders, fruits, raw vegetables and herbal medicines. I took care of their mental health by letting them play dramas of the moral stories they listened. My classroom was chirpy at times and too quite with the kids groups working on their projects. Parents were worried about this weird happenings. They approached our Head Master to ask. I still feel so grateful to him for standing by me at that time. He asked parents to wait for few months and then come back. He trusted me to the core and gave ample liberty to carry on with my experiments.

My class attendance turned to be 100% every month. The health of my kids improved so well. I took my kids home every Saturday to teach them through the computer. Learning went too good. Too good to an extent that when it was "Samaikyandhra Movement" in 2013, my kids completed the syllabus, did project works, learned lessons own their own, when I attended the movement for few months. Our Head Master Sri. Siva Prakash was due for retirement, so he had to attend the school. So our school was open as other schools were closed. He was absolutely surprised while talking to me on phone on how my class kids carried on the learning activities though I was not there, with due discipline. He said, my class kids asked him not to come and monitor them and that they can carrry on with their learning on their own.

After returning from the movement, you might have imagined how I might have danced in rejoice seeing the improvement in my kids. I got absolutely confident about Self-determined learning.

Figure 2 Source: Joannamkay

Heutagogy and its interconnections:
Let us take an example:

The other day when I visited the class in the morning, as usual, kids brought lesson resources to the class. But to my surprise, I see that everyone carried Datura flowers. I could sense that they might have seen the bloom of Datura flowers on their way to school and have plucked them. (now this is their self determination to learn about Datura flower)

I asked them to sit in a circle. I asked them what do they want to do now? They said they want to study the flower and name the parts. Parts of a flower were a lesson few months away in our syllabus. We don't mind it. So kids started studying the parts of the flower. One kid said he want to see what is inside the flower, one kid was already tearing the flower carefully to see the bottom part of the flower. (They knew the skill of knowing how to learn and tried their own ideas)

I gave a hint that they can bring a magnifying glass, a blade and water to study clearly. (here I moved into the world of the learner) Within few minutes they arranged the required things from their property boxes. They started exploring the world of the flower from inside.(here the process is given due importance than the content) Suddenly two kids discussed something. They asked me permission to go to the school play ground. They returned with other different flowers.

Now, started the real learning. They dissected the flower with the teacher's minimal help. They started drawing the parts of the flower looking at the real parts of the flower. Then they started comparing the other flowers with the Datura. They could see so many differences and discussed about this among themselves seeking my help sometimes. (We can see that there is no teacher centred learning here) (Students explored and learned from self chosen and self directed action)

Now that they have dissected the flower and came to know many facts, they went to their little group fields and prepared the soil for next day's activity. The next day, they brought each group brought one flower plant or seeds and sowed them in their respective farms.(Each group has a little bit of ground which they manage as a field or farm. They grow vegetables in those little farms) (they looked beyond their disciplines to work together in teams)

When the vegetables are grown, they were given into the mid day meals of the school. When the flowers bloomed, they were distributed among girls and teachers. And if many roses bloom, they were dried and powdered to make rose powder to use in bathing water.

There was no looking back though I had to face many odds inmy adventurous journey. My Grade V kids published a book named, "Letha Akasalu" where every kid authored a chapter on how Heutagogy carved their learning. I established first digital classroom with the help of my soul mate Madhuri in 2013. Combining technology with manual learning gave great results. My friends, my mentor Sri. Devineni Madhusudhan, my brother Mamidi Venkateswararao, relatives and family helped me a lot to improve the buildings and infrastructure of the school.

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I continued with my experiments though I was transferred to another school. We improved school by investing money on many things. It was 2015. My strong wish was to establish digital classroom. The school did not even have electricity. We could get power with the financial help of my friend Krishna. I took a classroom upstairs which was just constructed. The threat of theft was more here. I had no money.I took money by mortgaging my gold. Madhuri and I at last succeeded in establishing a Heutagogy classroom, with safety grills and electronic gadgets including a lab and a library for the Heutagogs. My wish was to take up Grade I and continue with them till their Grade V, so that they will become experts in Heutagogy. This happened with the batch of 2018-19. Now they are in Grade IV. We have every little thing that is necessary for Heutagogs in that classroom.

My experiments went on and that was when my paper on Heutagogy was selected for presentation in Finland. I am grateful for the Department of Education, Andhra Pradesh for funding my travel to Finland. The paper on Heutagogy won laurels from every country that participated, later I was authorized being the educational advisor for CCE, Finland. There after I presented my papers on Heutagogy in every TECH Global Conference.

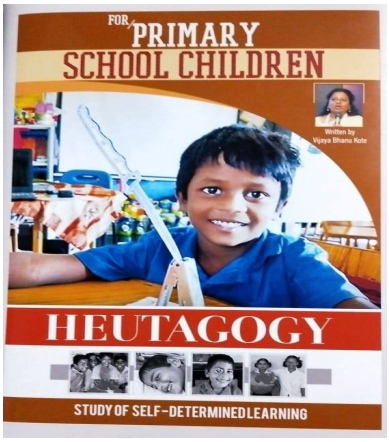


Figure 3
Module "Heutagogy for primary school children" written by Vijaya Bhanu Kote

I happened to connect with the founder of Heutagogy, Dr. Stewart Hase and his expert team members, Fred Garnett-FRSA and Nigel Ecclesfield-FRSA. In due course they came to learn about the model of Heutagogy I have framed and been implementing in primary school. I have authored Heutagogy modules in English and Telugu versions with their help and have published a book on models of Heutagogy named, "Nayi Talim- my experiments" which was inaugurated by our Honourable Education Minister, Dr. Audimulapu Suresh in "Nayi Talim National Seminar", at Bapatla, in 2019.

Figure 4
Release of the book "Nayi Talim and my experiments with Heutagogy" at Bapatla in Nayi Talim National Seminar in 2019

My Grade II kids displayed the Heutagogy App at TECH Global Conference, 2019 and I was awarded a scholarship of Rupees 10,000 for my work on Heutagogy. I could present my paper on Heutagogy along with my kids at SOTEL, Newzealand through virtual presentation in February 2020, where participants from various countries watched my kids learn through Heutagogy app, prepared by Happyadda studios, Bangalore.

Figure 5
My Grade II students displaying Heutagogy app at TECH 2019, Novotel, Visakhapatnam

22 మంది పిల్లలను దత్తత తీసుకున్న 13 మంది దాతలు

వారందరికీ ఎలక్ట్రానిక్ ట్యాబ్‌ల అందజేత

పాయకరావుపేట, నవంబర్ 1 (ప్రభాతవార్త

పాయకరావుపేట పట్టణ మండలపరిషత్ ప్రాథమిక పాఠశాల కొవిడ్‌వాడ 3వ తరగతి హ్యూమ్‌టగాజీ చెందిన 22మంది పిల్లలకు 13మంది దాతలు అందించిన ట్యాబ్‌లను ఎంఈఓ గాంధీ చేతులమీదుగా అందజేశారు. దేశంలోనే తొలిసారిగా ఇక్కడ పాఠశాల 22మంది విద్యార్థులకు ఎలక్ట్రానిక్స్ ట్యాబ్‌లు ఆంధ్రరాష్ట్ర అవతరణ దినోత్సవం సంధర్భంగా పొట్నీశ్రీరాములు చిత్రపటానికి పూలమాల వేసి దాతలు అందరి తరపున వీటిని అందచేసారు. ఆన్‌లైన్‌విద్యకు అనుకూలంగా ఒక్కొక్క ట్యాబ్‌లలో 30 యాప్‌లు వేయడం జరిగిందని వీటికి నెట్ అవసరం లేకుండా యాప్ ద్వారా విద్యాబోధనకు అనుకూలంగా ఉంటుందని ఎంఈఓ గాంధీ అన్నారు. 13మంది దాతలు అందచేసిన 22 ట్యాబ్‌లు ప్రస్తుత ఏడాది అలాగే పిల్లలు 5వ తరగతికి వచ్చేంతవరకూ ఆపిల్లలను మెంటరింగ్ చేస్తారని ఉపాధ్యాయురాలు విజయభాను చెప్పారు. అమెరికాకు చెందిన తనస్నేహితురాలు మధు ఆరుగురు విద్యార్థులకు ట్యాబ్‌లు అందచేసినట్లు తెలిపారు. వారందరినీ దత్తత తీసుకోవడం జరిగిందని విద్యద్వారా వారు ఎంతటిప్రయోజకులుగా అయ్యారన్న విషయం పట్ల ప్రత్యేక శ్రద్ధతో ఎప్పటికప్పుడు తెలుసుకుంటారని చెప్పారు. కరోనా సమయంలో విద్యార్థులలో మానసిక స్థైర్యాన్ని కలిగించడానికి వారిని విద్య పట్ల మరి ఎంతగా ప్రోత్సహించడానికి దాతలు 13మంది మెంటర్స్‌గా ఉండేందుకు నిర్ణయించుకున్నట్లు చెప్పారు. 22 మంది పిల్లలకు ట్యాబ్‌లు అందించిన దాతలు మాధురి జొన్నలగడ్డ, అమెరికాకు చెందిన సన్నపురెడ్డిపద్మ, శివకాన్త్, పూసర్లజగన్నాథ్, కాళ్ళగురునాథ్, కాకినాడకు చెందిన పదాల సూర్యప్రకాష్, పాయకరావుపేటకు చెందిన మామిడివెంకటేశ్వర్లు, వడగా చంద్రమౌళి, విశాఖకు చెందిన లక్ష్మీవసంత, తులసీదాస్‌పటేల్, పాయకరావుపేటకు చెందిన దానేటి పత్యూష, హైదరాబాద్‌కు చెందిన విష్ణుకాన్త్, ఢిల్లీకి చెందిన మాడభూషి శ్రీధర్ వీరందరికీ ప్రత్యేక కృతజ్ఞతలు తెలియచేస్తున్నట్లు విజయభాను తెలియజేశారు.

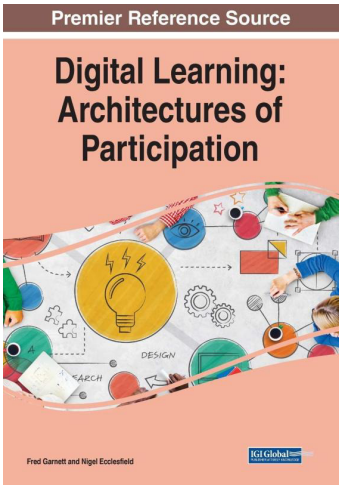
Advancement in implementation of Heutagogy:
Trusting the learner is the key to Heutagogy.
I was the World Curator of wikiquals for the project "Heutagogy for teachers" where we submitted 13 projects of teachers, parents, educationists on Heutagogy during Covid19.

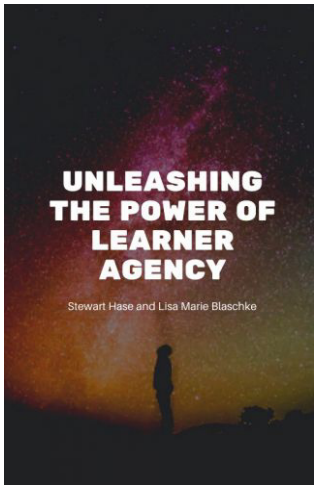
Figure 6
A paper notification for adopting Grade III kids by 13 mentors who donated 22 tabs for the kids to learn at home during covid.

During the time of Covid19, 13 of my friends and relatives bought 22 tabs for my kids. We trusted them and handed the tabs to them. They used these tabs all the time when the schools were closed. We had online classes. But more than that, they learned by themselves using the apps that worked offline too. This experiment and its success was featured twice by the UNICEF in October 2020 and then in October 2021.

Figure 7
Kids with tabs

One friend named Deepti Bevara, donated laptops and tabs to kids during the same time, that aided our learning in the classroom.





Acnowledgements:
I co-authored two books along with Dr. Stewart Hase, Fred Garnett FRSA and Nigel Ecclesfield FRSA which were published internationally in 2020 and 2021 respectively.

Figure 8 and 9
Books published internationally in 2020 and 2021 in which I coauthored a chapter in each book.

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Figure 10
Heutagogic mode of learning

Twinning with Riverley Primary School, London:

Figure 11
Twinning Session with Riverley primary School, London on 19th January 2022

Learning about my work and my module from my magic band as I call him, Fred Garnett, Primary schools in London showed interest to implement my module and train their teachers in Heutagogy. They also asked for a "Twinning" with my classroom. On 19th January we had a trial session of twinning Grade V students of Riverley Primary School, Leytonstone, London with Grade IV students of Z P High School, KH Wada, Payakaraopeta, Visakhapatnam District, Andhra Pradesh, India.

The Riverley School management, the Head teachers and the kids were so excited to share their learning methods with us. They felt very joyful after taking the virtual tour of our classroom and to know the games the kids play to learn. They were excited to see how Grade IV kids use a boxing kit to learn mathematics and improve their abilities. They were screaming with joy when they have seen the dart kit in our classroom and how we use the toys to learn all subjects through a story. Our kids were equally excited to learn about their topic book and were happy to see the ppt they have shared about their school's method of functioning. This "Twinning" will continue for an year and we wish to twin with a Finland school too next year.

లండన్ విద్యార్థులకు కథలు చెప్పిన పాయకరావుపేట చిన్నారులు

విశాఖ జిల్లా పాయకరావుపేట పట్టణ పరిధిలోని జె.హెచ్.వాడ ఉన్నత పాఠశాలకు చెందిన నాలుగో తర గతి విద్యార్థులు బుధవారం లండన్‌లోని రివర్లీ ప్రైమరీ స్కూల్ చిన్నారులతో జూమ్ ద్వారా సమావేశమయ్యారు. ముందుగా ఇరు పాఠశాలలకు చెందిన విద్యార్థులు పరిచయం చేసుకున్నారు. ఇక్కడి చిన్నారుల్లో కొందరు కథలు చెప్పగా లండన్ విద్యార్థులు ఆసక్తిగా విన్నారు. అక్కడి విద్యార్థులు కొన్ని పాఠ్యాంశాలను అభినయం చేస్తూ వివరించగా ఇక్కడి విద్యార్థులు వీక్షించారు. ఇలా వారంలో ఓ రోజు లండన్ విద్యార్థులతో తమ పాఠశాల చిన్నారులు మాట్లాడే కార్యక్రమాన్ని కొనసాగిస్తామని జె.హెచ్.వాడ ఉన్నత పాఠశాలకు చెందిన ఉపాధ్యాయు రాలు కె.విజయభాను వెల్లడించారు. స్వీయ అభ్యసనంలో భాగంగా ఈ కార్యక్రమాన్ని ఏర్పాటు చేశామని చెప్పారు.
– న్యూస్‌టుడే, పాయకరావుపేట

లండన్‌లోని రివర్లీ ప్రైమరీ స్కూల్ విద్యార్థుల ప్రదర్శన

రివర్లీ ప్రైమరీ స్కూల్ విద్యార్థులను పరిచయం చేసుకుంటున్న కె.హెచ్.వాడ పాఠశాల చిన్నారులు

Figure 12
Paper notification about London school twinning

I have trained many schools, teachers, students and parents in Heutagogy. A parent who has been pursuing training in Heutagogy by coming to my classroom and implementing Heutagogy for her twin kids Varshal and Varshita, Smt. Dasari Pratyusha and a parent who has been training her daughter Manasvi through Heutagogy, Devarakonda Supriya, are now authoring worlds first parent Heutagog books, which shall be published this year.

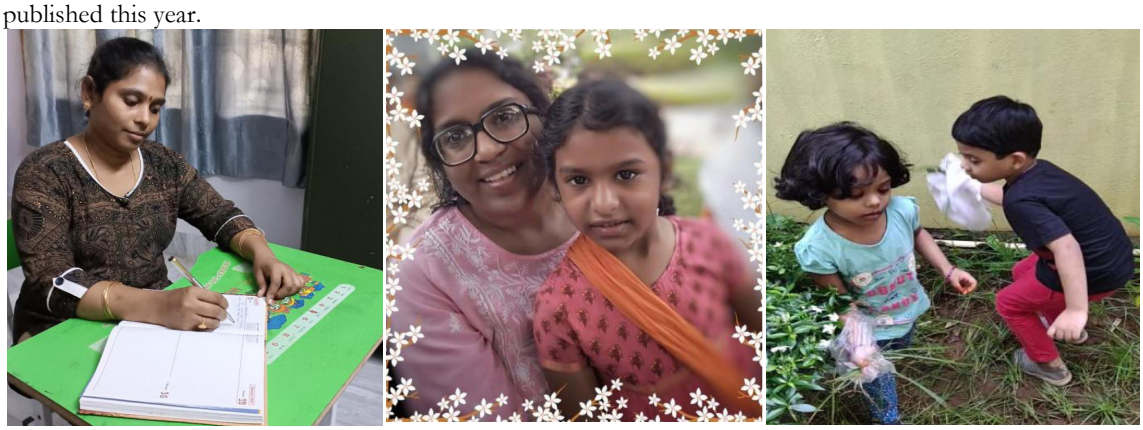

Figure 13 authors of parent Heutagogy books and their kids

Vizag teacher ties up with UK school for twinning classes

Umamaheswara.Rao
@timesgroup.com

Visakhapatnam: Taking the online lesson delivery to the next level, a government school teacher in Visakhapatnam district has tied up with a private school in London to offer the students twinning classes.

Under this twinning model, the fifth class students of Riverley Primary School, London, will learn the Heutagogy model being practised at ZP high school in KH Wada of Payakaraopeta.

Similarly, the best practices, techniques and approaches that have been adopted by this London school will be shared with the fourth class students of the KH Wada school. Vijaya Bhanu Kote, the teacher who started the initiative at the ZP high school in KH Wada, said the international collaboration is expected to improve the capacities of kids of both the schools and bring in increased quality to their activities. "The initiative will continue for the next one year. The international exposure will also help broaden the horizons of the students. Some students of our fourth class are facing the language barrier to attend the twinning classes with the students of London school. I am initially assisting them. In all, the initiative will improve our network and add value to the existing learning methods," said Vijaya Bhanu.

The initiative was started by teacher Vijaya Bhanu Kote

Explaining the origin of the initiative, Vijaya Bhanu said the twinning idea came from Fred Garnett (FRSA, UK). "He worked diligently regarding this concept and suggested to me Riverley Primary School in London. Consequently, we had mutual mails, a virtual session and discussed the possibilities. We conducted our first trial twinning session with students of both the schools on January 19. Riverley Primary School head Sabrina Reilly and assistant head Kirsty Fletcher attended the trial session. Payakaraopeta mandal education officer KN Gandhi appreciated our initiative. Dasari Prathyusha, who is writing the parent heutagog book for the first time in the world, and our Hindi teacher Jyothi were also present" said Vijaya Bhanu.

I Joshna, a student of class IV at ZP High School in KH Wada said it was a new experience for him to interact with foreign students. "Our teachers are helping us with the language. Apart from the academic benefits, the twinning session may improve our networking," she said.

When teachers say that doing so much of work is impossible in Government Schools, I ask them to first be innovative, improve on professional development and start working for the benefit of the kids. If I could work this seriously though I had to face lot of odds, it is because of the support of the education department. Trust the learner.

Figure 14
Paper notification about London School Twinning in Times of India Newspaper

We can localize Heutagogy according to our environment, students background, according to the area the students live or according to the needs of the school or students. There is no fixed frame of learning. Only requisite is the trust that we place on the learner agency.

Figure 15
Activities by kids

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Figure 16
Activities by kids

Acknowledgements

I sincerely thank our honourable Education Minister, Sri. Audimulapu Suresh, Founder of Heutagogy Stewart Hase, Experts in Heutagogy, Fred Garnett FRSA and Nigel Ecclesfield FRSA, my mentor Sri Devineni Madhusudhan Rao, Smt Sandhya Rani and Sri Vadrevu Chinaveera Bhadrudu(former commissioners of Education), my brother and our Mandal Educational Officer Sri. K.N. Gandhi, the whole of Education Department, Andhra Pradesh, my soulmate Madhuri Jonnalagadda and my classmates especially patel, my brother Sri Mamidi Venkateswararao, his wife parvathi and my neices Ganesh and kumar, my brother vadaga Chandramouli, late Ramateertha and Jagaddhatri, Sai Padma, Padala Charitable Trust, Lakshmi vasanta, Vishnu jasthi, Sri. Madabhushi Sridhar, NGO Grama Swaraj Samiti in unison with Plan India, Vasavi womens innerwheel, Yamini, Mamatha Kodidela, Deepthi Bevara, Sunitha, Devarakonda Subrahmanyam sir, C A Prasad dad, Gurunath Kalla, Siva Jasthi and all my dearest friends and relatives who made everything possible and provided all the wonderful infrastructure to my school, my husband Sri Bangar Raju Elipe to have supported every attempt and never said a word against my spending 10% of my salary towards my class needs every month and my sons Chandra Sekhar and Vardhishna Vibhavas Rajith Elipe who is the worlds first child Heutagog, for making my journey of Heutagogy worth traveling and marking milestones. It would never have been possible without the positivity of the friends around the world! Please visit my classroom one day!

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Book written by my Grade V kids- "Letha Akasalu"

Relevance of metacognition in heutagogy

Diane Joseph, R.
Principal, Venkateswara College of Education, Puducherry

Manikandan, K.
Assistant Professor, Venkateswara College of Education, Puducherry

Introduction

Heutagogy is self learning of individuals which involves student – centered instructional strategies. It involves self enhancement and self development of individuals through their self initiative and learning. Learning occurs by the free will of the learners and learning is left out to the self learning strategies. It is self paced and is purely dependent on the individual learner. The learner may concentrate or choose their own time of learning. The context of heutagogy is more emphasized in informal learning and it is employed in lifelong learning. This mode of learning is purely dependent on the matured learner and learners' will and attitude.

Heutagogy in education

It is employing self directed skills and self directed approach to learning. Learner centered approaches are employed to promote heutagogy in education. Teacher acts as a guide and instructs them to learn on their own. Intrinsic motivation is encouraged by the teacher so that student set their own goals and work to attain them on their own. Following methods can be employed to promoted heutagogy in education.

1. ***Learner-defined learning Contracts:*** Teacher and student collaborate together and students are made to fix their learning goals and steps to attain it in a phased manner. Through learning contracts, students decide what they want to learn and frame their individual learning methods.
2. ***Flexible curriculum:*** This mode of education is made feasible by making the curriculum flexible by the learners. Students define their own curriculum according to their interest. The time and choice of subjects are made by the students according to their wish.
3. ***Collaborative learning:*** Collaboration in classroom is promoted to develop self learning and sel direction. Learner has the choice of choosing to whom to collaborate and for what subjects they can learn collaboratively.
4. ***Alternative assessment:*** While practicing heutagogy, teacher has to adopt alternative forms of assessment as conventional mode of learning is replaced by self-directed mode of learning.

Metacognition

Metacognition is simply knowledge and awareness about one's own cognitive process like thinking, thought process, reasoning, memory retrieval etc. Metacognition is classified into three components:

1. ***Metacognitive knowledge*** (also called metacognitive awareness). It is the knowledge that an individual has on what he/she thinks or the knowledge about one's own thought process.
2. ***Metacognitive regulation***. It is the control one has over one's own thinking and thought process.
3. ***Metacognitive experiences***. It is the present state of mind and cognitive experiences one undergoes.

These three processes are involved in metacognition. It can be viewed as a skill one possess to understand and to monitor one's own thought process. Metacogniton can be related to mindfulness where the individual is always aware and conscious about his/her thought process. This metacognition helps an individual to accomplish a task by focusing and it develops the ability of concentration.
Metacognition helps one to have a focus on one's thinking and it improves the quality of the thinking. It aids one to be a good learner and to properly process information in the process of memorization. This promotes self- learning and self- management strategies. In this way metacognition is directly related to heutagogy.

Metacognitive Strategies

Metacognitive strategies refer to the conscious monitoring of one's cognitive strategies to achieve specific goals, for example when learners ask themselves questions about the work and then observe how well they answer these questions (Flavell, 1981). Boekaerts and Simons (1995) view metacognitive strategies as the decisions learners make before, during and after the process of learning. Some of the important metacognitive strategies are: Planning strategy, Generating questions, Choosing consciously,

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Setting and pursuing goals, Evaluating the way of thinking and acting, Identifying the difficulty, Paraphrasing, elaborating and reflecting learners' ideas, Journal-keeping etc..

Application of metacognitive strategies in heutagogy

As heutagogy involves self direction of learning and metacognition involves thinking about one's own though process, there is a close association between metacognition and heutagogy as both are involved on the self thought process of the learners. A learner while applying metacognitive strategies begins to involve in heutagogical process and thereby a strong self- learning occurs. Thus both metacognition and heutagogy aims at self-regulation, learner autonomy and independence of learning.

Integration of metacognition in heutagogy

The components of metacognition are integrated in heutagogy in the following ways:

A. Knowledge of cognition

1. Declarative knowledge: It is the knowledge about one's general processing ability which leads to self direction in heutagoy
2. Procedural knowledge: It is knowledge about how to successfully solve problem which leads the learner to choose a goal, overcome obstacle and solve the problem successful on a self directed way.
3. Conditional knowledge: It is the knowledge such as when to employ specific strategies and which again is interrelated to heugatogy

B. Regulation of Cognition

1. Planning: It involves identifying the right strategy to learn a concept
2. Selection: It involves choosing the right strategy to learn a concept
3. Monitoring: It involves finding out if it the right strategy works to learn a concept.
4. Evaluating: It involves checking the choosing the strategy and the result of it in learning a concept.
5. Debugging: It involves removing the errors in the chosen strategy and applying the correct strategy to learn a concept.

Table 1 shows the integration of components of metacognition and heutagogical process for the outcome of self directed learning

Component of Metacognition (R. Diane Joseph and V. Sundari, 2018)	**Heutagogical process (Lisa Marie Blaschke and Stewart Hase, 2016)**
Knowledge of cognition Declarative knowledge Procedural Knowledge Conditional Knowledge **Regulation of Cognition** Planning Information Management Strategy Comprehension Monitoring Debugging Strategy Evaluation	Explore Create Collaborate Connect Reflect share
Through all the process that involved in metacognition in which a learner chooses a strategy to learn a concept.	Through the above process a learner is involved in the process of self direction and self learning
By employing the metacognitive components the learner begins to apply the steps in heutagogy. leading to	
The final outcome of **Metacognition + Heutagogy = self directed learning**	

Conclusion

Learning proceeds from signal learning to problem solving in a hierarchical way. The future of learning is self – directed learning which always yields maximum learning outcome. By the integration of metacognition and heutagogical principles the self directed learning can be obtained.

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Digital education tools for teachers and learners

Prakash, N.
Research Scholar, School of Education, Tamil Nadu Open University, Chennai

Barathi, C.
Assistant Professor, School of Education, Tamil Nadu Open University, Chennai

Introduction

For the teaching-learning eco-system, digital technologies provide rich media. Learning through simulations (i.e. animation, games), video lectures, live chat sessions, online discussions, and forums are just a few examples of how digital educational technology and social media can be used for a variety of teaching-learning applications. Because of the better accessibility, flexibility, and cost-effectiveness that digital learning technologies provide, academic institutions are more motivated to employ them. Without a question, digital learning complements both old and current course delivery methods (Fletcher, 2005). This has been mirrored in the domain's expanding literature during the previous decade.

Evolution of digital learning

Digital learning is defined as the use of digital tools, technology, and media to enhance learning experiences. With the advancement of mobile devices and the increased use of the internet, digital learning is becoming more popular. As a subset of the system, this platform may comprise content suppliers, various technologies, and users. For their convenience, a large number of students are choosing for courses offered on a digital platform (Isaias et al., 2017). Teachers are also supporting learning through digital media since it adds value to the courses they deliver (Adukaite et al., 2017). Users can also access instructional content at any time and from any location with digital learning. Richer instructional content, such as color-by-number texts, audio-video narrations with graphical representations, and animations, has been found to help learners understand more (Paechter et al., 2010). Students can benefit from a user-friendly interface, online chat, social interactions, assignments, quizzes, and other digital learning technology. For their learning needs, students with special needs can employ digital technology such as text-to-speech information or instructors who use sign language. Virtual spaces, such as learning laboratories with technology, can also be used to help students develop critical thinking skills. Furthermore, digital learning allows for more creative and personalised learning, which contributes to its growing appeal (Pituch& Lee, 2006).

From USD 247 million in 2016, the Indian market for online education is expected to rise to USD 1.98 billion in 2021, representing only a small part of the diverse applications of digital learning technology (Palvia et al., 2018). Primary and secondary education, exam preparation, reskilling and online certification courses, use in traditional education, and learning for any interested sector are the key categories included in the calculation of this market growth. The concept of continuous learning has emerged as a result of the usage of digital learning, and it is beneficial in areas such as employability, social learning, and entrepreneurship (Palvia et al., 2018).

Despite the ease of access and cost-effectiveness of digital learning, institutions and students have not taken full advantage of it (Patterson & McFadden, 2009). To close this gap, essential dimensions in digital learning adoption must be identified (Balakrishnan, 2017; Lai et al., 2012; Teo& Lee, 2010). To fully utilise the usage of ICT for students, educational institutions must investigate these driving characteristics. Students are eager to use e-learning to advance their careers, but they are also concerned about the technology's operation, which limits its application (Calisir et al., 2014).

As a result, the acceptance of digital learning among students and teachers was researched in order to determine what factors inspire people to use it. The researchers examined this adoption by examining technology adoption theories in the context of people's embrace of new technologies.

The Most Popular Digital Education Tools for Teachers and Learners

Technology plays a critical part in the instruction of children and adolescents in the new era of learning. Here are some tools that, among other things, make communication between professors and students easier. Hundreds of digital education technologies have been developed with the goal of giving students more autonomy, enhancing academic process administration, fostering collaboration, and improving communication between professors and students. The following are the most important digital technologies for teachers to use in the classroom to improve teaching and learning.

1. **Edmodo**: Edmodo is a basic social networking website with similar features to Facebook, including a scrollable "wall" or "timeline" where you can view posts ordered by date, an

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individualised profile page, push notifications to show what's new, easy access to sharing links, and the ability to send messages to groups or individuals. The main distinction is that Edmodo was designed with students and instructors in mind, combining familiar social networking capabilities with classroom management system features. As a teacher, we may create assignments, quizzes, poll audiences, manage small groups, grade activities, and even issue badges all from within a two-separate area that allows students and instructors to keep their academic and social lives separate. With Edmodo, Students and teachers can collaborate in a setting where the focus is primarily on teaching and learning, without the possibility of unwittingly eavesdropping on each other's personal lives.

2. **Socrative:** Socrative is web-based interactive student response systems (also available as an iOS, Android, or Chrome app) that can help teachers generate dialogue and learning by allowing students to design polls and quizzes. Educators can use Socrative Teacher to generate true/false and multiple choice quizzes. They can then use poll questions and exit tickets to visually monitor where their pupils are in terms of comprehension and knowledge retention. All of the results are updated in real time, and the app grades all quizzes automatically.
3. **Projeqt:** Projeqt is a programme for creating multimedia presentations with dynamic slides that include interactive maps, connections, online quizzes, films, and other features. Managers can share presentations with employees that are visually tailored to different devices during a class or online session. It can be used on a computer, tablet, or phone with no problems. It doesn't appear to matter if it was founded in 2011, as it is quite appealing to the eye and simple to use. Projeqt's best feature is the ability to include any form of media in your presentation. It takes various types of files, including PowerPoint, PDF, Word, and JPEG. It makes the presentation much more dynamic and enjoyable to learn from. When it comes to delivering on boarding materials, the manager could get creative. On one slide, we could show a phone call clip of what a regular phone call should sound like, and on the next, we could show a video of how to browse the corporate website. We can even include music from Spotify and photos from Flickr to liven up the display.
4. **Thinglink:** Thinglink is a free and easy-to-use digital programme that allows users to convert any image into an interactive graphic. Turn an image into a multimedia launcher by creating various "hot spots" on select portions of the image. With the press of a button, you may add video, record audio, or provide a link to any website. An interactive ThingLink graphic can be easily embedded into any blog or website. ThingLink is an incredible tool that allows users to cram a lot of information into a tiny amount of space.
5. **TED-Ed:** TED-Ed is an educational website that allows teachers, students, and animators to collaborate on generating educational lessons. This website provides democratising access to material for teachers and students who wish to enhance their knowledge and good ideas. People can take an active role in other people's learning processes here.
6. **cK-12:** cK-12 is a website dedicated to lowering the cost of academic publications for the global K12 market. To accomplish this goal, this platform uses an open source interface that allows users to create and distribute educational content via the internet that can be customised and includes movies, audios, and interactive exercises. It can also be printed if it meets the editorial requirements in each region. The books made in cK-12 can be customised to meet the needs of every instructor or student.
7. **ClassDojo:** ClassDojo is a digital classroom management application that aims to assist teachers in improving student behaviour and communicating with parents more effectively. Teachers define goals or behaviours to track, such as turning in homework, participating in class, or staying on target, for each student, who can personalise their avatar. Throughout the school day, teachers can utilise a smartphone, tablet, or computer to award or deduct points. A smart board can display each student's score, and teachers can compile reports to send home to parents. ClassDojo reported this spring that its software was being utilised by two million teachers and thirty million students in 180 countries.
8. **eduClipper:** eduClipper is a fantastic tool for curating. It assists educators and students in creating, organising, and preserving educational collections. The online design is similar to that of social networking sites such as Pinterest, Scoopit, and others, but the best thing about EduClipper is that it was built specifically for educational purposes. It primarily targets teachers and assists them in making students' learning more effective.
9. **Storybird:** Storybird is a programme that uses storytelling to help kids improve their writing and reading skills. Teachers can use this application to produce interactive and beautiful books online using a simple and user-friendly interface. Among other things, the articles created can be incorporated in blogs, emailed, and printed. Teachers can also use Storybird to collaborate on projects with students, provide constant feedback, and manage lessons and grades.

10. **Kahoot:** Kahoots are engaging, interactive games that allow students to practise English and improve their language skills. Music and pictures are used in Kahoots to engage young students and make learning fun and pleasant. Kahoots can be used as challenges for solitary study or played in player-vs-player or team-vs-team settings. They work on desktop computers, tablets, and cellphones, giving teachers the freedom to use them in online classes, face-to-face classrooms, or at home.
11. **FUSE:** FUSE is a teaching materials and educational resources content collection. It includes standard text, multimedia, video, and interactive elements. Educators nominate and assess all materials, which are then categorised by audience, senior secondary, and early childhood curricular frameworks.
12. **Collaborative learning environments:** Through services that can be accessed on Windows, Apple, Android, and ChromeBooks, Google Apps for Education and Microsoft Office 365 online services give schools with access to modern digital teaching resources and support for BYOD. Outlook for students, One Drive, Office, PowerPoint, OneNote, Excel, Teams, Forms, and Sway are all part of Office 365. Gmail for students, Drive, Google Suite (docs/sheets/slides/calendar), Google Classroom, Forms, and Hangouts are all part of Google Apps.
13. **Educreations:** Educreations is an alternative to Explain Everything as an interactive whiteboard and screencasting application. It is Suitable for educators and upper-class students. Educreations allows you to teach and learn from anywhere by allowing you to explain any idea in an interactive digital environment. By repeating their work and enabling them to study at their own speed, the app allows you to approach each student individually. Here's a video that contrasts Educreations with Explain Everything that we think you'll enjoy:
14. **ClickView**: ClickView is a collection of thousands of interactive movies and related tools that help students and teachers learn and teach in a variety of subjects. Professionally produced videos are obtained from free-to-air and pay-tv programmes or created in Melbourne studios. Teachers may give personalised learning activities to students and observe and assess their replies using ClickView content.
15. **Stile:** Stile offers a variety of Science modules that include content delivery, formative and summative assessment, experiments, projects, classroom activities, and STEM job profiles. Every unit of study is framed in the context of real-world science discoveries and events, emphasising the relevance of the material to pupils. Every lesson may be totally customised, allowing teachers to adjust material and questions to their school's curriculum or individual students' requirements. If teachers want to be very creative, they can even develop their own Stile classes.
16. **Sibelius:** Sibelius is a music notation tool for composition, orchestration, and workshop design. Music professors that use Sibelius in their courses may show music theory and composition topics to their students, and students can compose their own pieces of music while learning these concepts. This programme is very useful for studying and teaching music.
17. **Wolfram Mathematica, SystemModeler, Programming Lab and Alpha:** Wolfram software is strong learning tools that are internationally recognised, industry standard, and can be utilised throughout STEM with applications in calculation, problem modelling, coding, and more. This programme is very useful for math, science, technology, and critical and creative thinking learning and teaching.
18. **Lynda.com:** Lynda.com is an online learning platform that offers 24/7 access to a library of over 209,200 "how to" videos in three categories: business, creativity, and technology skills. In addition, Lynda.com offers 5,700 professional learning courses and twelve Learning Paths to help teachers and students improve their knowledge and abilities. Teachers and students may use Lynda.com to learn how to utilise software such as Office, Adobe, Google, Sibelius, Python, WordPress, and Evernote on demand.
19. **Boardmaker Online:** Boardmaker Online is a multi-tiered approach to developing engaging print and interactive resources for special education. With easy-to-use improved capabilities, extend learning by tailoring curriculum to the particular requirements of learners. Make print exercises interactive on smart boards, laptops, tablets, other communication devices to increase participation.
20. **Comic Life**: Comic Life may be used to create comics and storyboards in a variety of Learning Areas. This programme is also useful for studying and teaching in the areas of the arts, technology, and critical and creative thinking.
21. **Prezi:** Prezi is a digital presentation tool that allows you to create interactive presentations. According to their research, Prezi's revolutionary approach of helping you prepare presentations - by zooming – results in more effective, convincing, effective, and interesting presentations than PowerPoint presentations. If you're still unsure about what the programme can achieve, we

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strongly advise you to try it out and show it to your pupils. Who knows, maybe this is one of the digital classroom tools that may help you maintain the students' interest.

22. **Crowdmark:** Crowdmark is a Blackboard-based assessment application that allows students to submit handwritten work as PDFs or picture files for evaluation.
23. **Xerte:** Xerte is an online learning resource creation platform that allows you to build interesting and accessible online learning resources. Text, interactive features, and multimedia can all be used. You may embed or link to the materials you create in Blackboard, or distribute them elsewhere online.

Conclusion

Teachers can help students learn more effectively by creating an interactive and collaborative learning environment. Although today's social networks provide an excellent interactive learning environment, there is still a need for an interactive online tool that is solely focused on education. We have included information on the greatest platforms for students and instructors to discover, exchange, and create educational resources and materials in this post.

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Phygital approach to education

Sumathi, D.
Assistant Professor, School of Education, Tamilnadu Open University, Chennai

Angelin Devakumari, J.
Research Scholar, School of Education, Tamilnadu Open University, Chennai

Introduction

Phygital approach is the blend of physical and digital mode of education. It employs resources of online and offline in a balanced way. With the rapid growth in internet and digital technologies, it is found out that a new integrated approach is need of the hour. By integration it means employing the use of digital online resources and use of the offline mode of education in a balanced way thereby creating a new ecosystem. Both the physical content and the digital context is employed in an optimal way to enhance learning process. Through Phygital approach students get exposed to digital content and hence they have wide exposure to online world and to new e-contents.

Digital education in India

With wide spread in the online technologies, internet and ICT technologies, it is evident there is tremendous growth in the new age technologies particularly digital technologies. Several private and government have taken huge initiatives to promote and disseminate digital education in India. Government of India has taken the following list of digital initiatives to promote online education, viz: PMevidhya, DIKSHA, NISHTA, Vidyadaan, MOOCs on DIKSHA, Swayam Prabha DTH TV Channels, on air radio broadcasting, National digital Education Architecture, E-Pathshala, Swayam, DIVYANG,etc... (India report digital education, 2021).

Reviews on Phygital education

Phygital mode of education is very recently evolved. Screen-based interactive devices stand as effective supports for playful experience in learning processes for kids with special educational needs. (G.Goretti Et.Al., 2020). A.A. Mihail. Et.al., (2021) examines the peculiarities of interaction between consumers and sellers in the framework of their interaction in the phygital environment. 'Phygital' or physical plus digital, is a combination of a physical circumstances or tangible objects and digital or online technology-driven. Quigley, D. (2016).

Origin of phygital

The interaction of the customers and retail market lead to the evolution of a new environment called phygital. This blend of online and offline was first evolved in marketing where in the customers are interacted physically and digitally via online in selling a product. The first such integration was done by Japanese company in 2004. Later this thought was applied to the field of education where in the learners are exposed to online and offline content and instruction.

Advantages of Phygital education

Following are the advantages of phygital education:

- Promotes integration of online and offline
- Solves the problem of digital divide
- Provides scope for online education in offline environment.
- Provides way for digital exposure of students to e-content

Process of Phygital education

The process of phygital education is given under the following eight steps by

1. *Connection:* It is the provision of internet connectivity for the exposure to online platform. Students get access to e-resources.
2. *Captivation:* It is students are engaged in online activity and the follow up is given in the usual offline classroom.
3. *Contexts:* It refers to the learning situation of a particular concept or a theme employing both online and offline mode.
4. *Contents:* It is the digital contents that are designed by the teacher and posted for students' usage. The contents should be both useful in a lucid and easily understandable way.

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5. *Communication:* It is the proper advice and feedback received from the teachers which helps them to learn employing online and offline contents.
6. *Collaboration:* It is the collaboration of the part of the instructor, students and e-contents.
7. *Consistency:* It is the continuous efforts taken by the teacher to provide facility for online and offline.
8. *Competency:* The final outcome of the Phygital environment is development of competency on the part of the learners.

Modes of Phygital approach to Education

Phygital approach to education has been incorporated in varying degree of integration. According it could be:

1. *Long term approach:* In the long term approach to phygital environment, integration is made for a long period of time. The entire course is conducted with the blend of online and approaches. Students find equal share of their time in online and in offline learning.
2. *Medium term approach:* On contrary to long term approach, in medium term approach online and offline is blended only to a particular period of time in the course. The students' share of time in online is relatively lesser than the offline.

Phygital approach and learning styles

Phygital approach encompasses to different learning styles of the learners. Through this all types of students needs namely visual, auditory and kinesthetic learners are met out. The e-content employing audio- visual, simulation, animation etc… helps to enhance learning.

Phygital approach and Classroom climate

In a Traditional classroom where in teacher and student interaction is always well pronounced. Whereas in a Phygital classroom climate is in two stages, namely: In stage one the interaction is between teacher and student in offline mode. It is equivalent to traditional mode classroom climate. In stage two the interaction is online i.e. between teacher students and in online environment. Through online the interaction could be done with another teacher or expert in a distant. By this interaction is two folded while using the combination of online and offline environment.

Phygital approach and Pedagogy

Pedagogy in phygital approach is totally new and it is a combination of student centered, teacher centered and technology mediated methods. In a traditional offline classroom, students are engaged by teacher using any one teaching learning method. But in a phygital classroom, a combination of methods are employed where in more than one method is employed at the same time. Like while handling a class in phygital way, technology in the form of computer assisted instruction or computer managed instruction is employed and teacher extends the class using lecture or demonstration method. Thus combinations of methods have to be employed in the phygital approach each time and in which Computer managed instruction is mandatory.

Future of Phygital approach

After the Covid-19, the entire educational system was shifted from traditional offline to online system. This has lead to the emergence of phygital mode of learning. Several institutions have adopted to use both offline and online mode of education. Sometimes when there is lock down institutions are forced towards online. This has lead to a blended approach towards education. Already in the present several institutions are using the combination of online and offline mode of teaching. Thus in the future phygital approach will become the new normal in the education at least at the higher education level.

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Digital learning in higher education

Saravanan, D. P.
Assistant Professor, Department of Educational Planning and Administration, Tamilnadu Teachers Education University, Chennai

Introduction

Virtual mastering additionally known as digital learning. The use of digital surroundings has now come to be very famous amongst pupil communities and quite a number social groups. Presently range of faculties and universities focusing on digital studying that makes college students pastime take part in on-line digital gaining knowledge of process. As a result, it makes convenient get right of entry to greater education. Students analyze at their personal tempo and maintain them in the remedy zone, the place they can enhance themselves at their own. Virtual gaining knowledge of help actual time experiences via sharing information's, methods, documents, records, and so on. Online structures enable them to actively interact in digital environments. Recent lookup suggests that digital gaining knowledge of has created high quality adjustments in mastering any idea in greater education. Hence it is vital to put into effect digital mastering in all throughout the greater schooling as quickly as possible. The essential goal of introducing digital gaining knowledge of is to supply get entry to faraway mastering environments for college students these who have now not in a position to get right of entry to to their group and excessive exceptional of education.

Types of e- learning

1. Computer primarily based digital learning- guidance furnished by using an academic software program mounted on a computer, the place personalized learn about fabric furnished for the particular wants of the students
2. Internet based–it is the extension of laptop primarily based digital learning. Here the coaching furnished by way of the software program and delivered via net and students get this via login with their password and username.
3. Instruction with the aid of faraway teacher- there is no bodily presence of teacher. Instead, instructor interacts with their college students thru videos, chats, and voice, for this reason many on line mastering purposes available, in which college students interacts with their instructor as they have been in the classroom.
4. Blended learning- the mixture of above cited mastering with usual strategies of school room educating make it special and extra powerful

Benefits

The college students and instructors get maximum advantages out of digital studying as follows

1. Interaction between pupil to instructor and pupil to pupil are stay and superb engagement for the duration of the session.
2. Students studying ride better by means of giving extra examples handy online.
3. They can get their personalized curriculum in accordance to the pupil gaining knowledge of pace, ability, and, interest, which cater man or woman desires of pupils
4. Feedback from trainer can actively be given immediately
5. Since it is on line type it can be recorded and given to college students these who are absent for that precise day.
6. Task come to be handy for trainer by way of getting laptop assisted Curriculum design. So that time saved and convenient to whole the curriculum inside the stipulated timeframe.
7. It is an handy venture for dad and mom to reveal their youngsters with the aid of getting direct and stay proof from the teacher

Advantages

1. Affordability- many universities provide an on-line direction at inexpensive fee so that can study from somewhere
2. Accessibility- even college students from a faraway place can without problems get admission to their on line lessons by means of net and additionally it has emerge as easy for disabled students, due to the fact there is no want for bodily presence in the classroom
3. Flexibility–students can time table their learn about sketch in accordance to their bendy time. Students can set their intention according to their herbal ability.
4. Management- It has turn out to be easy in phrases of administrative work and pupil performance

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Challenges

1. Motivation is an necessary aspect, as there is no bodily presence of teacher, college students may get deviation from their attention. It is hard to screen every scholar whether or not they are psychologically prepared to learn.
2. It is challenging to categorical their talent except specific equipment
3. Investment is a large hassle for economically terrible institutions.
4. Communication grow to be difficult if fallacious net velocity encountered

Major Steps to be taken by way of instructors

1. Legal safety need to be taken care of by way of strictly following copyright act. Students and instructors communities must be conscious of copying different reproduction proper reserved find out about materials, otherwise they will be subjected to copyright act. (Dziennik ustaw, 2000,n.80, item904 with amendments).
2. Instructor has to improve them to the state-of-the-art technology. Since a variety of modern day applied sciences rising on digital learning, it is obligatory that each trainer need to improve them by means of taking digital coaching programs.
3. Proper records must be given to all college students whilst conducting Webinar's (synchronous learning) and lecture seize (asynchronous learning). Prior to educating and whilst teaching, an trainer need to inform doe's and don'ts concerning everyday technical operation, so that college students can conscious of technical troubles which they come across in their session.
4. Personal protection ought to be maintained with the aid of giving a password. Every scholar need to be given special username and password, so that safety hassle can be averted and included private information, in which others can no longer intervene and steal information's.
5. Instructor need to display their college students and get remarks from college students after completion of every digital class. There is a chance of hazard that college students now not listening to their instructor, in order to keep away from this scenario periodical examination is critical that will alert the college students all through the session.

Conclusion

Virtual gaining knowledge of brings a new dimension to the tutorial education. In this present day generation college students availing get right of entry to to the slicing aspect technological know-how with regard to digital learning, that allow them to pursue a number of new on line publications at their disposal. It provides a fairly state-of-the-art and handy way of getting to know at somewhere any time. Many younger humans think about e- studying as alluring and modern-day way of gaining knowledge of in which they are attractive toward mastering process. Hence, eventhough normal strategies are being given importance, the e-learning additionally ought to be given greater priority, so that we can keep away from dropouts in greater education. The blended way of method carry trade the way students examine and overcome all academic boundaries

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Innovative teaching strategies

Sumathi, D.
Assistant Professor, School of Education, Tamil Nadu Open University, Saidapet, Chennai

Shyla Gnanam Ebenezer, J.
Ph.D. Scholar, School of Education, Tamil Nadu Open University, Saidapet, Chennai

Introduction

Learning must not be boredom or difficult task for students instead it should be fun filled and interesting one. So innovative teaching strategies must be followed by the mentors so that learners use technology, manipulatives and modern methods. Priority should be given for learning over performance. Lessons should be taught with spaced practice. Formative and diagnostic assessments have to be kept continuously to ensure understanding. The knowledge gap in students must be identified and filled. Open ended questions have to be given to students to foster creativity and all the technological advancements must be introduced to students to update their knowledge and skills. In this regard this paper tries to present some of the latest strategies that are introduced in the teaching learning process.A new method of teaching and learning is needed to enhance the students' active participation, perception, comprehension and cognitive development. Blended learning or phygital learning is a combination of classroom learning with mobile learning and online learning to provide a unique interactive experience for learners. Embodied learning on the other hand aims that mind and body work together to bring physical feedback and actions to reinforce the learning process. Argumentation helps students to encounter with contrasting ideas, which in turn deepen their learning. Problem based learning, competency based learning, thinking based learning are all possible with the help of innovative teaching strategies. Some of the innovative teaching strategies are outlined.

Educational Technology and Innovative teaching strategies

Educational technology not only gives access to information anytime and anywhere but also provides the students with fun filled opportunities to practice what they have learnt. Thus students are more engaged and able to collaborate easily. It gives an inclusive atmosphere to students and learning materials can be differentiated according to the needs of the individual student. Technology enhances the creativity and productivity of each student. Automation is another boon of technology where teachers upload lessons and assignments intoLMS Learning Management System). Assessments and grading are easy. Parents also receive immediate feedback and receive messages instantly. Projectors, smart boards, smart tables are few of the best gifts of technology. Live online classes, group discussions, and debates, interactive sessions, recording screen and videos by different tools are all the results of innovative technology.

1. **Flipped Classrooms:** It is an innovative instructional strategy where students do prior reading of the learning materials and contents at home and come to the class and clarify doubts, do more practice and work on live problem solving. Thus classrooms provide the students with an active learning environment and students learn at their own pace. Crossover learning is also possible by this method.
2. **Project Based Learning:** In this method, students work for an extended period to gain knowledge. They investigate complex questions, problems and challenges. It enhances the students' research skill. It is a kind of dynamic classroom approach in which students actively explore real world problems. Each student has different approach to the same problem and thus results in innovative thinking.
3. **Inquiry Based Learning:** Here students explore with high level questions and make real world connections based on problem solving and experiential learning. Students are encouraged to come up with solutions for the questions. It is a student cantered approach and needs critical and creative thinking. It develops passion, motivation, questioning skillsand research skills. The teacher is a leader and facilitator. Students design investigations, interpret the results, find out explanations and come out with findings and solutions.
4. **QR- Codes:** QR Codes hold the URLs of online applications and saves logging time. Students have access to the appropriate study materials. QR Codes are being used for each lesson or a concept taught in the class by the teachers and they are printed on each text book and with the help of the mobile phone, students are provided with the supportive information of the subject. All the e-resources (videos, multimedia, texts etc.) are easily accessible for learning.
5. **Educational apps and software:** Educational apps are a piece of mobile software designed to help students learn by themselves. Apart from teaching, educational apps help the teacher in grading and organising the students and tracking their progress. Apps always give another approach to a subject. A good educational app should achieve the learning goals and must be designed according to the

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pedagogy of the learner. It should meet the learners' needs and give a personalised learning experience. Some of the widely used educational tools are Google play books, tools in Khan Academy, My script calculator 2, Quizlet etc. Some of the most popularly used educational apps are Google Classroom, Toca life world, Duolingo, Brainly, Zoom, YouTube, Google meet, Microsoft Teams etc.Educational software areComputer software used for educational purposes. They make teaching more effective, pleasant, interactive, efficient and engage students in learning and enhances communication. Educators upload and organise course materials and make lesson plans. Canvas, Preply, Latent LMS, power school SIS, Gradelink, Dyknow, Schoology are some of the educational software available on the market.

6. **Creative teaching:** Creative teaching uses pedagogy as its foundation. By providing autonomy and accepting environment, giving positive feedback on students' creativity and ideas a teacher can be creative in her/his teaching. Thus it motivates students and enhances critical thinking, communication and collaboration.
7. **Interdisciplinary teaching:** Interdisciplinary approach involves two or more academic disciplines to address important problems. It includes a wide range of problem solving techniques, strategies and methods to bring a solution. Combining multiple disciplines needs in-depth subject knowledge, and collaborating skills on part of the instructors.
8. **Brainstorming:** It is a strategy where specific problems are analysed and spontaneous new ideas are collected and productive conclusions are made. Brain Writing, Rapid Ideation, and Mind Mapping are some of the brain storming techniques. It encourages student collaboration and generates innovative ideas.
9. **Virtual teaching and augmented reality:** A well planned virtual sessions and augmented reality classes make teaching more interesting and interactive. Online video forums, instant messaging andreal time video streaming gives virtual experiences to students and thus aids educators and students engage with each other. Setting guidelines, creating agendas, careful scheduling, engaging everyone and making casual chats are the basic steps to have a successful virtual learning. Augmented reality helps students grasp abstract concepts. Some of the augmented reality apps are Animal Safari AR, Adobe Aero, Complete Anatomy 2021, Jigspace etc.AR can make education more inspiring, offer experiential learning, promote collaborative learning and even theories can be implemented.
10. **Gamification:** It is an innovative learning strategy where educational contents are converted into videogames which gives enjoyment and interest while learning. It creates playful environment, competition and addiction among the learners. It also gives real time feedback which boosts up the learners. Jigsaw puzzles improve mental speed. Some of the best websites for free jigsaw puzzles are Jigidi, Jigsaw Planet, Crazy4jigsaws, zigzone etc.
11. **Differentiated Instruction:** It is a most effective teaching strategy which involves the differentiation of the learning materials or the contents by proactively planning. The process of learning and the methods of evaluation is also differentiated according to the interest, abilities and aptitude of the learners to achieve unique and personalised learning experience. It is a way of tailoring the lessons according to the students' readiness, interest, need, aptitude and motivation level. Giving meaningful task, making flexible grouping, assessing the students' performance continuously are few of the basic principles of differentiated instruction.
12. **Teaching for social and emotional learning:** Students not only need good teaching and technological support to learn well but also a good school climate, sense of belonging, an inclusive environment and a positive emotional support from peers and teachers. This helps students achieve more and help them face hurdles with ease.
13. **Remote Assessment Strategies:** Students write exams, tests and assessments with their own laptops or computers from their home. Students are assessed entirely online. Synchronous formative assessments, gamified assessments, interactive presentations with assessments, asynchronous remote assessments are some of the strategies for assessing students remotely.
14. **Vocational Teaching:** This is otherwise known as Career and Technical Education (CTE). They are vocational courses and help students develop academic skills and employability skills. Students are taught and equipped with technical and career specific skills. Some of the best vocational courses are Audio or electrical technician, game designing, foreign language expert, digital marketing, animation, graphics and multimedia, fashion designing, business processing and data analytics, artificial intelligence, robotics etc.
15. **Deep Technology Teaching:** It is based on engineering, innovations, and advanced scientific discoveries by intellectual properties and teaching which results in applicable technological solutions to problems in the society. Digital teaching platforms (DTPs) and using simulations in teaching, robotics, drones, blockchain, artificial intelligence (AI), photonics, photo voltaic panels, DNA based medicines and biotechnology are all results of the deep technology learning.Lexplore uses AI and assess the reading level of children in 3minuites. Smart homes smart cities, aggrotech, edtech…and the impact of deep tech learning are innumerable. To develop deep technologyteaching skills educators

must be equipped with skillsand update their knowledge in latest technological advancements and use them in their teaching. They must be given institutional support, technological training and coaching periodically as they infuse technology.

16. **Digital Teaching Curriculum:** Digitization force and transform our educators to become tech savvy. It is acquiring information from multiple sources and requires functional and critical digital skills and knowledge.Digital literacy and digital based reading are the basis for the digital literacy curriculum. It leads to paperless society and library as it is assisted by primary, secondary and tertiary e- resources like e-books, e-library, e- University, e- schooling etc. Thus digital literacy curriculum prepares the future students.
17. **Nano Teaching:** Nano teaching delivers modules within two minutes and focus on teaching one skill with the learning objective. It is laser-focused and learning objectives are quickly achieved. The modules are short and targeted towards specific learning goals. Thus helping the learner choose exactly what they need to learn. Students are 'Digi natives" now a days. So Nano teaching brings new possibilities in the field of teacher education.
18. **Online Schooling:** Online learning is the most effective ways to impart education especially during the lockdown due to pandemic. The impact of the covid-19 was so strong that online education became an essential element in the department of education, because the physical interactions of teachers with students have become difficult. The schools and educational institutions were forced to move to online mode to resume their mission. So there was a tremendous rise of e-learning and teaching. Teaching is done remotely on digital platforms instead of physical classrooms. Teachers made sure that students were not affected in their learning. This resulted in the active involvement of students through online learning.
19. **Using 3D Modeling and Printers:** They can bring all the educational concepts and subjects into life. In biology organs can be printed, in history artefacts, in architecture3D models can be printed. It gives hands on experience, empower creativity, design thinking, and real world understanding.
20. **Blockchain In Grading:** Grading can be done entirely by Blockchain technology and teachers get more time to do other academic activities. Scores can be stored securely on the blockchain. It is cost effective in storing the files such as certificates and student credentials.

Benefits of innovative teaching strategy

Teaching must be learner centred, enjoyable, less time consuming and build new knowledge and creative thinking. To achieve this, the objectives, curriculum contents, teaching methodology and evaluation must be modified and differentiated according to the modern trends in education and pedagogy of the future generation. Teaching must be innovative and effective to ablaze the monotony in the learning process. Latest technological skills must be imparted to students. To ensure critical and creative thinking among students and give appropriate learning experiences to students, innovative teaching strategies play an important and vital role.

Conclusion

Innovative teaching strategies are the need of an hour as educators need to prepare students for the future. A constructivist approach demands mentors adapt and equip themselves first so that they can mend the present tech-savvy students to cope up with the future modern world. Innovative teaching strategies are the only way to meet the requirements of the today's learners in maintaining interest in learning.

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A strategy for regulating the immersive learning environment in the classroom to revolutionize the learning process

Usha Nandhini, R.
Research Scholar, Faculty of Education, Dr. M.G.R. Educational and Research Institute

Senthamizh Pavai, R.
Research Supervisor, Faculty of Education, Dr. M.G.R. Educational and Research Institute

Introduction

The present scenario in the field of education is propelled by innovative technologies which cause greater distractions than ever among the learners. These distractions cause adverse effects in the process of learning. So, how are we going to diminish those distractions and make the learners study effectively? Implementing Immersive learning is the only solution for this scenario. Immersive learning gives sensible settings wherein learners can take part in circumstances and simulations. Immersive environments are created with synthetic stimuli which include sounds and snapshots that make learners sense bodily gifts within side the digital world. The following are the techniques of immersive learning: Augmented Reality (AR) and Virtual Reality (VR). Augmented Reality augments a real-international environment right into a user's tool and complements fact through incorporating virtual features. Virtual Realitycreates virtual simulations in a headset, permitting learners to be immersed in a digital environment.

Immersive learning permits inexperienced persons to govern the effects through connecting them with actual experiences in a secure. It allows learners surrounding to improve their engagement in learning and boost their level of motivation towards learning to meet the global standards. Another exciting feature is that it has interactive surroundings for learners which look real physically. By this means, we could recreate numerous physical environments that cannot be accessed inside the four walls of a classroom. The digital content material is so stimulating and it leaves a massive influence on the psyche of a learner.

Three phases of Immersive Learning: Exploration, Creation, and Sharing:

Figure 1: Three Phases of Immersive Learning Experience

1. **Exploration** of actual locations and conditions offers us wings via time and distance. This is the destiny of long-distance area journeys, no fundraising had to revel in overseas cultures or historical cities. Virtual area journeys can be realistic of any difficulty within side the curriculum giving learners an appropriate experience in complex studies.
2. **Creation** is one of the holistic methods in the aspect of immersive learning which practices 4 C's: Critical thinking, Communication, Creativity, and Collaboration.
3. **Sharing** connects with sympathy, and how the presence of the creator through their voice affects how the watcher or audience gets the story.

Five major points of Immersive Learning:

1. Immersive learning in school advances associations with this present reality through investigation, creation, and sharing.
2. On the worldwide level, vivid learning can intervene a context-oriented encounter of any subject of the review and this way increment understudy commitment.
3. On the local level, it can help construct and envision associations between time, spot, and individuals.
4. On the cluster level, it can assist with creating decisive reasoning, correspondence, innovativeness, and collaboration through vivid narrating.
5. On the distinct level, it can help communicate and share individual encounters, and build compassion.

How immersive learning will revolutionize education?

Advances in technology and generation changes, immersive learning becomes an easily adaptable technique in the teaching-learning process. It can be adopted in traditional classroom settings. It promotes the global standard of learning where the learners can view the surroundings which are far from. It also promotes problem-solving critical thinking skills etc. It covers a wide range of topics. Example: functioning of heavy machinery, flight simulators. Some of the features of immersive learning are as follows:

1. ***Better Knowledge Retention:*** Gaining and retention of knowledge become greater as compared to the traditional classroom setting. Based on the study conducted in 2020, the level of retention in listening to traditional lectures was only between 5% to 10% and at the same time non-conventional way via immersive learning technique with the highpoint of 75%. Hence it is proven that this form of learning is more functional and the retention exceeds more than 90%.
2. ***Increased Motivation:*** It is joyful learning. With the help of technology, teachers can create exciting things for learning and it promotes motivation towards learning which in turn learners volunteer themselves for all other activities.
3. ***Distraction-free World:*** As this methodology of learning creates an exciting environment and gives motivation to the learner, there is no place for distractions in learning. Learners get immersed in the learning process effectively.

Implementing Immersive Learning:

Immersive learning can be used in any learning situation. The following are some of the ways it can be utilized:

1. ***Virtual field trips:*** Geographic location, safety, and budgetary constraints save you precise environments and ideas from being explored with virtual field trips using Virtual Reality. However, the capability to accomplish that with Virtual Reality opens up an entirely new comprehensive way of gaining knowledge and promoting opportunities to the learners. It can assist the learners to recognize complicated topics.
2. ***Vocational and life-skills training:*** It offers virtual reality courses in a variety of fields, including welding, nursing, culinary arts, drone piloting, and many others. They also provide training in areas such as washing, scheduling, and other life skills.
3. ***Courses in astronomy:*** Some sciences, such as astronomy, are difficult to grasp since the information is abstract. Virtual reality, augmented reality, and other kinds of immersive learning, on the other hand, can assist students in better understanding abstract and dynamic issues.
4. ***History lessons:*** Students can learn about historical events and places all over the world through immersive learning. Teachers can design classes that transport pupils back in time so they can learn more about historical topics.
5. ***Education for students with special needs:***It provides them with more confidence in their communication and interviewing skills.
6. ***Education in the Future:*** Immersive learning is a terrific way for people of all ages and levels of expertise to learn new skills. Because of technological improvements such as cheaper Virtual Reality equipment and improved mobile technology, immersive technologies are becoming increasingly common.

These advancements allow educators to exploit the power of immersive learning, and learners to study without limits and achieve their full potential. Immersive learning can improve learning effect and engagement while also providing a superb learning experience.

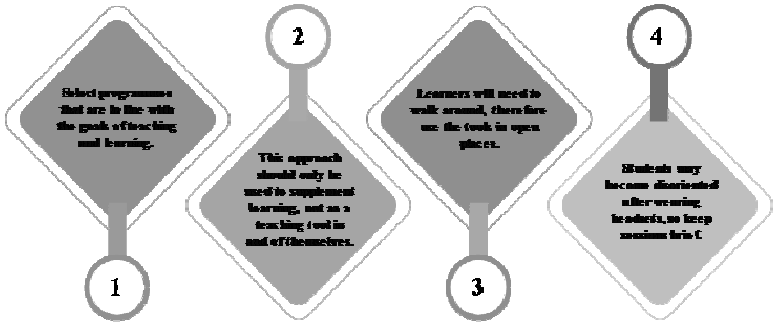

Figure 2: Points to be kept in mind while implementing these immersive learning tools in the classroom

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Benefits of Immersive Learning:

Teachers can use immersive learning tactics to encourage students to participate in a technology-assisted active learning process that allows them to: Explore and alter items and their environment to obtain knowledge

1. They are free to learn at their own pace and learners will be able to better understand abstract concepts and their connections if you provide them with context.
2. Develop skills and apply what they learned to solve difficult real-world challenges and settings.
3. Make a safe and controlled learning environment where students can make mistakes and learn from them.
4. Facilitate the development of skills in collaboration and teamwork.

Types of Immersive Learning:

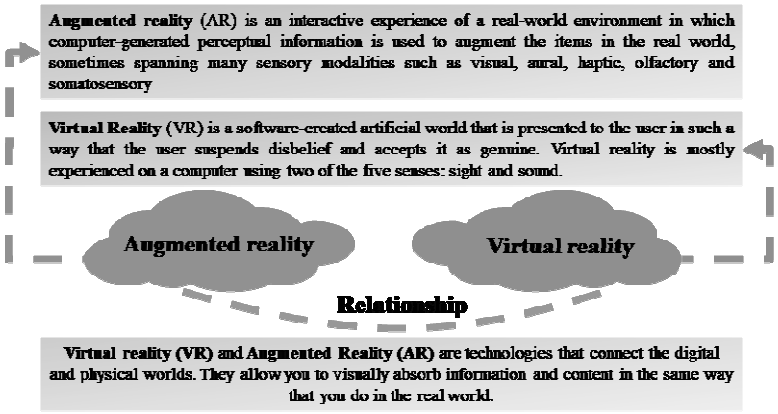

Figure 3: Types of Immersive Learning & Relationship

The Importance of Virtual and Augmented Reality in Education

Traditional teaching approaches are being changed at educational institutions all around the world. The key defining features of this revolution are virtual reality and augmented reality. Teachers' and students' learning styles have shifted as a result of virtual reality and augmented reality. Even though EdTech is a forerunner of a myriad of technologies, little has changed in terms of the basic technologies that are used; nonetheless, Virtual and Augmented Reality are the key path breakers in rethinking the role of technology in the education business. The most appealing component of incorporating AR/VR into educational technology is the broad scope it covers. AR/VR is not restricted to a specific age range. Experiential learning is the most effective form of learning; it may be inferred. By offering schools interesting and growing comprehensive immersive learning experiences that will be managed across the classroom, AR and VR foster a proprioceptive mode of learning. These technologies have the potential to transform classroom learning while also making it more participatory and enjoyable. Let's look at how AR and VR vary from one other now that we've established that they're altering the educational landscape.

Influence of Augmented Reality in Education

Augmented Reality takes advantage of the natural world around it and overlays movement or any form of data on top of it. It strengthens the truth. The most significant advantage of Augmented Reality application development is that it does not necessitate the use of a dedicated display device. Innovation has been the standard favourite in the current technology revolution as a result of these benefits. Words frequently fall short of capturing the essence of a scene. This is something that augmented reality can help you with. Rather than just reading a section, it will become increasingly possible to visualize the subject. It aids pupils in gaining a better grasp and insight into the theme. Similarly, Augmented Reality keeps students excited and interested in new learning by providing intelligent experiences. One of the most notable advantages of Augmented Reality in Learning and Development is that it does not necessitate any financial concerns or equipment investments. We may use our phones or tablets to experience Augmented Reality.

Influence of Virtual Reality in Education

Virtual Reality is an entirely man-made environment. To put it another way, to create a VR application, we must first create a setting and then develop an activity around it. Contrary to its name, Virtual Reality appears to be far more genuine than Augmented Reality, although it does have the disadvantage of requiring a dedicated VR headgear to operate any program.

Augmented Reality has the potential to dramatically transform the world of training. VR will be used in training from the initial assessment through the end of school. Understudies can see the vivid substance of any subject using virtual reality headsets.

Furthermore, a 360-degree view of any substance gives students a more practical feel as they experience it for themselves as part of the virtual environment. Collaboration with VR material also motivates people to go further into the issue. When kids are overly engrossed in the virtual world, they are unable to be engaged in the current reality. It also enhances their ability to concentrate and their attention span.With the use of sensors, VR provides students with a whole tactile experience in which they may for all intents and purposes touch, see, and hear the functional information at the same time.

Augmented Reality and Virtual Reality Benefits for Learners:

These technologies have a lot of advantages for pupils. Let's have a look at a few of the most intriguing:

1. *Collaboration and teamwork are now more important than ever:* AR and VR, not only aid in enhancing collaboration between the teacher and the student, but they also aid in improving joint effort among students and maintaining cooperation.
2. *Concepts are better understood:* Learners can better understand dynamic themes using augmented reality and virtual reality, which is impossible to do with traditional teaching methods. Students can gain a 360-degree view of topics.
3. *Learning can be made more fun by using games:* Gamification of learning new concepts is one of these advances, which makes the process more enjoyable and intelligent. Virtual content is extremely appealing to students of all ages, and as a result, they are constantly occupied with it.
4. *Learning Without Interruptions:* AR and VR allow students to learn the subject matter in a distraction-free environment, resulting in improved understanding and recall.
5. *Learning through Proprioception:* Because these developments are accompanied by insightful learning content, students may be exposed to events taking place around them. Proprioceptive learning is a type of learning that improves long-term memory.

Examples of Augmented Reality and Virtual Reality:

1. Augmented reality is being used to bring science concepts to life. We can now use augmented reality to create a tornado and then bring it into the classroom, giving pupils a close look at these devastating storms. Students can also take an augmented reality tour of a beehive to learn about the inner workings of the hive and how the bees work together to benefit the community.
2. Students can use the SkyView app to apply AR overlays of the night sky to explore the universe. By pointing their mobile device upward, anyone may use SkyView to identify stars, constellations, planets, and even satellites.
3. Students can now study a frog's internal organs using the Froggipedia app's augmented reality technology to dissect frogs in biology class to learn about animal internal organs. That operation was unpleasant to us when we do it in real-time.
4. Microsoft HoloLens allows medical students and professionals to learn about the human body through mixed reality. Students can study not only anatomy but also how to heal many medical ailments by going into the human body, flowing through the bloodstream, isolating, enlarging, and even flowing through the bloodstream.
5. Immersive VR Education's 1943 Berlin Blitz in 360°, made for the BBC, uses real-life footage from a Nazi Germany night-time bombing to assist students understand what it was like to go through a major historical event.
6. While most teachers won't be able to take their students to Mount Everest's Base Camp or the Louvre, Google Expeditions' series of highly immersive school trips will allow them to do both.
7. If you've ever wished you could practise a speech in front of a virtual audience before giving a live performance, you can now do so by donning virtual reality goggles. VirtualSpeech helps you improve your public speaking skills by providing immersive, realistic virtual reality simulations.
8. The VR Museum of Fine Art on Steam lets players to get up close and personal with world-class paintings and sculptures, including the Mona Lisa, without having to battle crowds or see through protective glass.
9. To make the streets safer for both civilians and police officers, virtual reality is now being used to train cops on how to deal with riots and arrest people in specific situations.
10. While reading books might make learning languages seem very theoretical, virtual reality educational software companies like Mondly can deliver an immersive language-learning experience without the need to travel to another country. In Mondly's VR settings, you can have realistic conversations with real people, making your language learning more effective and likely to stick.

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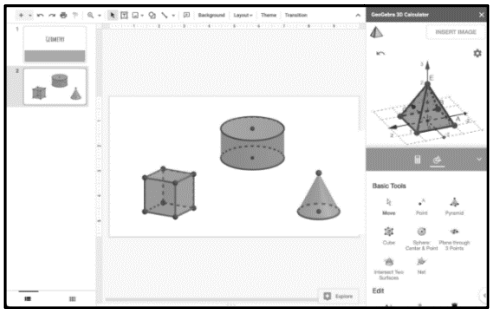
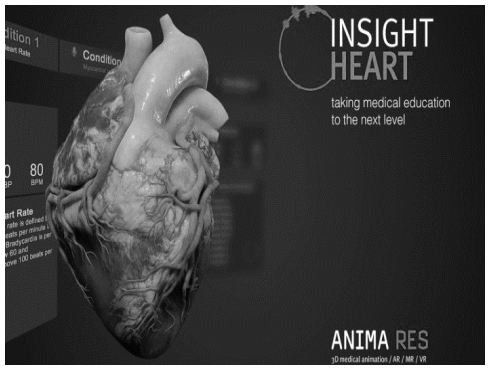
Some of the Open Source Software's to Create AR and VR:

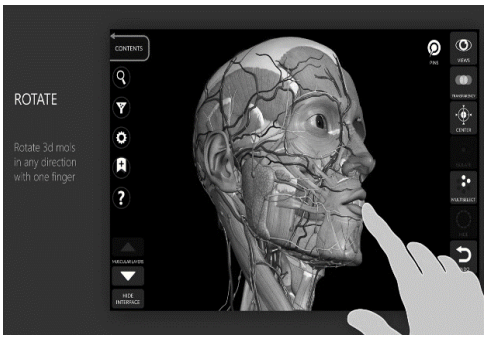
1. **ARToolKit+:** It is an open-source augmented reality software that aids in the resolution of core augmented reality issues such as geometric and photometric registration. The ARToolkit+ is a set of software tools that give users outstanding outcomes. This open-source augmented reality software employs scalable AR solutions to address real-world problems.
2. **Mixare 2:** It is an open-source augmented reality browser that functions as a stand-alone application. This free augmented reality app is compatible with Android and the iPhone 3GS. It is released under the GPLv3 license and is also open for implementation development.
3. **Holokit:** It is one of the most popular open-source augmented reality apps for mobile devices. The HeadKit cardboard headset and TrackKit software are included in the software. With the use of smartphones and mixed reality apps, HoloKit gives users access to the realm of mixed reality. It offers users an immersive experience.
4. **BRIO 4:** If you're seeking the greatest free augmented reality software, check out BRIO, which has the power to excite audiences. This software provides ray tracing in the browser. The BRIO materials collection has a variety of materials and textures that users can add to their models. It's simple to share the BRIO scene on the internet.
5. **Adobe Aero:**Adobe Aero is a free augmented reality program that allows users to create, watch, and share rich and interactive AR experiences. The user does not need to know how to code and can seamlessly blend the physical and digital worlds. The program rapidly and easily creates interesting augmented reality experiences.

Examples of Immersive Learning Apps in India:

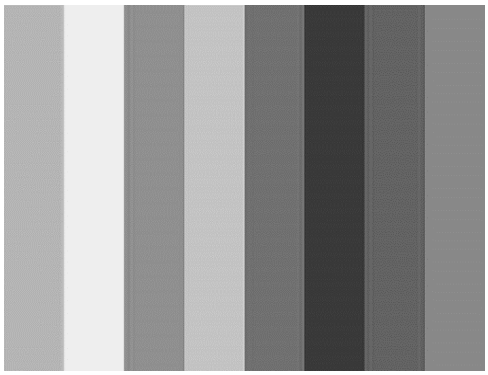
Indian Apps	**Example Content**
1. GeoGebra 3D Calculator: Graph 3D functions and surfaces, design geometric constructs in 3D, and store and share your creations with ease. You may set math objects on any surface and walk around them with Augmented Reality enabled! GeoGebra is used by millions of individuals all around the world to learn math and science.	
2. AR Ruler App – Tape Measure & Camera to Plan: With the camera on your smartphone, the AR Ruler app employs augmented reality technology (AR) to tape measure the real world. Start measuring with a tape measure tool on the detected plane.	
3. Insight Heart: This is the first of a series of augmented reality Apps built and tailored for medical education purposes to be released. The goal is to make medical education interesting, explorable, and enjoyable for students, physicians, and patients - anywhere and at any time, whether in or out of the classroom, lecture hall, or living room. They've committed to taking medical education to the next level by creating visually attractive and highly interactive information based on real-world medical and scientific requirements.	

Indian Apps **Example Content**

4. Human Anatomy Atlas 2021: Complete 3D Human Body: The Human Anatomy Atlas features textbook-level definitions and thousands of models to help you learn and express how the human body looks and works. Use it as a reference or to build virtual lab experiences instead of an anatomy textbook.



5. Civilisations AR: Civilisations AR, the BBC's first Augmented Reality app, puts history in your hands by bringing art and culture from around the world to you. To learn more about the origins of these cultural treasures and the people who created them by delving into the secrets of ancient Egypt, revealing hidden layers underlying Renaissance masterpieces, and learning more about the origins of these cultural treasures and the people who created them.



Conclusion

This chapter has covered a small part of the ever-growing field of immersive education. New opportunities will develop as technology progresses and becomes more widely adopted.Going forward, it will be critical to ensure that instructors have the requisite skills and knowledge to incorporate AR/VR solutions into their lesson plans, as well as to provide chances for students and educators to develop necessary content. Policymakers could encourage more innovation by easing content development, investing in critical safety and efficacy research, and promoting initiatives to extend access to these technologies.There has been an increase in the use of AR/VR for enhanced learning throughout higher education institutions. Schools are building infrastructure and allocating resources to integrate these technologies into their courses. AR/VR technology is not cheap, and it takes careful alignment between the technology and the curriculum to achieve the intended learning outcomes. Some institutions may be hesitant to adopt AR/VR into their education delivery systems as a result of this.Workshops and tutorials are needed to raise awareness and persuade educators that the benefits of AR/VR greatly outweigh the costs. Special events using AR/VR can be used to demonstrate the technology to the college community. Furthermore, as economies of scale take effect, the cost of AR/VR will decrease over time, and new technologies will boost the allure of making studying a real-life experience for students. The future of higher education is bright, thanks to these breakthroughs in education technology.

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An analysis on remote learning in prevailing times and future

Dhiraj Barola
Research Scholar, Dept of Psychology, SoSS, TNOU

Bosco, K.
Research Scholar, Dept of Psychology, SoSS, TNOU

Manjula, A.
Research Scholar, Dept of Psychology, SoSS, TNOU

Sudhakaran, M. V.
Professor, Dept of Psychology, SoSS, TNOU

Introduction

Remote Learning is an educational approach wherein learners do not need to be physically present in a traditional classroom. Instead, the learner could interact with their corresponding institutions, either through email or through visiting their nearest regional learning centers. Remote Learning till covid 19 was also referred to as Open and Distance learning, post-Covid-19, Remote Learning has encompassed Online learning and digital learning under its gambit.

In today's context, Remote learning is oriented towards Online Learning, wherein due to situational challenges, traditional classrooms had to adapt to remote learning process. The adaption has paved way for making Remote learning a complimentary educational approach to the traditional classroom approach. Surprisingly, these two were seen as opposite approaches, earlier.

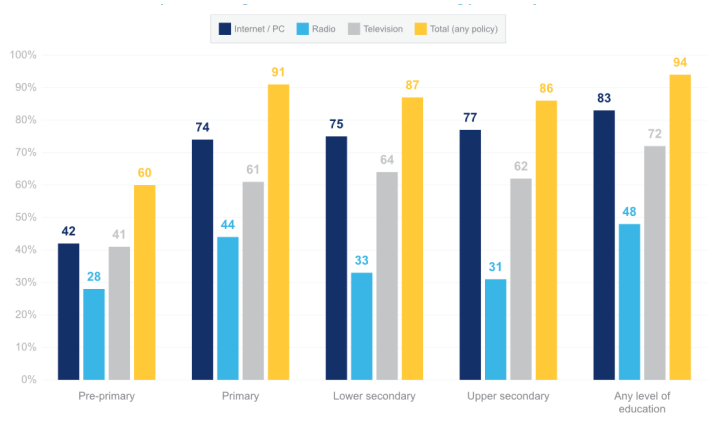
At this juncture, it is pertinent to note that World Bank report states that at the peak of the pandemic, in April 2020, about 1.6 billion, K-12 learners in over 190 countries were deprived of in-person schooling (UNESCO 2020a) (Muñoz-Najar, Gilberto, Hasan, Cobo, Azevedo, & Akmal, 2021)Under these circumstances, Remote Learning assisted in providing a continuous learning process via Online Medium. Earlier, remote learning was only preferred for higher studies, but today, all the stake holders, viz. learners, parents and institutions have adopted this approach. The fact that parents enroll their wards in open schools such as the National Institute of Open Schooling for even primary education speaks volumes about the impact of remote learning. The significance and efficiency of remote learning have improved leaps and bounds during the last decade.

Objective and background

This paper will focus on the new form of Remote learning, also known as Online Learning, Digital Learning or E-Learning. The reason being, earlier the synonym for remote learning was distance education but as things evolved and technology improved, remote learning is now closely associated with Online Learning. Any new development or technological advancements in any field brings about a positive impact along with some challenges and remote learning in our times, i.e., remote learning using the internet which commonly translates to online learning, is no different. In the study titled " A study of technological intervention in mass communication education through open and distance Learning Mode in India" by Gaur Poona(http://hdl.handle.net/10603/220768), financial resources, level of training and skills in human resources, technological infrastructure, institutional policies and students' attitude were highlighted as important factors that influence the technological integration in Open and Distance Learning mass communication education. In the study, lack of financial resources, trained human resources and technological infrastructure were recorded as the main barriers to the technology integration in Open and Distance Learning mode and mass communication education. However the positive impact of e learning are highlighted in the study , "Will distance learners become E learners, factors determining e learning acceptance among distance education students in Tamil Nadu" by Sudha Shankar, (http://hdl.handle.net/1060&3/199800) wherein it was concluded that respondents perceive the computer to deliver reliable, accurate and timely information regarding their subject of interest. The respondents expect that e- learning will enable them to learn the up-to-date syllabus unlike the more traditional modes of learning, where syllabus is updated only every 3 - 4 years. This is especially true for courses such as management and Information Technologies which are seeing rapid changes in the fields. This requirement for constant up gradation of the curriculum is an attractive feature of e-Learning among distance education students. It is pertinent to note that in the current scenario, despite all the lacunae mentioned above, without much deliberations, discussions and plan of action, the pandemic forced on the system , remote learning and even before the system was ready to take it, it was on a *do it and learn mode*.

We would like to cite UNICEF report, As per the report of (UNICEF, 2020),the collected critical information on how ministries of education in more than 110 countries continued to provide learning opportunities during school closures. For each level of education, most countries have developed policies regarding digital (internet-based) or broadcast (TV- or radio-based) remote learning. The most common approach focused on digital instruction, which was used by 42 per cent of countries for pre-primary education, 74 per cent of countries for primary education and 77 per cent of countries for upper secondary education. Many countries have also developed broadcast curricula, especially for primary and lower secondary students.

Figure - 1–TheShare of countries that implemented digital and broadcast remote learning policies, by education level



Sources: UNESCO-UNICEF-World Bank Survey on National Education Responses to COVID-19 School Closures (2020) and UNICEF country offices (2020).
Note: Figures are estimated using simple averages across countries.

We put light on these data quoting UNICEF because had there not been a provision for remote learning, imagine the effect it would have had on learners across sections. Though remote learning has come a long way from its inception, it now plays a pivotal role in learners' continuity of learning and gives them the freedom to learn at their pace and time.It is not limited to formal education alone but also to skill development.

Impact and Challenges

With every challenge comes a solution, as the saying goes, necessity is the mother of all inventions. This commonly used quote perfectly aligns with the evolution, remote learning has undergone from being an avenue of an offline process to going Online, in a blink of an eye, though with few ifs and buts. The evolution of the system has not been perfect, it's still evolving but it served as a perfect stopgap alternate to the traditional classroom or in-person learning method at the time which the world needed it the most.

Fig.No.2 The impact remote learning, provided via multiple platforms

Remote learning approach	Education level	Low income	Lower-middle income	Upper-middle income	East Asia and the Pacific	Eastern Europe and Central Asia	East and South Africa	Latin America and the Caribbean	Middle East and Northern Africa	South Asia	West and Central Africa	Global
Internet / PC	Pre-primary	23	1,396	9,640	2,326	1,163	728	9,259	505	1,378	289	20,299
	Primary	2,205	33,554	96,582	69,115	13,910	4,233	26,958	15,085	11,144	4,044	157,648
	Lower secondary	1,710	16,668	60,872	36,938	14,806	1,571	20,629	4,670	5,791	1,232	94,840
	Upper secondary	869	18,204	53,943	35,769	9,853	1,367	16,301	3,475	9,968	1,685	90,545
	Total	4,807	69,822	221,037	144,148	39,731	7,899	73,147	23,735	28,280	7,250	363,331
Radio	Pre-primary	1,971	6,435	2,533	1,058	258	3,654	8,879	-	945	2,082	18,986
	Primary	43,886	50,129	10,683	10,984	360	32,513	29,548	982	15,455	35,157	132,115
	Lower secondary	7,131	18,750	6,689	6,541	169	4,390	20,300	650	6,156	8,299	52,362
	Upper secondary	2,073	13,195	6,079	1,890	249	3,428	13,982	592	6,943	4,636	36,114
	Total	55,061	88,509	25,985	20,473	1,036	43,985	72,709	2,225	29,499	50,174	239,576
Television	Pre-primary	421	11,267	20,826	3,734	2,453	2,727	17,461	1,453	8,985	2,766	46,412
	Primary	14,457	196,103	190,251	166,102	5,893	26,703	51,596	18,078	112,031	19,721	445,089
	Lower secondary	8,338	90,810	110,386	79,806	18,085	6,110	33,725	13,681	53,312	7,783	237,049
	Upper secondary	3,612	82,174	84,503	60,074	10,416	4,094	21,550	14,417	58,719	5,814	200,679
	Total	26,828	380,353	405,966	309,716	36,847	39,634	124,332	47,628	233,048	36,084	929,228
Total	Pre-primary	2,050	13,730	21,397	5,922	2,547	5,144	18,240	1,453	9,299	3,427	54,784
	Primary	49,042	217,340	199,154	173,507	16,005	49,372	54,355	24,835	118,548	39,130	520,837
	Lower secondary	12,234	95,761	111,615	83,901	18,523	8,412	35,025	14,177	55,389	10,436	252,886
	Upper secondary	4,448	87,020	86,863	64,296	11,636	5,540	23,752	14,435	60,961	6,276	214,796
	Total	67,775	413,851	419,029	327,627	48,710	68,468	131,373	54,899	244,198	59,270	1,043,303

Source: Authors' calculations using MICS, DHS and other national household surveys.
Note: Figures were calculated using weighted averages based on the number of students across countries.

Figure No 2 states the impact of remote learning, provided via multiple platforms, had on learners' education. We all know the impact it had on providing continuous learning through online classes, on-demand sessions (Recorded versions), digital books (E-Books), online-based assignments, exams, etc. The challenging parties, though online remote learning provided all-around support towards learners' development, sustainment and learner engagement was an issue that was lurking all the time. Since the shift

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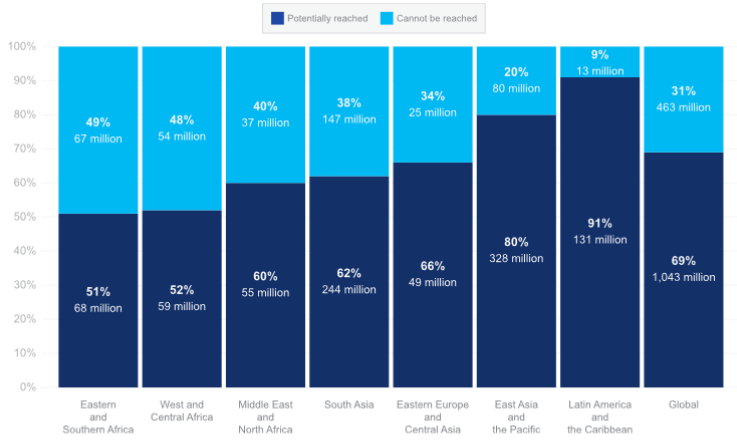
was so rapid, there weren't enough trained people and resource people and teachers who could adapt and implement it within the stipulated period. Though the shift was neither instant nor seamless, a word of thanks should be shared across the globe to all the teachers for being able to be ready for the challenge and for the dedication in making sure the learning did not stop any further.

Despite, teachers and resource persons putting in all the efforts, in making online remote learning classes engaged among students, there wasn't a plan ready to take on an accustomed system of traditional classroom / in-person education system which has been prevailing for centuries. The challenges were not limited to adaptation alone, but also included technological challenges, economicalchallenges and lack of technical know-how to reach out and access. The same is reiterated in the study titled "Will distance learners become E learners, factors determining e learning acceptance among distance education students in Tamil Nadu" by Sudha Shankar C K,(http://hdl.handle.net/1060&3/199800) , it was concluded that the major obstacles pursued by the respondents are lack of financial resources to access band with every applications and downloads such as video lectures, lack of knowledge and skills regarding use of e- learning tools and services and lack of time to learn about e- learning options.

Figure No 3 Profile of accessibility and inaccessibility of online remote learning,



Source: Authors' calculations using MICS, DHS and other national household surveys.
Notes: i) Figures are calculated using weighted averages based on the number of students across countries.
ii) The high potential reach in Latin America and the Caribbean does not indicate that children in this region had more access to communication assets in the household – access is shown in Figure 5. Rather, it reflects that the policies in this region targeted technologies that are available in most households.
[1] "Reached" indicates potential maximums; "Cannot be reached" indicates minimums, which are likely much higher.

Figure No 3 provides a picture of the accessibility and inaccessibility of online remote learning, this is just provided as a reference to understand the metrics. Though there are many challenges in online remote learning the convenience and impact it provides, outweighs the challenges and it stands out as an alternate preferred learning space for students. 54% of Indian students are comfortable with Online learning, as per a report carried out by Times of India on their website on 21st April 2021.

Hence, this paper would like to look at the bright side and discuss, suggest, deliberate and propose ways to sustain learners' attention and engagement. Paper also categorically state that this is not to be viewed as Covid-19 only study, but under a general lens, as covid-19 has paved the way in making remote online learning a little more accessible in comparison with Pre-Covid times and has also made it inclusive in comparison with Pre-Covid times. Online Remote Learning, hence, is not limited to Covid-19 period or Covid-19 lockdowns alone. The data and examples from the COVID-19 period are liberally used to show the shift and rise in awareness and acceptance of online remote learningavenues. This may be a new norm for approaching and imparting education, in coming times.

Method

We have employed secondary data obtained from various sources including reports and published papers.

Proposed Concept(s)

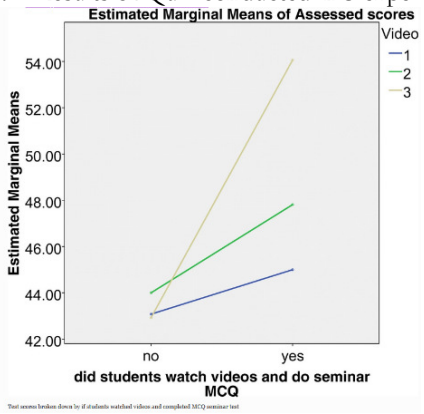
The ball is set in motion for Online Remote learning and even beginners are slowly adapting to this new space. Platform, in terms of digital infrastructure, seems more ready than the previous times, but the main issue is sustaining and engaging learners throughout the learning process. Paper proposes the following enhancement and addition to be incorporated in the remote online learning process:

1. **Interactive Lectures**: Instead of traditional book, board and chalk lectures, the teachers in the online classroom either address students on a particular topic or makes use of audiovisual aid such as power point presentations to convey the contents of the topic. In a long run, the latter process also becomes

monotonous, as the learner's role is limited to listening alone. Sustained attention and engagement could only happen when learners are also given a chance to interact. In between classes, responses should be sought through chat box and interaction by way of using smiley reactions available in the video conferencing platforms should be encouraged, in addition to unmoving oneself and expressing. Questions can be posed to students on the hitherto handled module and students should be encouraged to use the chat box to answer the same, *like fastest fingers first.*

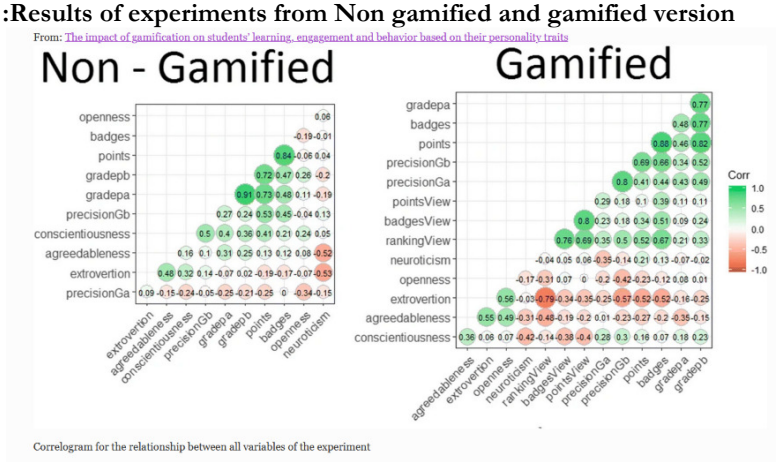
2. **Between &Exit Quiz**: To encourage learners' engagement, the teacher could incorporate a quizeither during the first half of the session or at the end of a session. Between and Exit quiz is a type of quiz which is added to the session either in the middle or right at the end of the session when the learner is about the close the window/tab post a session. The Between and exit quiz may feature questions from that day's topic. This helps students to watch the entire session by keeping them engaged and helps them answer better during their test (Refer Figure 4, an experiment was carried on by using 3 video lessons, 1st video did have a quiz, 2nd video had a quiz at the end, 3rd video had quiz during the middle, we can infer the results from figure 4.)

Figure 4 – Results of Quiz conducted in 3 experiments



3. **Gamification of Lesson questions:** The lesson concept or theory questions could be provided in a gamified quiz version, where a few touches of games are provided such as levels, scores, and leader board. In doing so the learner may be at ease in taking these quizzes or exams, at their own place and pace, as the gamification process is based on a game's theme with the addition of important lesson details in form of a quiz. Dueto learners' competitive spirit, learners may feel motivated and encouraged to attend such quizzes which will help them understand the concepts better and in turn help with better engagement with class sessions along with better performance (Quoted in figure 5)

Figure No 5 :Results of experiments from Non gamified and gamified version



Correlogram for the relationship between all variables of the experiment

4. **Small Team Formation:** The major challenge in online remote learning both in general and during Pandemic is the lack of interaction of learners among their peer groups, which affects their social behaviorsand limits their cognitive functionality as they do not communicate or share knowledge/information. The teacher could divide the class into small groups of 4-5 learners and provide the task of gathering information on the next day's topic or gathering additional information on an already taught topic, this will help in making the class engaging and train learners to work in a group, where different viewpoints are exchanged. This is also a preferred model by students (quoted in figure 6).

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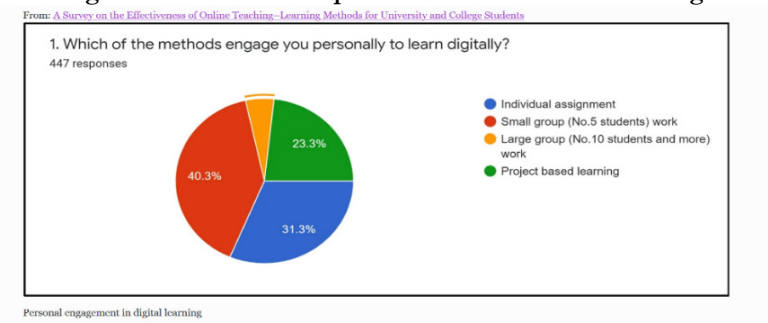
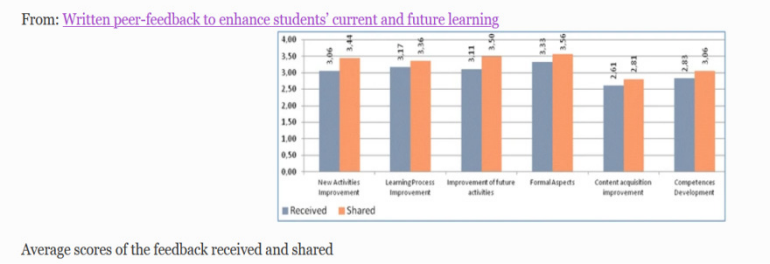
Figure No: 6 - Learners preferred model of team learning



5. **Feedback based assessment tool**: A feedback-based assessment tool could have a very good impact on students' recall of lessons or student's memory enhancement. Feedback based tests or quizzes are a tool wherein feedback of right or wrong answers is provided. If the learner answers it correctly, the reason why it's right is provided and if the learner answers it wrong, the reason for why it is wrongsprovided. The descriptive feedback may help learners to understand the concept better and will also assist in better recall value during tests. A time frame may be set to access this tool and the timely utilization of this feedback should be considered while evaluating the Students' performance.
6. **Peer Group Feedback and Evaluation**: Learner in a classroom at times understands a concept better when it's shared by a classmate, this happens because it is possible that both of them may be of the same knowledge level. There isn't any space for being afraid to ask a doubt or a sense of feeling let down when a fellow from peer group provides feedback, it is taken in the right spirit and it helps improve performance, and the teacher could implement the same during online remote classes. (Refer to Figure 7, it reflects a general perspective of peer group feedback's impact)

Figure No 7- Impact of feedback from the peer group



The outcome of the proposed concepts

The proposed concepts for enhancement of sustainability and engagement of learners will help teachers achieve a better engagement percentage over the general video lecture-based session, as some of the concepts proposed include the feature of concepts used in the traditional classrooms such as peer-based feedback's impact on the performance of a learner. The proposed concepts cover both cognitive and social angles which is very important for a learner to better engage in remote online learning. This will provide an inclusive environment that also paves way for additional interaction with teachers and fellow students.

Conclusion

Due to the multi-level impact, by incorporating the proposed concepts into remote online learning, the teacher could see better results and engagement from students for a lecture session. It addresses many challenges, and it also empowers the learner to be in orientation with the subject and with the classroom as the proposed concept involves activities to be carried out at the learner's end as well. Remote Learning has evolved into a dynamic world and a field just as we humans, who evolve with time and technological trends. Remote learning is now a wider network with an even bigger role to play in the development of a learner, educationally and in general, as remote learning, these days isn't only limited to education, but skill development and hobby development. The pandemic has brought unparalleled usage to the existing field of remote learning with the inclusion of the tech of the future "Internet base learning", this has only marked a path-breaking beginning for Remote learning space, which one day will be at par if not over the traditional classroom or in-person setup. There will be no element of surprise if tomorrow both in-classroom and remote learning are used together as a complementary space or as an alternative method for learning owing to both strengths and acceptability, either way, the future for learners and to the field of education looks very prospective and inclusive.

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Incite of self directed learning among young minds of today

Neethi Perumal, M.
Teaching Assistant, Department of Lifelong Learning, Alagappa University, Karaikudi

Sivakumar, G.
Assistant Professor in Education, College of Education, Alagappa University, Karaikudi

Lenin, I.
Assistant Professor in Education, College of Education, Alagappa University, Karaikudi

Introduction

"You cannot teach a person any think, you can only help him Find it within himself"- Galileo.

The teacher is not possible to teach all those things among their students and there is a possibility for the teacher to engage their students into different self learning techniques. At present digital age observes educators attention to the modifications on characteristics of learners in the learning environment. There are different types of technology resources which the learners using for the improvement of their learning. The period of globalization academic performance of students has closely connected with different types of learning method. At present there are different learning methods are available however, the few learning methods are very applicable for the students who improve their academic performance. The self directed learning method is most important method for the young minds of toady. At present the culture of learning among the learners gradually moves to self-directed learning because it is a self paced one whenever the learners have interest who can able to learn. The self directed learning method is most effective method especially young minds of today. It provides self independency among the learners. Hence, the teacher of today motivates the young minds of today to involve the self directed learning.

Self directed learning

The advancement of communication technologies, it is enables more virtual learning opportunities for changing the learners understanding of learning. In the view of traditional understanding teacher was shows to only source of knowledge. Today, there are wide number of learning source are available. Hence, the access of information among the learners becomes easier. The present context of learning environment has been entirely changed due to many reasons among the learners' attitudes towards in the learning culture. But at the same time the teacher who direct the students to learn the subject through other mode of learning methods. In order to learn precisely the subject concept and improve their own learning process among the learners the self directed learning is gift for them. Generally the self directed learners are well versed in planning of learning and determination of their learning objectives. The self directed learners who is willing to learn, have curiosity in learning and make effort to learn new things in self controlled manner.

Self directed learners

The learners who himself or herself directed his or her view to update their knowledge without expecting help from others. These kind characteristics learners will equip themselves through different learning resource available through open access. The self directed learners easily access and understand any concept and ideas obtained through open learning resources. The self directed learning skills are needed for the present context of learners who update themselves into the different areas of knowledge and skills. The self directed learners are become ready for their fruitful learning environment. The self directed learners of today have more opportunities to execute themselves for their successful learning in the any kind of learning environments.

Incite of self directed learning among young minds of today

The young minds of toady have lot of distraction due to various reasons such as social media, family climate and social climate etc. They are unable to concentrate their inner minds into the success of academic performance. The academic performance of students not only improved through effective teaching learning which need some kind of self learning techniques. There are different types of self learning techniques are available in learning environment. But very effective self learning techniques are few of them engaged by learners. The self directed learning is one among the best technique for the young minds to improve their learning culture and academic performance. Therefore, the teachers of toady

motivate the young mind in the class room to engage themselves into the self directed learning. It provides various benefits to the young minds of today.

Conclusion

The present chapter concludes that the self directed learning is most important for the young minds of today to improve their different skills such creativity and self confidence in achieving the academic task. The real effect of student's performance determined by the how the students who involve themselves into different individualized learning techniques. Therefore, the most important duty of teachers to incite the young minds of today engages themselves into the self directed learning. Finally, this chapter concludes the students who realize the value of self directed learning to improve their different academic related skills and professional related skills. The self directed learning not only helps for their academic part it is also helps for their entire life survival.

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Interactive modern teaching method in education

Sunitha, S.
Ph.D. Research Scholar (Full-Time), Department of Education, Alagappa University

Catherin Jayanthy, A.
Assistant Professor, Department of Education, Alagappa University

Introduction

Over time, there have been changes in teaching styles. In contrast to the past, when students were taught by memorization and the same old recitation exercise, interactive teaching strategies were used utilizing modern teaching methodologies, and the results can be noticed. This is an educational reform that offers a completely new perspective on teaching and learning since, unlike traditional teaching methods, modern teaching techniques do not treat all students at the same comprehension level. Rather of depending simply on the teacher, modern teaching tactics emphasis questioning, demonstrating, explanation, practical strategies, and cooperative strategies, as well as being more activity-based.

Nowadays, there are a variety of educational techniques to choose from. In today's fast-paced world, teaching has developed, and educational institutions have adopted new teaching methods to deal with pupils in the classroom. Distance learning, online learning, and traditional classrooms are just some of the options accessible today. As the scope of education develops across the world, the need for qualified instructors grows, making it much easier to educate children than it was previously. As a consequence, if you're a teacher, use new technology to make your lesson more successful.

Importance of Modern teaching method

In recent years, humanity's ability to adapt to new science and technology information has greatly grown, as has the spectrum of knowledge in the field of science and technology. As a result, there is a significant demand for creative and imaginative minds to examine uncharted territory in a variety of industries. The only way to exist in the modern world and the knowledge-driven technology of technology is to adopt current practices.

Modern Teaching Methods

Education, like other industries, has seen significant transformations over time. Until now, the most successful way of bridging the gap between education and students has been through teachers. They employed standard teaching techniques to explain the material or provide notes. On the other hand, modern education sees a major condition that stimulates pupils to study intensively and fulfil their curiosity. We've been exposed to new modern teaching strategies in recent years, and the combination of technology and innovative educational approaches has ushered in a revolution in education. So, let's discuss any unique teaching approaches that are accessible.

The Modern Teaching Strategies:

1. **Collaborative Learning:** When they were expected to do so during on exam or on a regular basis, students used to revise the topic or syllabus in isolation or in a room. This was a common practise in previous teaching methods. Collaborative learning is being developed by colleges as a solution to this challenge or as a helpful platform for students. In this modern teaching style, teachers organise a group of students so that they may sort out their problems, debate issues, and gain answers to their concerns. This helps kids build social skills while also allowing them to understand the information more efficiently.
2. **Spaced Learning:** Spaced learning is one of the modern teaching methodologies that teachers use. This strategy is used by teachers to repeat a lecture several times until the pupils fully get it. On the other hand, the teacher repeats the course with 10-minute interruptions (breaks) in between. The gap is intended to refresh students' thoughts by involving them in enjoyable activities or practising mindfulness practises, so preparing them for the following session of the same course. At regular intervals, this technique allows learners to inherit knowledge and develop connections between learnings. Before moving on to the next chapter, this technique prepares the students with the essentials.
3. **Flipped Classroom:** In the pedagogical field, the term "flipped classroom" is well-known. You are without a doubt aware of this. It is distinguished by its title, 'Flipped Classroom.' It was one of the most influential modern teaching methods at the time. In this method of instruction, the teaching process is reversed. Students, unlike in traditional education, study new material or topic material at home before putting it into practise at college. Instead of obtaining material at the

institution, learners are required to review or practise it at home. Learners may put this method into practise at home by viewing a video, searching online, or working on the material that the instructor generally offers.

4. **Gamification:** It is common knowledge that youngsters like video games, whether they are played online or on the field. Teaching with video games is one of the most important contemporary teaching tactics that has been applied under cutting-edge coaching methodologies. The importance of gamification in education has been extensively recognised in elementary and preschool devices. The fact that students are learning through video games will go unnoticed by them. It had an effect on pupils as well, and it proved to be beneficial not just for preschoolers, but also for students of all ages.
5. **VAK teaching:** VAK is a cutting-edge teaching method with demonstrable outcomes. Visual, auditory, and kinesthetic learners are the three categories of learners (movement). One must know which kind they fall into, or a trainer must know which group her trainees fall into. In VAK, V represents a visual way of viewing data, A represents an auditory way of gathering data by listening, and K represents a kinesthetic way of feeling the data. Because some students learn by seeing, hearing, or feeling, a teacher must keep this type of students in mind when teaching. As a result, they should communicate the same information in a variety of methods.

Advantages of Modern Teaching

Along with developments in the learner's educational equipment, the face of teaching is shifting in the twenty-first century. Before using modern teaching methods in your system, it's critical to comprehend their benefits and advantages. As a result, the most effective usage of services at the lowest feasible cost is achievable. We may take a look at some of the major benefits of contemporary schooling.

- Cognitive Thinking Skills
- Bringing Prefrontal Cortex into Life
- Exploring Things
- Developing Unique Patterns of Learning
- Application-based Skills
- Online courses

Learning relevantly to the Increasing desires

One of the most essential functions of education is to train individuals to adapt to changing circumstances, which necessitates efficiency. The current educational system has created a specialisation of this and has made them efficient enough to deal with the challenges of rising environmental needs.

Conclusion

After a comprehensive evaluation of several teaching approaches, we are unable to say which pedagogical approach to teaching is superior! Both traditional and modern teaching methods have benefits and drawbacks. They have a lot in common, yet they're also very different. Traditional teaching methods must be viewed as the foundation of current teaching methods, and students must not completely disregard them when learning new ones. On the other hand, modern coaching practises are suited for managing problems and environments in the twenty-first century.

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Mindfulness activities in recent educational technology

Tamil Selvan, P.
Research scholar, Department of Education, Alagappa University, Karaikudi, Tamilnadu, India

Kalaiyarasan, G.
Professor & Head, Department of Education, Alagappa University, Karaikudi, Tamilnadu, India

Introduction

Mindfulness is to act carefully, calmly and patiently. It develops to follow meditation practices, and good activities. Meditation practice usually refers to a formal practice that can calm the mind and enhance awareness of ourselves, our minds and our environment - Behan, C. (2020). Accordingly, mindfulness is very difficult for every teacher and learner in the current educational situation. When we are in mindfulness, we can avoid problems and any of loss. Mindfulness practice is to be given face to face but nowadays, education is being followed through online, whatsapp, email, twitter, telegram and one step up more google form, google meet, zoom meet, video conferencing, OER etc. each one cannot see others in person. At the same time educational practices are being followed without face to face. So, we are being affected to stress, anxiety, fear and depression.

Challenges of mindfulness in technology

Mindfulness meditation is a helpful technique which can bring one's attention back to the present moment, Kabat-Zinn, J. (1990); Salehzadeh Niksirat et.al (2017). Some year ago, mindfulness meditation was given under the guidance of supervisor or experts. It has improved their life ethically and personally but, in this day, education is being given by different ways through technology-based. Sometimes technology based on education makes a chance for disrespect from others and to get stress, anxiety and depression. Digital based on education has more commitment but should play sitting particular place with self-confidence. So, every student and teacher has faces challenges of mindfulness in technology.

Mindfulness in technology

Technology, also advancing significantly during the past decade, has been increasingly used to help reduce certain challenges associated with traditional, in-person instruction (Kazdin and Blase 2011). Educational technologies are making dynamic changes in education because educational technology is used in every aspect of teaching and learning. In recent years, mindfulness has been increasingly applied to characterize organizations that stay "attentive to and aware of what is taking place", Brown and Ryan, (2003); Valorinta, M. (2009). In the current climate of teaching and learning practices digital devices and applications based on computer, email, whatsapp, mobile technology, video conferencing, google meet, zoom meet, wifi zone and social media etc. are used. So, we have to use carefully the technology devices with mindfulness. Therefore, mindfulness practices are needed for everyone. It will help to play without stress, anxiety and depression at every situation.

Mindfulness in computer

Each of the computers performs functions vital to the overall operations. It is more tightly coupled to complete higher-level tasks, Heck, B. S., Wills, L. M., & Vachtsevanos, G. J. (2009). According to this current situation, everyone should know to use computer or laptop with mindfulness. There are more people in the world who cannot accept the growth of other. Many people do not know how to use without error the computer devices. So, we have to ask from others how to rectify the computer error. At the same time some people may help to rectify our error or some people may not help us to rectify our error. In that situation, we should not have anxiety, fear or stress. Rather we should follow mindfulness.

Mindfulness in e mail

Education is being followed through many different ways due to pandemic COVID-19. Email is one of the best ways for communication and sharing information with full safety. It is also being used to send and download material, assignment, educational information, lesson content, question paper, answers script etc. and at the same time user id and password is important for the activity. Mindful behavior has been characterized by awareness of multiple perspectives, orientation in the present (Langer, 1997; Sternberg, 2000; Fiol and O'Connor, 2003; Valorinta, M. (2009). So, the teacher and student must follow patiently in their process. They need not act with tension, should enter the correct mail id, password to log in.

Mindfulness in WhatsApp

The digital interventions are all administered online Mrazek, A. J. et.al (2019). In the the current situation education is done through whatsapp. In whatsapp group, the audio message, instruction, video, or any other information is sent to their students or teachers by the Admin. Viewers may open the content, text message, voice message or video content at convenient time. At the same time, they may raise any doubt or query from viewers' side but the admin cannot clear the doubt because of network problem, inconvenient time or work load and so on. In that situation, respondents or viewers should follow mindfulness activities.

Mindfulness in e-learning

This pandemic period education is being followed through e learning. E-learning is being used to upload and download material, subject-content, audio, video, picture etc. Such as e- content material, audio, video is in e-learning. When we upload or download e-content the portal may ask to enter email id, personal id, name of the institution, location. In that time, we should act with mindfulness. Before we upload or download, the e-learning content we should give correct information without tension.

Mindfulness in open educational resources

Johnstone, S. M. (2005) said that open educational resources was created for sharing resources to local community in individuals' desire to make difference in the lives of those less-fortunate to educate. Open Educational Resources have many educational sources, materials and strategies. It is useful for all learners and teachers. It has published in open licenses. We can use materials to reuse, adapt, share and modify according to specific needs. Textbook, lecture notes, syllabi, assignments and tests are available in open educational resources. In this pandemic period, we have been using open educational resources in many ways. So, while we are collecting materials from open educational resources, we may be asked email id, institution name, location, grade of study etc. At that time, we should act with mindfulness and enter the correct information.

Mindfulness in software

People, who are mindfully engaged in a procedure, perceive changes in an environment. Therefore, there is a probability that they are more creative and that they are more likely to adopt new ways of working, Matook, S., & Kautz, K. (2008). Thus, it is also more likely that we find innovative solutions to problems through software technology. Software technology is an important role in teaching-learning activities, because we are using the google meet software, translator software, and scanner software. When we use education related software, we should have mindfulness. If we follow mindfulness, it can help to escape from the internet hacker and protect our data, and avoid illegal software.

Conclusion

This topic shows how to use mindfulness when we are using educational technology and individual mindfulness contributes toward our recent educational system. It is a very quick stress relief. It is a cool and a good way to get focused in technology activities, Cook, M., & Croft, J. B. (2015). During the current climate, the world is being witnessed phenomenal growth in educational activities. Teaching-learning activities are being continued through technology devices like internet. So, we may get a chance of easy depression, anxiety, fear, stress, loss of memory etc. Therefore, we should practise mindfulness to get good results. One way to overcome these limitations to productivity is by promoting mindful meditation techniques, Cook, M., & Croft, J. B. (2015). Its highlighted aim is to develop mindfulness in technology education from primary to higher education in the current situation.

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Phygital learning, the next big revolution in education for the future

Dhiraj Barola
Research Scholar, Dept of Psychology, SoSS, TNOU

Bosco, K.
Research Scholar, Dept of Psychology, SoSS, TNOU

Manjula, A.
Research Scholar, Dept of Psychology, SoSS, TNOU

Sudhakaran, M. V.
Professor - Dept of Psychology, SoSS, TNOU

Introduction

The term Phygital is the combination of the word physical and digital, which is nothing but an amalgamation of two independent spaces, i.e., Physical space and Digital space into one dimension. In context to learning and education, Phygital learning is the usage of conventional in-person / in-classroom learning along with recently developed digital learning space, wherein learners could attend classes over the internet. We foresee this as a revolution for future education as Phygital learning offers convenience and scale. We are all aware of what an adverse effect pandemic on learning, online learning/classes were necessary during lockdowns for obvious reasons of health and safety of people at large. But, Online Learning alone cannot constitute complete learning. Though online learning provided the much-needed platform for continued learning, it cannot sustain itself in providing wholesome learning, as it comes with challenges of its own, the challenges which could have adverse effects. It brings in psychological, social, and philological issues on long term usage (Maharjan, 2021), along with the fact that transfer of knowledge cannot be assessed (Shah Shreeda, 2020). On the contrary, the chalk and board model will also not provide a wholesome learning experience as it does not provide all the skills required as per today and tomorrow's technological trends (Kim, 2016). Lack of quality schools, quality teachers and quality of education impairment adds to the unemployment figure in our country, India (Adhikari, 2019). Phygital learning binds the traditional classroom model along with digital learning, which has seen acceptance with learners. Additionally, it also provides positive social and learning reinforcement as this form of learning helps make learning even more accessible for differently abled learners. It also helps learners with Intelligence disabilities when such Phygital learning is provided in the social care centre (Mirko Gelsomini, 2021), making it an inclusive alternate.

Objective

The objective of the paper is to establish Phygital learning may revolutionize future education.

Method

We have employed secondary data obtained from various sources including reports and published papers.

Process for Phygital learning (Vate-U-Lan, 2016)

Figure 1 provides the process for Phygital Learning. Source: (Vate-U-Lan, 2016)

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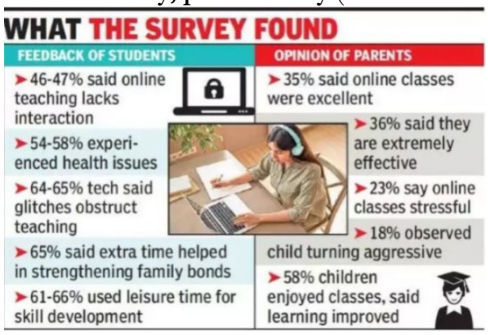
Current Challenges

The current challenges posed by traditional classroom and online classes is evident, we would like to divide our proposition into factors, and the factors are.

1. Psychological, Social, and Physiological Factors
2. Economic Factors
3. Problems based on perspectives

1. **Psychological, Social, and Physiological Factors:** Since Pandemic, learners especially learners who attend schools have gone through various psychological issues such as Anxiety, Stress, inability to focus, social issues such as feeling lonely, not being able to make friends, not being able to share knowledge with peer groups, etc and physiological issues such as vision issues due to prolonged screen-time, ear issues due to prolonged usage of the earphone, frozen shoulder, muscle, and body aches due to posture irregularities. Due to limited physical activity, obesity also made inroads. Though it all were caused due to being homebound due to external factors, it did take a toll on them, not limiting to physical, mental, emotional, and social health (Halupa, 2016) but also with social skills, emotional health, cognitive skills and their general interaction with the world and environment.

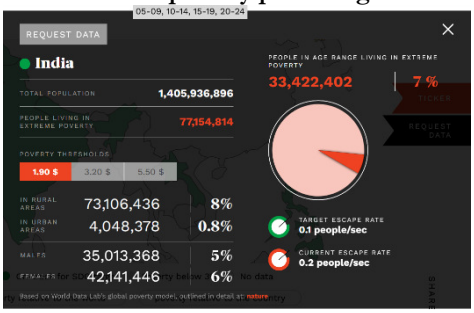
Figure 2 represents results from the Survey, published by (TNN- Times of India, 2021)



But isolating the covid-19 alone will not solve the purpose of imparting quality learning. And traditional classroom method only will also not solve the problem.

2. **Economical Factor :** India despite being the world's fastest-growing major economy as per the latest quarter report by (Business standard.com, 2021) still 5% of our entire population live in poverty, out of which if people are age-matched with primary, higher and under/post-graduate education age group, i.e. between age 5 to 24, the extreme poverty rate is about 7% which roughly translate to 33+ lacks people (World Data Lab, 2022).

Figure 3 represents the extreme poverty percentage for the age group 5 to 24.



Due to poverty, kids schooling, and education are curtailed, moreover, such kids are sent to work at an early age which also limits India's fight against child labour. During such times with the support of Governments, International Agencies and other stakeholders, such children could be benefited out of the Phygital learning process, as it cuts the expense to half in terms of travel, food, accommodation and miscellaneous.

3. **Problem-based on perspectives**

Different problems are based on different stakeholders, such as Students, Teachers and parents.

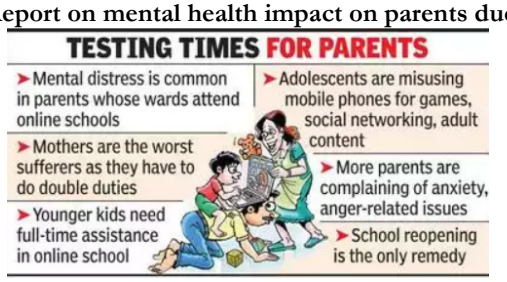
a) **Student's Perspective :** Learners henceforth referred to as students, are the most affected as their role of learning and gaining knowledge were hit the most due to online-only learning. On average students of every class have lost a minimum of a year of in-person traditional classroom studies. As an alternate, online classes were introduced by the institutions during

the lockdown, but due to numerous factors such as technical glitches, operational knowledge, inability to afford devices, inferior quality of teaching. Another major factor was the under-preparedness of all the stakeholders associated with the education sector. Now that the schools are opening, how will student's cope with their current syllabus having gotten to learn only in limited part for their previous class? Additionally, all the syllabus at once cannot be passed on at once. This will also have an impact on them psychologically as they may be low on confidence and stressed out due to not being able to understand the concept or focus on the subject.

b) **Teacher's perspective:** Teachers also had an equally challenging time, their problem was muti-dimensional, first was to adapt to a new norm of online classes and the second Was to replicate a traditional classroom teaching and interaction over online mode, exceedingly difficult. The task was challenging as, until then, there were no such provisions available, nor any training or awareness programs were conducted for teachers to adapt to the impartment of technology-based classes to the students. Some of the key issues faced by them included a lack of knowledge of digital tools, technical glitches, shorter duration of the class, unable to assess students, etc., This posed challenges for both students and teachers, as students were missing out on learning important things and teachers found it difficult to adapt to online classes. Even in a traditional classroom, teachers did not have the scope to keep them updated nor could use external resources while explaining concepts, and its stopped teacher's gaining knowledge on modern technologies.

c) **Parents Perspective :** Parents, despite not being a direct party either in learning or teaching yet had to face challenges in adapting to the online classes. Of late, due to lack of employment, parents were worried about the quality of education imparted at institutions, as this deals with carriers of their wards. Post covid-19, the worryingincreased further already they were satisfied with the traditional classroom's impartment of knowledge as teachers could not upgrade or update themselves on the latest technology trends, only if they are aware, they can pass on the knowledge. Now, online classes were not effective either. For many parents, it affected their work as they had to sit along with their kids, as they had to set things up and operate the device for learning. This led to stress and other mental health issues in parents.

Figure No 4 : TOI Report on mental health impact on parents due to online learning



Suggested Solutions and Discussions

- Quality and effective learning can be imparted only when learners are in synchronizationwith subject knowledge along with today and tomorrow's technological trends, which Phygital learning offers.
- Will enhance their learning experience and also assist in building a career, as today, no industry/company can function without the usage of digital platforms or tools.
- Phygital Learning strikes a balance and provides a middle ground for all-around well-being along with quality education.
- Phygital Learning is not a solution to every learning issue, but it will serve as a platform for learners to engage with their history in terms of theories and will enable them to attain knowledge about current trends and development.
- Will serve as a confidence booster as they are better prepared to face the real-world challenges as learners are imparted with both yesterday and tomorrow's knowledge.
- The point we are driving is that this could be done with the support of government and international organizations wherein devices could be provided for free or at subsidized rates or EMI or rentals, plus the government could establish a town/panchayat resource centre for the larger good. Additionally, the government is already planning to broadcast 200+ educational channels which will feature class and syllabus-based lectures.

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- By 2024, the declined poverty rate of the entire country would stand around 4% and the poverty rate for people age matched as per the standard education attainment age group would be at 6% (World Data Lab, 2022),
- When the influx rate for students joining schools and colleges will be at an all-time high, and such demands could only be met through Phygital learning as the skills in-demand for employment will evolve and evolved technological trend's skill development cannot be achieved without digital infrastructure and learning.
- Phygital learning may be a need of the hour under such situations, as it provides flexibility and provides an educational gateway to the world.Today various educational websites, video courses, presentations are available on varied topics.
- These digital resources are prepared in a way to suit learning in quick time also learning in visual forms, whose recall value and understandability remain long, which is easier to understand.
- Institutions and teachers could provide students with recorded videos on the student's dashboard, wherein it permits students to watch, refer and learn any topics at a timeand place convenient to them. For students of technical courses such as engineering and medical courses, a real-time simulation which is the closest thing they get to the physical lab will help them learn seamlessly no matter for which model they are opting.
- With the incorporation of Phygital learning, teachers could better equip themselves with technology and can effectively deliver lectures by incorporating various audio/visual mediums.
- This will help teachers gather knowledge and information on current technology trends which will add up with their existing expertise in classroom teaching.
- Apart from the digital classroom setting, teachers could divide the syllabus into class-based and digital medium spaces hence will be able to devote more time in explaining the important concepts and clarifying the doubts arising out of digital class.
- Phygital learning provides the flexibility and convinces best from both worlds, i.e., traditional classroom and digital learning in form of providing knowledge on tomorrow's trends.
- The amalgamation of both classrooms will also limit the time parents have to spend in just setting up the online class's resources, also it will take care of their mental health as they do not need to constantly at a stretch devote their time in attending their ward's online classes but can continue with their work. Psychologically they are assured that their wards will have additional knowledge provided by digital classes, tools, and resources.

Conclusion

Education, post evolution of the internet and digital technology has become a global arena hence learners must also be provided with an opportunity to benefit from and to contribute to the global educational arena, doing students will be empowered to learn and implement modern technologies and learning for their betterment.

No method of learning is completely right or wrong, the methods just evolve with time and technology, and change is the only constant. In the educational and learning field, from the word go, something or the other kept evolving, irrespective of its scale and usability. In the learning and education space, learners' will, and requirements have led the space in bringing about the evolution, right from board and charts to slides of the presentations. Every development in learning techniques provides both, accessibility, and limitations, as there is never a perfect learning model. The reason is learning and gaining knowledge is subjective and standardization can only be done to a certain extent. When it comes to Phygital learning, the uniqueness of being able to provide the experience of two complete opposite variables acts in its favour, which makes it accessible, acceptable, sustainable, engageable and scalable. The reason we believe it will revolutionise the future education space is due to its very nature of being fluid and its ability to provide learners with the platform which they find convenient out of both.

This will also help teachers and institutions to understand students better and help build personalised learning programs using technology such as Artificial Intelligence and machine learning. Teachers can now recognize the shortcoming of their students by assessing the students via offline and online tools, hence would be in a better position to provide a teaching experience in alignment with students' understanding or how their students understand better. Additionally, this also provides insights to develop existing teaching methods or to formulate new methods based on technological shifts. It enables, teachers, to make their students independent and helps in preparing them for real-world challenges.

Overall, this is revolutionising the education space as it empowers both learners and teachers to be able to travel with the time for future needs and at the same time also provides an opportunity to learn yesterday's theories, which will serve as the foundation for tomorrow's development.

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Problem-based learning: a nuance in innovative pedagogy

Shirley Moral, C.
Assistant professor, Department of Education, Madurai Kamaraj University

Saradha, S.
Research scholar, Department of Education, Madurai Kamaraj University

Introduction

Problem based learning has modified traditional homiletic and learning methods. The problem based learning has produced more attention for fruitful learning in recent times. It is an innovative strategy of teaching. It collaborates recent technology with the ancient teaching for the learners in their schooling experiences. Problem solving skill is not the prior skill in problem based learning. It includes acquisition of the knowledge, group learning and enhances communication via learning. PBL is a learner centered tutelage in which learners study their subjects through the experience of the solving problems found in prompt material. It doesn't inculcate an exact solution on solving the problems but it enhances the development of some features, qualities and skills. PBL process encourages small group of students. Each member of the group should be responsible for the things happening. Role taken by the members of the group must be alternatively changeable be it either formal or informal. Totally, it is an effective learning pedagogy for small group of the learners in the recent times.

Problem- based learning – PBL

Word (2003) defines Problem Based Learning as a process that identified issues within a scenario to increase knowledge and understanding.

Origin of PBL curriculum

In 1960, Barrows and Tamblyn introduced PBL process at Mc Master University, Hamilton for the medical school program. In olden eras, medical education let down the students who engage their times for learning alone but not spends much of their time for the application process. It makes the learners feel difficult over the practice and relevance to the clinical based medicine. In order to avoid these difficulties , the PBL learning strategies were introduced. It mainly focuses on motivation towards tutoring and enhances the responsibilities over the studies with synergistic approach of the professional ethics with curriculum. At first PBL curriculum was introduced at the middle school and then it spreads all over the fields like engineering , social studies, mathematics and law, etc., PBL strategies have been followed by 20000 students roughly.

Principles of PBL

1. It stimulates the person's self identified aims and results
2. 8-10 learners along with the facilitator for discussion while learning takes place.
3. Before entering into the larger group, learners followed independent study mode and they are responsible for the directions chosen for their study design.
4. Prompt materials for the curriculum can be used.
5. Team work is anticipated.
6. Synergy helps learners to acquire knowledge through team work and wisdom.
7. All the needed skills for the future professional life should be encouraged like problem- solving tactics, collaborations in learning, responsibilities over the concepts in self-directed goals.
8. Free and smooth atmosphere for learning. They can be reproductive more and more only when they are independent.
9. Each and every member of the group has a role to act.
10. Life-long education is mandatory and the efficiency of learning should be a continuous one till end for the future.

Unification of PBL process

The steps to implement PBL processes are as follows:

i. Make ready staff members to alter the method.
ii. Frame committee for the curriculum and labouring
iii. Define academic outcomes and framing PBL processed curriculum.
iv. Getting advice from the counselors and experts in problem based learning.
v. POM- planning the curriculum, organizing the committee and managing the skills.
vi. Give training regarding objectives and framing the objectives .

vii. Seeking students to the PBL process.
viii. Explaining the objectives and constructivism of the PBL method.
ix. Assessment change is must
x. Getting feedback from the learners and facilitators
xi. Possible learning platform is availability of the resources and guides self-motivated and directed learning.
xii. Repeat the same and the continuous assessment.

PBL - A systematic process

Although PBL is a self directed learning, it refers to a constructivist approach. It promotes life - long and self directed learning. It emphasizes tutor guidance and makes learning more fun and collaborative. Learners discuss the problem with their group and identify what type of problem it was. Try to accompany their prior learning skill and ability. The next step is to frame possible objectives to develop a problem; the students have to explain problem based on their prior knowledge and theories. Based on the objectives, facilitators help the learners to construct the knowledge in connection to the problem. Students can find the solution according to their own pace and work independently because they are in PBL process as self directed learners. Learners have to find the issues related to the problem, and then the learners have to work together for discussing about their findings, difficulties faced in finding the solutions etc., Final step is that the learners have to explain based on what things they learned in PBL process.

Traditional learning Vs Problem Based Learning

Traditional learning	Problem-based learning
• Tutors facilitate what we want to know • Learners need to memorize • Tutors assign problems to the learners to describe how to use it practically.	• Assigning the problem • Learners identifying what they want to know • Self- directed learning keeps learner stronger to learn and solve the problem

Merits of problem-based learning

- Learner-centered which stimulates active learning
- It paves way for good understanding
- It helps to retain knowledge.
- It helps to improve life oriented skills which is applicable in many fields.
- It motivates how to get more idea in learning via communications, learning together, ability of the problem solving, vast thinking capacity over the content moving together and self directed learning views.
- PBL assists the learners by applying real life and real world experiences.
- Attitudes may vary from person to person in finding the solution to the problem.
- Different prospective help to find solution to a problem easily.
- Learner-centered
- Lifelong learning
- Comprehensive
- Build on conceptual knowledge
- Self pace learning
- Deep understanding and adeptness
- Upholds synergy
- Reinforcement
- Learn independently
- Self-motivated
- Significant curriculum
- Beneficial cognitive growth
- Enriches teacher- learners relationship
- Self assessment techniques
- Retention of knowledge
- Level of learning is high.

Limitations of PBL

In 2003, Wood says that demerits of this process consist of availability of the resources and the existence of facilitator. Many educations find that PBL causes frustration and difficulty due to the lack of staff members to lead facilitation, group discussion. Even though the learner group is small, PBL process requires physical spaces and the computer resources. Relevance of the information is not available in higher order. Overload of information through computer resources affords difficulty in determining what amount of the study is required and fails to acknowledge the information available. As like traditional teaching methods students may not be in close contact with the staff members. It leads to difficulty for the learners to decide the inspirational role models. It is a time consuming process. It requires more time to prepare proper learning materials. Even though learners learn how to solve a problem by themselves in PBL courses yet they may get frustrated in spending more time. Self- directed study helps in many ways but also affects the learners' wisdom wise as compared to the students who were assisted by tutors directly.

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It allocates difficulty in altering their past habits, because they were assisted under the guidance of teachers in their previous years of the education. Instructors also have to change teaching methods in order to subsume problem-based learning process. For instructors, it is a difficult task to assess pupils' mastery over learning. Tutors have to change their methodologies in assessing learners. It is highly appreciable by female learners as compared to their counter parts due to un-certainity regarding confusion arising in two or more interpretations. Learners feel difficulty in solving the problem with the large amount of the information available in earlier days. After getting expertise they may feel comfort in solving and learning. It is not an easy thing to amending PBL method in schools, colleges and universities, because requirement of abundant resources, well constructed organization and an accurate planning is mandatory.

Conclusion

PBL declares that it is an effective learning strategy and teaching method. It has been assessed for the life- long retention of knowledge and the learners could find the way how to apply in other domains. In ancient days, PBL process has been introduced and familiar in the field of the medicine. But now it is widely spread over all the fields and the development is rapidly higher in particular. Outcomes of the learners evaluation declares that the superior performance could have been improved in problem based learning rather than the traditional methods of teaching. PBL method learning has been opposed to the lecture methods. PBL methods influences student's learning. It started with analysis of the problem self-directed study followed by explanation phase/ report writing is important to predict learners' mastery over learning. Also educators says that availability of the resources is more, collaborative study and self directed study are not sufficient and also it is not enough to mould the learners to attain mastery over learning. Learner's engagement with the problem is enough to enhance learners and self directed study could not make the significant difference in learners' learning. Finally, we conclude that in both the methods, we have merits and demerits, we people put hands together to welcome and get expertise in new methods combined with traditional methods prior this knowledge whole heartedly.

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Digital technology in today's classroom instruction

Samidass, S.
Assistant Professor in Education, Krishna College of Education for Women, Tiruchengode

Rajkumar, R.
Assistant Professor in Education, Krishna College of Education for Women, Tiruchengode

Poongothai, R.
B.Ed Student-Teacher, Krishna College of Education for Women, Elayampalayam, Tiruchengode

Kowsalya, S.
B.Ed Student-Teacher, Krishna College of Education for Women, Elayampalayam, Tiruchengode

Introduction

Digital Technologies have touched every sphere of our life in the present scenario. The society is highly sensitive to create knowledge-intensive environment to efficiently create, share, use and protect knowledge. All the educational institutions are gearing up to provide information networks to students with access to digital resources. Digital Technology is a powerful tool for problem-solving, conceptual development critical thinking and evaluation which help to make the learning process much easier for the students. To be effective in the classroom instruction, teachers should acquire the knowledge and skills to adapt to the new digital technological tools like Computer Assisted Instruction (CAI), On-line Learning, Virtual Learning, e-Learning, m-Learning, Blogs, Videoconferencing etc. which are student-centred, collaborative,which aims to achieve high academic standards. Digital Technology plays an important role in alleviating the problems in learning. Individualized learning enriches as well as helpful in the development of all round personality. Because of globalization, digital technologies extend its boundaries throughout the present scenario. The advancement in digital technology is changing the whole nature, philosophy of education and gives opportunities for international cross-culture and collaborative learning, etc. More digital technological awareness and aptitude must be acquired by the teachers so as to utilize the potentiality of the digital technologies. Standard hardware and software are to be utilized in the field of education to compete with the modern world.

Digital technology as a potential media

The effectiveness of any educational system is achieved only when its educational process results in true learning in the individuals and as a result leads to human resource development in its true sense. The advances in technology are changing the whole nature and philosophy of education and by this it is forcing us to get reformed thoroughly. Classroom is the first place where the impact of the digital technology is being felt across the world. A smart classroom enables the teacher to display Power-Point presentations, present the Internet resources, show streaming videos with audio and play course-related CD's and DVD's.

A classroom must look like a computer laboratory with all of them are connected to the Internet and also installed with different software and course-material relevant to course being taught. It facilitates the educational transaction between providers and users by keeping students well informed about the courses, enhancing Teacher-student relationship through e-mail, chat, on-line learning, discussion forum, Blog etc. enhancing active learning, sharing ideas, providing immediate feedback, encouraging paced learning and allowing for effective Mapping of learning pathways. Teachers would able to develop their lesson plans and also to find free animation and simulation to enliven their lessons. Enhancing students' learning by the integration of intellectual, social and emotional values through the technology based learning will enable teacher to focus on the holistic development of students.

Varieties of digital technological tools

The following are some of the digital technological tools that can be used effectively in the Classroom Instruction like e-Learning, m-Learning, Computer Assisted Instruction (CAI), Virtual Learning, On-line Learning, Blogs etc.

1) **E-Learning:** E-learning which refers to the electronic learning promotes innovative strategy in teaching methods with information of diversified learning environment. It has more variety of information resources in learning experience with the use of multimedia and non-verbal presentation by teaching material which encourages more and more self-learners to continue life-

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long learning without limitation of space, time and profession. It is a single point of access that serves as a gateway to variety of e-resources.

2) **M-Learning:** Mobile Learning is termed as m-learning which is enabled by the use of portable computing devices such as Smart Phones and tablet PC's communicating over wireless networks. The use of computing in teaching and learning is being extended to spaces beyond the traditional classroom and within the classroom, the teachers and learners are gaining more flexibility and new opportunities for interaction with each other through Short Messaging Service (SMS), downloading the course-content where lessons are provided in bit sized format, a fact which is appealing to make busy students through the Blue-tooth connectivity easily without Internet connectivity.
3) **Computer Assisted Instruction (CAI):** It is a development of systematic programmed learning and teaching machine. It is a self-instructional device with the principle of atomization. CAI is "Computer applications applied to traditional teaching methods such as drill, tutorial, demonstration, simulation and instructional games". It is an effective medium and an indispensable aid in the teaching-learning process. It is perhaps the best in classroom instruction, because it offers (a) Individualized Instruction, (b) Effective interaction with the Learner, (c) Immediate feedback, (d) Engage students as active learners, and (e) Promote student self-assessment and self-reflection. Thus there are so many advantages for an individual to enrich his learning to the great extent as one likes. The learner may feel that a best teacher is with him whenever one learns through Computer Assisted Instruction.
4) **Virtual Learning Environment (VLE**): VLE is a set of teaching and learning tools designed to enhance a students' learning experience by including computers and Internet in the learning process. The principal components of VLE package include curriculum mapping, student tracking, On-line support for both teachers and students.
5) **On-Line Learning:** It is synonymous with Web-based learning where learning is fostered via World Wide Web (WWW) only with Internet connectivity. It is pedagogy of On-line teaching and learning. The various strategies of Instruction was followed through On-line learning such as Conversing, Discussing, Mentoring, Questioning, Debating, Sharing data which is the necessary components for the teaching-learning process in the Classroom Instruction. The other important features of On-line learning are Analyzing, Seeking, Collecting, Organizing and Synthesizing, On-line information of knowledge resources towards the evolutionary growth of open, flexible, anytime and anywhere in learning.
6) **Blogs:** The term 'Blog' is a blend of the term, 'web' and 'log' leading to 'web log', which finally becomes "Blog". Blog as an educational tool can be integrated in multifaceted manner to accommodate all learners. As they are easy to create and update efficiently they can be used to inform students of classroom requirements, post handouts, notices, home work and assignments or act as a question and answer board. It provides conversation between the batch-mates in larger classes. A teacher can create and manage a blog to his/her professional interest and disseminate academic information and give instruction to their students on-line. The information or instruction through Blogs can be accessed by the students through the Internet connectivity everywhere even after the classroom hours

Benefits of digital technologies in today classroom instruction

There are ennumbers of benefits from the usage of digital technology in today classroom instruction. The benefits of this digital technological feature in today classroom instruction are as given below.

- Improves efficiency both in teaching and learning process
- increasethe motivation of students and teachers
- Paves way for Personality Development
- Active Participation of students and students
- Self-paced Learning Environment
- Very flexible and rich medium for students to access the information
- Better learning, Retention and Students' performance
- Multisensory Learning experience

Thus digital technology has enormous potentiality to deliver many numbers of benefits to the learners. Unless the teachers use electronic technology they cannot obtain up-to-date information to face the competitive world. Using digital technology is the need of the hour and essential part of the life of every individual who wish to enrich his life.

Integrate digital technology in today's classroom instruction

Teachers are encouraged to experiment and adopt a variety of innovative learner-centered, pedagogical teaching and learning approaches, in order to evolve alternatives to the traditional methods of teaching. The effective and efficient use of digital technology depends on technically competent educators/teachers. To implement digital technology based learning in the Teacher Education Programme so as the student-teachers while they become teachers in schools and colleges would be able to utilize digital technological tools in classroom instruction in promoting flexible learning environment to meet individual learning objectives of the subject content. The Four phases are there to integrate digital technology in today classroom instruction are as given below.

a) Developing Information and Communication Technology (ICT) literacy
b) Effective and Efficient use of Hardware and Software for teaching learning process
c) Technology based environment, networking and management
d) Adopt best innovative practices in the use of technological approach

If an Institutions or individual follows the above phases to integrate digital technology, definitely one can acquire the benefits in learning. If a teacher integrates the digital technology in teaching, it will help the teachers to discharge the duty effectively.

Conclusion

Transition, transformation and revolution are the present scenario of educational system. All process of learning is soon crossing boundaries and barriers. So, it requirea change in knowledge competencies and skills to deal with technological advancement in networking which is necessary to establish a network between students, educators, parents, institution and libraries and the world over. The four approaches which adopted in the technology such as emerging, applying, infusing and transforming will represent a continuum. The main purposes of implications of the study is to make knowledge free and seamlessly available to all those which need it for educational matters at anytime, anywhere and accessible from any device. The full benefit of this technology in the educational process is realized only by enhancing the technology skill of students and teachers, ensuring adequate system support and providing funds essential to build a new educational framework around the innovative resources. The students and teachers must work together to improve the utilization of technology in teaching-learning process and interaction among the learners society.

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Virtual reality and augmented reality effective usage in school education

Dhilip, S.
Doctoral Scholar, School of Education, Tamil Nadu Open University, Chennai, India

Preethi, V.
Doctoral Scholar, School of Education, Tamil Nadu Open University, Chennai, India

Dominic Rajaseelan, P.
Doctoral Scholar, School of Education, Tamil Nadu Open University, Chennai, India

Arul Lawrence, A. S.
Research Supervisor, School of Education, Tamil Nadu Open University, Chennai, India

Introduction

The use of technology in the classroom will undoubtedly improve the quality of teaching and learning. This digital integration is unquestionably necessary in all classes, from kindergarten to college. A teacher should choose appropriate technology tools based on the subject they teach, search for available materials, and organise classroom activities that incorporate this technology. The old school method of books and notes will not function in today's world. Teachers must keep up with current events and have access to the most up-to-date technology. They must incorporate these technology advancements into their curriculum while maintaining control over the classroom. For example, there are various school applications and smart apps available for toddlers that make learning and teaching a breeze. Personalized, technology-enhanced learning is unquestionably the way of the future in education.

Difference between AR and VR

AR and VR teachers can effectively deliver the concepts for information in engaging and entertaining ways. This virtual experience is very much needed for developing countries like India because this mitigates barriers of cost and distance. Virtual experience can be helpful for the students to experience the virtual laboratory where the not need to go to the manual labs and waste the chemicals. Through this virtual experience students can travel across the globe and visit any part of the world or go into any exhibition for museums and visit it sitting from their classrooms.

Classroom usage of AR and VR

We can give exposure to students visiting Anna Zoological Park Chennai sitting in the smart classrooms with internet connectivity .They can closely visit dangerous animals like lions, tigers and Cheetah sitting in their place even if they travel to the Zoo in person also they could not see those animals such closer as sitting and zoom in and see so closer using AR/VR. They can also dive into the sea and watch the Sea animals sitting in the smart classroom and experience the Virtual tour. The inner organ systems of body can also be viewed when they are experiencing the Virtual tour of human body using different applications. These AR and VR content include many libraries of digital content working with simulations medical concepts, arts, technical education, Humanities, STEM education, and for developing the communication skills and other 21st century skills etc.

AR and VR in Education

The teachers using AR and VR in the classroom can make it economically by selecting an appropriate gadget. Resources ranging from less expensive gadgets like Google Cardboard to cost-effective equipment that connects to smart phones are accessible without breaking the bank. Teachers may use resources which are affordable or even free apps such as ARLoopa which allows students to experience visiting different new places. Another app, Animal 4D brings animals into classrooms, Human anatomy brings in different organ systems and human anatomy into classroom.

Science teachers can do dissection of animals and visualizing organ systems and other science experiments are possible with this AR and VR integration.

Different AR and VR classroom resources

S. No.	Name of app/Software	Usage in Classroom
1	Apollo 11 VR	The Apollo 11 VR software immerses you in the body of an astronaut, allowing you to experience the legendary NASA mission firsthand.
2	Arloopa	Allows you to precisely position 3D items in AR.
3	AugThat	Virtual reality augmented library
4	Arize	Makes it possible to create a direct link to a website.
5	EONReality	Teachers and learners can collaboratively build a blended-learning environment that incorporates 3D, PowerPoint, sound effects, and notes, among other things using this app.
6	Google Cardboard	This Cardboard device is a virtual reality headset developed by Google corporation. This is used to interact with VR apps on smartphones.
7	Google Earth VR	Every lesson can be turned into a field trip with Google Earth VR! Take a stroll through Tokyo's neighbourhoods, fly over Yosemite or the Grand Canyon, and see historic landmarks like the Colosseum.
8	Google expeditions	You can take your kids on a virtual reality trip to learn about history, science, the arts, and the natural world. There's something spectacular to explore for every subject, whether you're roaming with dinosaurs or looking at Renaissance sculptures.
9	Nearpod	This is a free VR-based teacher resource .Near pod assists instructors in making any lesson, to use in classroom or online, interactive.. Using this a teacher can make interactive presentations with quizzes, polls, videos, collaborative boards, and other features.
10	Number hunt	This virtual reality programme in your math class is extremely entertaining and interesting. Students engage on a virtual trip to find and shoot numbers in order to learn to add, multiply, divide, and subtract in a fun way. Allow your kids to compete in your virtual reality classroom area
11	Immersive VREducation	Educators can develop their own lesson plans and immersive experiences with this open-source education platform.
12	Minecraft Education Edition	Students can now design their own virtual environments, such as Fort Clatsop or Jamestown, using the popular game's instructional component.
13	Schell Games	The purpose of interactive game experiences is to positively influence someone's knowledge, attitude, and habits.
14	Timelooper	Timelooper is a virtual reality time travel programme that allows you to go across the world and explore amazing locations and attractions. Your kids will be immersed in historical events as if they were present at the time.
15	Titans of space	Students can compare the sizes of planets and moons that have been scaled down to one millionth of their true size using this VR app. They also learn fascinating information about the planets. This virtual reality programme can be used to teach about space or other planets.
16	Tilt Brush	Tilt Brush focuses on painting, sketching, and making artworks, which is one of the most enjoyable lessons available! Allow pupils to create in the "air." They can use dynamic brushes and share their work online.
17	Unimersiv	This is a virtual university that offers a wide range of educational opportunities. You can visit the Titanic, fly into space, or travel back in time to the Roman Empire. This app is intended for educational purposes. This VR programme or virtual platform can also be used to educate biology.
18	Youtube VR	You can "teleport" to specific locations using the YouTube VR app. You can watch videos in 360 degrees, putting you right in the centre of the action. I really recommend the "travel" playlist. You can find engaging videos to teach children about nature, cultures, and history from across the world.

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Advantages and disadvantages of using AR and VR in education

Advantages

- Very effective to teach abstract concepts
- Useful to teach Science with virtual labs
- Virtual tours are economical
- Increase the curiosity of learners to learn in an engaging way
- It fulfils the needs of three types of learners Visual, auditory and kinaesthetic
- It is very effective for learners who are gifted, average and below average
- It helps teacher pre plan the activities and display in class

Disadvantages

- Integrating technology with pedagogy is challenging
- Proper training is needed for the teachers to use such technology
- Time consuming to prepare the gadgets
- The gadgets are expensive and all schools doesn't have the facilities
- This technology can't be used for all topics and all subjects
- The interest of students differs from one standard to another its difficult to fulfill the interest of all students.
- Time and classroom management is difficult while using this technology

Conclusion

There are numerous resources available for both educators and students. Virtual reality has a wide range of applications for different purposes ranging from agriculture to architect and so on. Indian projects on VR and AR are still in their infancy. The government has to take aggressive steps to address the flaws. Teachers using this Virtual reality, augmented reality, and mixed reality should judiciously use this in teaching and learning different subjects. AR and VR usage in our country should increase and the companies developing education related VR and AR apps should come forward to release more apps on this topic. Integrating technology to pedagogy will definitely lift the future of education.

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Augmented reality in education: Transforming the learning experience of learners

Seema Yadav
Assistant Professor, BSSS, Bhopal

Introduction

Human memory does not easily forget the visual learning inputs, based on this research based evidence, 2D and 3D objects are used in the classroom for facilitating learning. With the help of technology visual learning aids can be used in an effective manner. Among many technological tools of learning to facilitate effective learning, Augmented Reality (AR) is one of the teaching aids used in the classroom. Augmented Reality (AR) is having additional dimension of the object and give the 3D element in the visual experience to the observer and in education the observer is the learner. The Augmented Reality (AR) experience in education is thriving as a significant trend in educational sector, and it is estimated that by 2023 there will be 2.4 billion mobile users with Augmented Reality worldwide, However, there were only 200 million users in 2015 of Augmented Reality being used in mobile games like Pokémon Go and specially the social media platforms like Snapchat. However, education sector is another significant space where this technology can enhance the learning experiences of the learners.

Augmented Reality (AR) is a teaching- learning tool with visual graphical experience. In actual, Actually, Augmented Reality (AR) has the capacity of augmenting computer-generated graphics into the real environment on a screen. Augmented Reality (AR) enables learner/ observer to see a computer-generated object on the screen. Altogether, it happens in real time with a camera. This advance technique can enable students to learn in a more interactive environment. Augmented Reality (AR) technology majorly includes 25% digital reality and 75% existing reality in actual, It means it doesn't replace the complete environment with the virtual; rather, it integrates virtual objects into the real world. With Augmented Reality (AR) classroom education can be extraordinary and more interactive because it can enable teachers to show virtual examples of concepts and add gaming elements to provide textbook material support for visual experiences. Augmented Reality (AR) techniques are used extensively now a days in various real world applications for education,training, entertainment, tourism, and cultural heritage (Poux, 2020). The learning experience can becomes more meaningfulwhen maximum of the senses organs are involved. For this, a fascinating way of usingtheir senses is through visualization, which is a crucial and impactful way to improve and develop theircapacity to understand things(Çöltekin, A, Et al., 2020)

Augmented Reality (AR)

The Concept-Augmented Reality (AR) is constituted with superimposes sounds, videos, and graphics in an existing learning environment. It majorly uses four main components to superimpose images on current learning environments: cameras and sensors, processing, projection, and reflection in the learning environment. Each of these components of Augmented Reality (AR) provides an individual function such as cameras and sensors can detect an image's depth or calculate the distance between two objects before superimposing digital content atop the user's view. Projection and reflection in the Augmented Reality (AR) process also add virtual information over what a user sees; for example, a method known as projection mapping enables Augmented Reality (AR) apps are usedin this process to digitally overlay video onto any physical surface such as book page surface. As for processing and transmitting data, limited bandwidth and latency of wireless networks accessibility have typically posed a big challenges to wide-ranging adoption of Augmented Reality (AR) in education.

According to a study done on Primary school students, it was found that for primary students it is often find it difficult to understand the differences between two dimensional and three-dimensional geometric shapes at their stage. Taking advantage of the ability of virtual and augmented reality to visualize 3D objects for students, it was found that using virtual and augmented reality technologies for teaching the lesson of geometric solids to primary school children, positive result were found. (Demitriadou, Stavroulia, & Lanitis, 2020)

A study was conducted to find out the effect of the augmented reality based teaching-learning program on the motivation, attention and conceptual skills of preschool children. And it was found that Augmented Reality (AR) can help in providing motivation among preschool students (Aydoğdu, 2022).Augmented reality (AR) allows an educational application that promotes interactions in the classroom. A study concluded that Augmented Reality (AR) approach brings a sense of curiosity and satisfaction to the students, and also enhances their motivation because of its active and collaborative nature.(Saez-Lopez & Cozar-Gutierrez, 2020).In this regard, Augmented reality (AR) can be used in science lessons to motivate students to the lesson, to change students' attitudes, to help students overcome their prejudicesand to provide more effective results.(Arici, Yilmaz, & Yilmaz, 2021). It was concluded that

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Augmented reality (AR) has a positive impact on the motivation of middle-school students.(Di Serio, Ibáñez, & Kloos, 2013).The quantitative student evaluation done in medical education shows a positive development in the three sub-competences knowledge, skills and attitude among students. It was concluded that surgical teaching can be profitably used to develop digital skills of students. (Kuhn et al., 2021).

Augmented Reality (AR) technology has a vast potential and great pedagogical that offers new methods for the purpose of providing effective education to learners. Computer generated system with Augmented Reality (AR)allows user to see the real world environment with virtual objects superimposed or composite in real world. Although Augmented Reality (AR) withthe domain specific, pedagogical and psychological aspects have to be considered for real use in classwill enhance the educational outcome. Bistaman, Idrus, & Rashid, (2018) stated that the strategies such as collaborative learning were considered when designing and engaging) learning environment with an Augmented Reality (AR). Collaboration is to work together from one to other party where they can communicate each other to learn and get some mutual benefits (Bistaman, Idrus, & Rashid, 2018).

Visualisation in science and engineering education using Augmented Reality (AR) in the context of biology education based on constructivist and constructionist concepts. Augmented Reality (AR) can be implemented with using mobile technologies in biology education for future primary school teachers. With Augmented Reality (AR) Students' understanding could be deeper, with motivation creativity is strongly supported. Augmented Reality (AR) motivated to cooperate v well and learningbecomes constructive (Fuchsova & Korenova, 2019).

The development of augmented reality-based interactive multimedia can be used to improve the critical thinking skills of elementary school teacher education students in learning earth structure and fisheries material science. Development of media products determines indicators of learning, programming, display, and curriculum (Syawaludin, Gunarhadi, & Rintayati, 2019)

Augmented Reality (AR) make the learning process easy, and fun as compared to traditional methods. These methods lack focused learning and interactivity between the educational content. To make learning effective, we propose to use handheld marker-based AR technology for primary school students. Augmented Reality (AR) based learning materials can be used for learning performance, motivation, attitude, and behaviour towards different methods of learning. AR-based learning techniques canenhance students' learning motivation and performance as compared to the non-AR learning methods.(Afnan et al., 2021)

Advantages of Augmented Reality (AR) in Education

1) **Augmented Reality (AR) as an effective learning system-** Augmented Reality (AR) provide the learners to acquire knowledge through rich visual and immersion into the learning material. It can be stated that Augmented Reality (AR) targets an effective information gathering sense in learners with multisensory experiences.
2) **Augmented Reality (AR) for Easy and effective access to Learning Materials-** Augmented Reality (AR) can be used as a supplementary learning techniques to textbooks and it can be used in place of text books. As a consequence, Augmented Reality (AR) is having the capacity to reduce the cost of learning materials. Augmented Reality (AR) can be coordinated with mobile learning devices.
3) **Augmented Reality (AR) as Immersive Practical Learning-** in education, to deal with the practical aspect of learning, Augmented Reality (AR) can help very effectively.
4) **Augmented Reality (AR) for engaging learners-** Augmented Reality (AR) used in education can provide the situations for engagement of students. Augmented Reality (AR) makes learning interesting, fun, interactive and effortless. Interactive learning environment is the main virtue of Augmented Reality (AR). It provides vast opportunities to make classes less tiring by infusing unmatched interactivity through a computer-generated environment.
5) **Augmented Reality (AR) for transforming learning experience-** Augmented Reality can bring a breakthrough to the traditional education system by transforming the complete learning experience. Altogether, it can impact positively in the interest of students and make them efficient. Augmented Reality (AR) help students in comprehending the concepts of the subject in a technological immersive environment, which help to simplify the concepts and make the learning process easy.
6) **Augmented Reality (AR) for complicated content/ subject-** Augmented Reality (AR) help to deal with complicated subjects and complicated topics of study in syllabus. For example, to deal with the complex nature of Geometry in Mathematics, Augmented Reality (AR) is useful and effective. Augmented Reality (AR) is helpful in teaching of abstract concepts.
7) **Augmented Reality (AR) for creating interest among students for learning-** Augmented Reality (AR) can be used by the teachers using interaction and experimentation for exploring academic interest among students.

8) **Augmented Reality (AR) for inspiring learners' minds-** Augmented Reality (AR) can be used by teachers to inspire learners mind by providing them interactive and interesting environment.
9) **Augmented Reality (AR) for enhanced engagement of learners-** learning that incorporate Augmented Reality (AR) can help learners to become more involved in learning process. The interactive environment provided by Augmented Reality (AR) provide the hands on learning experiences to the learners. The learners are acquainted with practical skills.
10) **Augmented Reality (AR) for collaboration among learners and teachers-** Augmented Reality (AR) provide access to share content and that is beneficial to teachers and it also provide the spaces to collaborated with learners for meaningful learning. A collaborative learning environment provides students with increased motivation in the learning process because the students are actively engaged in the content creation process of educational process.
11) **Augmented Reality (AR) for multisensory experiences-** Teachers can plan for multisensory learning situation with the help of Augmented Reality (AR). Experiential learning situations can easily be provided with Augmented Reality (AR).
12) **Augmented Reality (AR) with element of Cost-effectiveness-** There are many contradictory arguments for cost effectiveness of Augmented Reality (AR). The cost of Augmented Reality (AR) has been identified as a barrier in adopting the technology on a wide range of applicability. However, smartphones and mobile phones are making the cost of Augmented Reality (AR) affordable and accessible to a wider range. This is the reason that Augmented Reality (AR) in teaching-learning increasingly becoming more cost effective to implement. At the same time, the cost of textbooks are also being replaced by Augmented Reality (AR) to make education process cost effective as a whole.
13) **Augmented Reality (AR) for training-** Augmented Reality (AR) can be widely used for training purpose in many areas with wider applicability. Industries like aerospace, aviation, military, hospitality etc. can be benefited with Augmented Reality (AR). In education, for training teachers , Augmented Reality (AR) can be used extensively. With Augmented Reality (AR), the cost and expenses can be reduced and training can be made more interactive.

Challenges of augmented reality in education

1) Training issues in Augmented Reality (AR)- The practitioners/Teachers may struggle in putting the technological skills into practice due to their non-technical background. Training of teachers for the technological skills and its application in teaching learning situations is a major challenge in the implementation of Augmented Reality (AR).
2) Augmented Reality (AR) and required Hardware- Augmented Reality (AR) is supported by hardware which is the basic resource in the process. In many social groups, having smartphone is always a challenge. Augmented Reality (AR) sometimes does not get support of required hardware in Augmented Reality (AR) application.
3) Augmented Reality (AR) and Content Portability Issues- Augmented Reality (AR) and its content portability are the issues faced when it is made applicable. The quality of Augmented Reality (AR) content is not same in all the devices that are used in practice.

Conclusion

With the emerging technologies of augmented reality (AR), the learning process in today's classroom has become much more effective and motivational. Augmented Reality (AR), a novel technology in education has been a special attraction for the stakeholders of education to improve the quality of education and increasing accessibility. Augmented Reality (AR), a renewable technology in schools continues to develop. Displaying the objects of learning in 2D and 3D in real time, Augmented Reality (AR) has revolutionised the learning situations. By making positive impacts in education, Augmented Reality (AR) can be used more widely across world. Augmented Reality (AR) is a supportive technology for the implementation of learning activities and it also creates experiences to the learners. However, learners should always be aware of the difference between the real world and the virtual world of learning. The technological and social changes related to use of advanced mobile devices can be implemented in educational process with great impacts.

Many Industries such as engineering and technology, manufacturing units, and outer space exploration use Augmented Reality (AR) in the business applications such as research and development. With the emergence of new educational technologies and adoption of smartphones in education, educators are expected to use Augmented Reality (AR) in the classroom for improving academic outcomes with the help of Technology. The use of Augmented Reality (AR) in education is helpful to learners in improving their knowledge of the subject, increasing their extrinsic motivation to learning and to improve their involvement in the learning process. Educational institutes should accept Augmented Reality(AR) application because using visualisation and its application in educational process brings a faster

understanding of the syllabus/ subject and increases the interest in learning the complex and complicated subjects.

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Variance of self-directed learning: Tracking pathways to success prepared

Balasubramanian, R.
Research Scholar, Tamilnadu Open University, Chennai

Manivannan, M.
Professor and Director, School of Education, Tamilnadu Open University, Chennai

Introduction

Self-directed refers to the self-directive process through which learners convert their mental abilities into task related skills (Zimmerman, 2001). Students explore themselves through play and apparently raise continuous questions during the vibrant period. They learn from their peer and influential adult to lead a healthy life-style from their surroundings and environment in which they live. Primary experiences may have sound effects on the progress of the students. Their physical and emotional abilities may persuade their intellectual development in many fields. The brain develops based on the quality and quantity of the stimuli it gets. Everyday practice strengthens their nerve in their brain. The practices of behavior and emotional response set in the initial period may become very difficult to change in later years, even though the brain continues to develop and mature in various fields. This chapter focuses on self-directed learning among students.

Three Pillars of Engagement for Self-directed learning

Academic, intellectual and socio-emotional are the three pillars of engagement for self-directed learning. All these are the enriching elements to develop ample of opportunities to the students. In educational institutions, it is observed that students involve themselves in academic, intellectual and social-emotional that is supported during students learning. The following three pillars of engagement are essential for self-directed learning.

1) **Academic engagement:** Academic engagement is needed for students to engage in their academic work. It is explained as a hard work committed by students to all the academic activities. It is achievable only if the students are actively interact with their peer groups and teachers. It is also possible if they are involved in all the academic activities with adopting to educational conditions and environments. Academic disengagement may result toward unfavourable results such as poor performance of academic achievement, failure and dropout.
2) **Intellectual engagement:** Intellectual engagement is about rising the inquisitiveness and impudence to approach with concepts, ideas and issues which results to explore, investigate, problem-solving and inquire over a fixed period of time. Students learn better when they are actively involved in work that is enthusiastic, personally relevant, appropriately challenging and while receiving regular feedback on their progress. It also develop students' critical and creative thinking, teamwork, negotiation, decision-making, synthesis and problem solving skills.
3) **Socio-emotional engagement:** Social and emotional engagement is a primary part of education and human development. It is the process through students applies their knowledge, skills, and attitudes to develop healthy identities manage emotions and achieve personal and collective goals, feel and show sympathy for their peer groups, create and maintain supportive relationships and make responsible and caring decisions (Archambault et al., 2009). Social and emotional engagement enhances educational fairness and fineness through school-family-community partnerships to establish learning environments and experiences that attribute collaborative relationships. It supports various forms of bias and empowers students in every aspect of their life (Fredricks et al., 2004).

Three Components of Self direction Learning

There are three components of self-directed learning. They are as follows:

1) **Cognition Component:** Cognition component includes skills and habits that are needed to memorise, encode, think critically and recall information.
2) **Metacognition Component:** Metacognition component skill enable the learners to understand and monitor their cognitive processes. It is closely related to learning processes and academic achievement as it includes awareness of individual's own thinking processes and ability to control his/her own cognitive system.
3) **Motivation Component:** Motivation component indicates the selection of one's learning path. Students who have been praised for discovering independent ways of thinking, are more likely to

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be self-directed learners. The method and the approach of motivating will differ from one student to another student.

Features of Self-directed Learning

Self-directed learning is an integrated learning process which includes a compact of positive behaviors that influence student's learning. These processes are planned and modified to support the recreation of personal achievements and learning skills. Self-directed learning is not a mental ability, but a self-directive process in which students transfer their mental abilities into academic skills. It refers to self-generated thoughts, feelings and behaviors that are intended to reach their goals. Self-directed learning is essential because it is the development of everlasting learning skills.

Self-directed learning is supported by meta-cognition, purposeful actions like planning, monitoring, and evaluating personal progress which leads to learn. Self-directed learning ensures autonomy and control. Specifically, self-directed learners are aware of their academic strengths and engage in their academic tasks. Students hold confident about intelligence and attribute their successes or failures within their control. Self-direction in learning can create long-lasting learning. The features of self-directed learning are as follows:

- Students' efforts and planning for learning.
- Can recognize and deal with their own educational needs without being in a formal education system.
- Students' experiences are revealed to meet a part of their educational needs by searching knowledge from various sources.
- Self-directed learners could apply their creativity to learn better and could increase their learning by getting multiple learning skills, including note-taking skills in the classroom and during their study.
- Promote their efforts to learn better.

Process of Self-directed Learning

The social learning psychologists perceive the structure of self-directed learning processes in three cyclical phases. They are: forethought phase, performance phase, and the self-reflection phase.

1) **Forethought phase**: Forethought phase refers to processes and beliefs that begins before an attempt to learn. Self-motivation and task analysis are the two major part of this processes. Self-motivation includes students' beliefs about learning, such as self-efficacy about having personal potential and consequences of learning whereas task analysis includes strategic planning and goal setting.
2) **Performance phase:** Performance phase processes are classified into two major classes such as self-control and self-observation. Self-control refers to the use of specific methods or strategies which are chosen during the forethought phase. It includes the use of imagery, self-instruction, and attention focusing and task strategies. Besides, self-monitoring is a hidden form of self-observation which refers to one's cognitive tracking of personal functioning.
3) **Self-reflection phase**: Self-reflection phase includes two major classes such as self-judgment and self-reaction. These are the two forms of self-judgment. Self-evaluation refers to comparisons of self-observed performances against some standard and self-reflection which refers to beliefs about the cause of one's errors or successes.

Application of Self-directed Learning

There are many applications that can be practically applied for self-directed learning process. Literacy instruction, cognitive engagement and self-assessment are three main areas of self-directed learning to direct its activities in classrooms situation. While instructing, teachers can teach the important areas by using various methods such as open-ended tasks and problem-solving methods. All these are student-centered and inquiry based. This strategy would allow them toward autonomous. However, students are expected to realize the importance of utilizing them in order to experience academic performance.

Role of Teacher in motivating Self-directed Learning

Teacher's role in promoting self-directed learning among students in the classroom can be illustrated in many aspects. On the one hand, teachers need to train students to be strategic learners to make aware of their potential strategies, attribute success to good strategies, select and monitor suitable strategies. Teachers shall provide students with instruction in managing and incorporating their goals to reach positive effects and outcomes in their performance. In addition, teachers role in classroom are as follows:

1. ***Initiating Task analysis:*** Task analysis can be implemented by dividing the complex skill or activity into smaller units and teach the succession of each step. It may be useful for a wide and large range of their abilities.
2. ***Monitoring:*** Monitoring takes place during written practice, when the purpose is to spot out the errors and encourage self-correction. Guided practice activities, specifically are monitored for accuracy, whereas less guided group- work activities are monitored for task achievement.
3. ***Self-Assessment:*** Self-assessment fosters planning and assesses what skills the learner has and what skills are essential. Teachers have to allow students to internalize standards of learning so they can regulate their own learning.
4. ***Wrapper Activity:*** Wrapper-activity is an activity-based pre-existing learning or assessment task. This activity can be given as homework a assignment. It consists of self-assessment questions to complete before completing homework and after completion. It is a follow-up activity. This will enhance the learners to plan and prepare their own conclusions about the learning process.
5. ***Initiating the student to Think Aloud:*** Think Aloud involves thought process in solving a problem. In Questioning, students may follow new material and develop questions about the material. As students think out loud with teachers and with one another, they slowly internalize the conversations and it becomes their inner speech, the means by which they monitor their own behaviors and problem-solving processes (Tinzmann et al. 1990).
6. ***Students' use of learning strategies:*** Use of different learning strategies can inspire the students in the classroom practice such as visualization, cooperative learning, inquiry-based instruction, differentiation and teaching using technology in the classroom. It is based on the beliefs that different strategies are essential for learning, and that overcome obstacles in an effective way. Students who are not self-directed learners may involve in day-dreaming, delay in completing their assignments or sometimes forget to complete their assignments. Those who do practice self-regulation ask questions, take notes, allocate their time effectively, and use the resources available to them. **(**Schunk, 2001).
7. ***Providing positive feedback:*** Teachers can motivate students through positive feedback. Students often adopt their teacher's evaluations of their work as their own, which means that teachers can highly influence student's persistence in engaging with a task or giving up. Besides, developing a habit of knowing the mistakes as an opportunity to learn is also important. Generally discussing areas of improvement will pave way for growth, and an addition of positive feedback. Teachers can differentiate their level of weakness and strengths of their students in a particular task.
8. ***Creating a conducive environment:*** Teachers can make sure that the study environment is conducive. While discussing an important part of learning, self-direction becomes much more challenging in a noisy environment. This is particularly important that students should not be distracted so that they would be paved toward critical thinking skills. Teachers can further support by open-ended and complex tasks that give them the opportunities to prepare the way to control their distractions and maintain focus towards their goal. It can help them to develop better learning habits and strengthen their study skills (Wolters, 2011).
9. ***Guide students to track their progress:*** Students can self-monitor by tracking themselves to become aware of their strengths and weaknesses of their own knowledge through practice, recall according to the nature of their aim. Some students may try to improve their time management skills. These students would benefit from maintaining a record of how to spend their time and then referring it with their tasks.

Conclusion

To conclude self-directed learning has a deep effect on students to become self-directed learners. The most important thing is that it needs to explore the relevant strategies training in a supportive learning environment. It is the duty of the teachers to find a better method to achieve an educational goal and promote students to be self-directed learners. In short, teachers, as the strategies trainers and environment constructors, play an important role in this process. Establishing new habits, teachers can work meticulously to guide and support learners to become successful and independent learners.

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Vocational education: It's challenges and measures as reflected through present-day India

Masuda Hasin
Asst. Prof., Dept. of English, Dhubri Girls' College, Dhubri, Assam

Objectives of Writing this Paper

A few objectives of writing this paper are as given below:

- To discuss how vocational learning plays a very important role in skill development preparing students for future jobs.
- To find out whether vocational learning increases self-confidence, competency, ability and completeness among students or not.
- To describe the extent to which educational institutions are facing challenges to fulfil the mandate of the NEP.
- To emphasize how the report makes several suggestions and recommendations for the solution of such challenges.
- To discuss some systemic issues that has led to the delay of vocational education in India.
- To find out whether the NEP addresses the existing challenges and sets fixed future goals for vocational education.
- To reveal narrow social mindsets not attaching status and importance to vocational education.

Methodology

Methodology used in the paper is:-

- Descriptive and analytical methods.
- Survey method.
- One of the research methods applied here is qualitative and not quantitative.
- Though both primary and secondary data are found but mostly secondary data is used here in the paper.

Introduction

The National Education Policy 2020 deeply discusses about the implementation of vocational education in secondary education to bring in vocational education into mainstream education. An urgent need of The Technical and Vocational Education and Training (TVET) system arises to meet the requirements of Indian students and also to meet the aim of inclusive and equitable growth in India. There are always a number of organizations revealing their own views and opinions regarding vocational education like the Kothari Commission of 1966 as reporting on the diversification of the curriculum at higher secondary levels through vocational courses and also the National Education Policy, 1986 focusing on the improvement of the organization and management structure of vocational education. Yet, it is a matter of grief to say that over the years, not any fastest growth is witnessed in case of vocational education.

It becomes most urgent that graduates have acquired some skills along their main subjects' right from their schooling to college period. As students lacking the necessary skills may often get nervous and are always about to lose confidence finding themselves in any new situation. Even finding themselves in various businesses they may feel frustrated both for losing money and time, they may also find themselves in great problem when they are to train such new employees lacking both the insight and practical knowledge. Therefore, students need various trainings for the acquisition of various skills on their part so that they can feel confident in their abilities after the completion of such courses or trainings finding them fitted enough to work anywhere, in any particular business or factory. So, naturally their confidence level begins to grow and this is a very positive sign found in them.

Vocational learning plays a very important role in skill development preparing students for future jobs. Whereas theoretical learning requires plenty of hours on behalf of students, in the field of vocational education and training, students spend hours in the practical workshops to learn practical skills. As when in the library and in case of computers conducting research and writing papers students build their theoretical knowledge in a variety of fields. They begin to spend much of their time understanding theory, ideas, and procedures used by others. In such cases, the skills for work acquired by students are limited as their theoretical knowledge is not fruitful enough in applying to the practical field. Apart from vocational learning, students spend more time in learning work opportunities to prepare themselves for their future jobs. In their case, more focus is given to learning the practical. As a result, when they are to join real-life

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jobs, they already have acquired the needed experience to begin the job. Thus, in case of vocational learning, students find themselves as quite competent and complete and valuable employees. This increases their self-confidence due to which they can build their career faster and thus they become successful in their life.

The National Education Policy 2020 deeply discusses about the implementation of vocational education in secondary education to bring in vocational education into mainstream education. An urgent need of The Technical and Vocational Education and Training (TVET) system arises to meet the requirements of Indian students and also to meet the aim of inclusive and equitable growth in India. There are always a number of organizations revealing their own views and opinions regarding vocational education like the Kothari Commission of 1966 as reporting on the diversification of the curriculum at higher secondary levels through vocational courses and also the National Education Policy, 1986 focusing on the improvement of the organization and management structure of vocational education. Yet, it is a matter of grief to say that over the years, not any fastest growth is witnessed in case of vocational education.

Generally, the graduates struggle to find employment after the completion of their degree course. Even after getting a job, a student may not become sure about his job worrying about the suitability and satisfaction of it to him. But students completing graduation from a vocational training school may not confront with such situation. In case of vocational learning, experience gives employers more insight to do well-performance on the job. Students are able to build fitted resumes for future jobs through their practices in vocational learning even before completing their graduation. Thus, students can excel in a particular field resulting in their positive future.

CBSE gives the following types of vocational courses to be studied along with regular school education:

- Business and commerce courses, such as, stenography and computer application, accountancy and auditing, marketing and salesmanship, banking, business administration etc.
- Engineering and technology courses,
- Health and paramedical courses,
- Fashion and textile courses, such as fashion designing, dyeing and printing
- Agricultural courses, such as poultry farming, food service, catering etc.
- Other courses like transportation system, life insurance etc.

Similarly, according to the Indian Certificate of Secondary Education (ICSE) the following choices of vocational subjects should be given to students:

- Mechanical and technical courses like civil and telecommunication engineering.
- Offset printing and graphic designing technician courses
- Interior and exterior design
- Business studies
- Physical education etc.

Besides this many state governments offer the following vocational programs for the Indian students:

- Computer courses**:** MS-OFFICE, computer hardware and graphic designing .
- Management courses,
- Women-oriented courses**,**
- Educational courses like Spoken English course ,
- Media courses like reporter, anchor, editor, photographer etc.

According to the NEP: 2020, there should be provision for quality vocational education in higher education system. NEP further states to implement some important vocational crafts, such as carpentry, electric work, metal work, gardening, pottery making, etc. into the vocational education course, as decided by States and local communities during classes six to eight.

Aiming at the universalized education, the policy intends to attain 100% Gross Enrollment Ratio (GER) in schooling by 2030. The NEP 2020 Not only so it proposes a few changes by opening Indian higher education in foreign universities and also talks about the introduction of a 4-year multidisciplinary undergraduate program and gives importance to the preparation of National Curriculum Framework for Teacher Education (NCFTE) by NCTE in consultation with NCERT.

Emphasis is also given to the factor that every child should learn at least one vocation and be exposed to several more so that out of these, students will be able to choose the subject according to their interest. The Policy also insists to apply a 10-day program with local vocational experts. It also proposes similar internship opportunities to students between classes six to twelve. The NEP also talks about the implementation of the national effort ensuring universal access and affordable opportunity to all children of the country for obtaining quality holistic education on their part.

The problems and challenges of vocational education lie on the fact that people having narrow mentality of society do not attach status and importance to vocational education. Accordingly, it is given little priority as compared to other streams of education. Another reason for the failure of vocational education in the education system in India is inadequate equipment, lack of trained vocational teachers, and lack of importance given to students from this stream in admissions to higher education. .

That is why this sort of problem is rightly called by scholar Philip Foster as the Vocational School Fallacy deeply reflecting a situation where vocationally trained students are interested to pursue higher education to get more decent jobs of high weightage. Thus, NEP 2020 gives less importance on the theoretical part of vocational training emphasizing teaching only practical aspects. The NEP also emphasizing the credit-based National Skills Qualification Framework (NSQF) introduced in 2013, the NEP wants to help in the assessment of prior learning of the students for measuring their practical experiences and appropriate level of the framework.

To overcome the situation of social factor attached to vocationalization, the NEP recommends:

(i) The inclusion of vocational education programmes into mainstream education in all educational institutions;

(ii) The teaching of vocational courses should be implemented from class 6 onwards, mostly in the form of internships and practical activities emphasizing that every student should study one vocational course.

With the intention of making the NEP implementations successful, educational institutions should overcome the narrow mindset prevalent today in society and also to prove the fact that TVET is as inferior to regular school and college education as it is suitable for students who are unable to cope with mainstream education. A student acquiring a vocational course is not given equal respect to those students completing higher education. Schools have not succeeded in overcoming this problem till today for a number of reasons. Thus, management committee along with teachers at schools and colleges should overcome their lack of knowledge thereby introducing vocational education and also embracing the task of integration with enthusiasm and commitment.

The NEP supports the Education 2030 Agenda and also becomes hopeful of introducing and expanding TVET for the successful attainability of social justice and livelihoods by providing quality lifelong learning opportunities to all. The report also intends to provide inclusive access to TVET, particularly for women. Instilling a sense of pride among its youth is also highlighted by the report.

The policy also supports 2030 Agenda for its Sustainable Development Goals. The renewed education agenda is going to transform the lives of individuals, communities and societies, guided by the concept of lifelong learning. For attaining the objectives of TVET the report points out the following recommendations:

- Vocational education should take learners as the basis of their study.
- Proper ecosystem for teachers, trainers and assessors should be created.
- There should be focus on skill-acquisition and lifelong learning.
- Taking into consideration of TVET for women, differently abled persons and other disadvantaged learner, there should be provision for inclusive learning,
- Digital provision for vocational education and training.
- Introduce innovative models of financing TVET.
- Establish a coordinating mechanism for inter-ministerial cooperation etc.

Learning Outcomes or Findings of the Paper

1. It is found that though NEP 2020 puts a lots of efforts to make it a success ,but vocational education couldn't be implemented properly in the education system of India due to inadequate equipment, lack of trained vocational teachers, and lack of importance given to students from this stream in admissions to higher education.
2. It is also seen that vocational education is given little priority and low positioning when compared to other streams of education. Besides due to the low social mentality of not attaching status and importance to vocational education, this becomes a reason for the failure of the proper implementation of vocational education in India.
3. It is also found that NEP 2020 also makes several suggestions and recommendations for the solution of such challenges.
4. No proper implementation for digital literacy among the students has become more critical as compared to before.

Suggestions

No doubt, NEP 2020 thought about the implementation of a number of issues in our education system also giving importance on vocational education. In addition to these, there should also be the provision and inclusion for some other skill education as part of vocational education like implementation

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of sewing and embroidery, cutting, cooking, parlouring, hair-designing, fabric etc., in our education system in order to fulfil the future needs of our students for their survival in society.

Conclusion

Thus, there are some primary agencies responsible for the implementation of vocational education and training in the country. As for example, Ministry of Human Resource Development, Ministry of Labour, Ministry of Skill Development and Entrepreneurship, and National Skill Development Council etc. Even Skill India Mission in the past has not had the desired impact. Thus, to bring in systemic change as recommended by NEP 2020, there arises urgent need for the efficient use of budgets. Even the government starts to fulfil the gaps between the demands of industry and supply of vocational courses so that skills can be available according to the jobs. Along with these challenges, there should be the provision for digital literacy in vocational education when the world moving towards a digital order, technology-based skills, especially, among the students.

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Influence of AI in education system

Rahul Raj, P. V.
PGDDSA Scholar, Department of Information Technology, Kannur University, Kannur, Kerala

Ebin Antony
Assistant Professor, Department of Information Technology, Kannur University, Kannur, Kerala, India

INTRODUCTION

Artificial intelligence (AI) is an emergingtechnology, described as "the capacity of a machine, such as a computer, to execute activities that would typically require human intelligence". Artificial intelligence is very useful in many fields such as health care, Autonomous transportation, Business, criminology, military, and educational field. Improvement in user experience and efficiency, Reduction of errors, increase in speed and the ability to do risky tasks that cannot be done by humans, etc, makes Artificial Intelligence makes more relevant. The education system plays a major role in building a disciplined and well-balanced society. From Egyptian and Mesopotamian, civilization onwards, education practices can be seen. It helped very much to build a better society and to transmit the acquired knowledge and cultural values from one generation to another. AI can help the instructors to understand the tendencies of students as well. After the widespread of COVID-19 around the globe, according to Statista, the demand for educational apps increased due to the lockdowns [2]. Covid – 19 increased the demand for Artificial Intelligence in the educational system as well.Just as much has changed the industry with the advent of Industry 4.0, so has the education sector with the advent of machine learning [3].

Artificial intelligence in education

Artificial intelligence aids in the rethinking of our whole educational system, resulting in a whole new better experience for students and instructors by giving more personalized and diverse learning opportunities. Many major educational institutions are seeking to implement artificial intelligence by providing customizable software-driven tutors, developing Smart Content, learning analytics, chatbots or virtual assistants, Personalized learning programs, and customizable self-assessment tests in their platforms. This is accomplished primarily via the use of speech recognition, computer vision, deep learning, Natural language processing, and machine learning.

AI software systems can exploit incredibly detailed patterns of information and accurate assessments of student behavior. This approach can aid in identifying students who may be in danger in terms of academics, social life, or financial stability. The data can be used by institutions to determine whether students are eligible for financial help or other interventions. However, these technologies may present privacy and autonomy problems for individuals.AI meets the particular demands of students, leading to higher productivity. AI also saves a lot of time for tutors. They don't need to spend extra time explaining complicated subjects to learners over and over again. As a result, Artificial Intelligence is now extremely relevant to any educational institution.

Impact of artificial intelligence in education

Artificial intelligencehas evolved tremendously in recent years, and they now have applications in almost every business industry. Among them, Artificial intelligence has the most influence on the education sector. Artificial intelligence in the education industry has also allowed us to potentially provide universal access to learning and outsource some administrative work. AI can also be used in facial recognition, behavioral Identification, and biometric identification. And it is very useful for instructors and parents to understand each student's involvement, response, and performance in real-time.

Similarly, the designing of personalized study methods using AI helps the learners with specific needs as well. That is, Companies can deliver differentiated curricula depending on student interest and skill evaluations by utilizing AI.considering each learner in a separate customizable manner helps to increase the efficiency of learning also. In short, AI is revolutionizing the educational sector.

Advantages of AI in education

Artificial Intelligence is the combination of deep learning and machine learning. AI-powered digital platforms like ITS (Intelligent Tutoring System) and ILS (Intelligent Learning System) allow students to explore the material on their own. ITS is built to keep a record of a student's progress, which gives tips and choose practice problems that will help learners to learn new abilities. Similarly, Teachers can use Integrated Learning Systems to track students' progress and offer timely feedback so that they can grasp the topic through hands-on experiences.

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According to UNESCO, learning with Artificial Intelligence, learning about different AI technologies or approaches, and preparing for AI are the 3 areas where AI and education intersect [4]. To develop AI skill frame frameworks and manage online repositories UNESCO currently doing a project called "Teaching artificial intelligence at school". The main goal of this project is the popularisation of both the technological and human components of AI into student education programs.For students with learning difficulties, such as those who are deaf or visually impaired, AI opens up new methods of connecting by using Assistive Technology. By using AI, courses can be created on learners' specific needs. This is called Personalized learning. It is helping the teachers to develop a better picture of how their learners understand as well as allowing them to customize the course accordingly. Similarly, students might avoid embarrassment by using chatbots or virtual personal assistants, and they can keep asking the same questions again and over until they get the concept.

The real-time problem-solving assessment tests and analysis of the engagement of each learner in the course are very helpful for parents and tutors to understand the condition of their students in a real-time manner. Another important AI-enabled technique is virtual reality learning, which allows the students to interact with the 3-dimensional simulation created by using computers. Online and remote learning is becoming increasingly popular in this digital age, and many individuals are beginning to see the advantages of using an online learning platform. With such substantial changes, it's only natural that we use technology to enhance the learning environment's potential.

AI can help the instructors to understand the tendencies of students as well. For example, if a large no. of learners is selecting the wrong options in an assessment test, the instructors can understand the problems in their course structure, and thereby, the quality of the course can be improved.Nowadays many companies are using chatbots and other bot services to improve productivity and to save the time of both employees and customers. In the education sector, also these types of AI chatbots are used. They are virtual tutor assistants which help to reduce the tasks of teachers and, these chatbots are designed to answer the commonly asked doubts of learners on the subject, assignments, deadlines, and course. These AI chatbots are also useful for monitoring the learner's signs of progress, guiding the learners, education consultancy, and analyzing the individual feedback of learners on tutors and the structure of the course. Thereby, tutors can give suggestions to the learners and improve themselves.

Predictive Analysis and Dynamic Planning AI can learn the habits of students and thereby, provide the most productive study plan for them via predictive computing. Another important AI technique used in the educational sector is gamification. It helps to reduce the stress, facilitation of the learning process and improves the engagement time of users. Similarly, AI can form communities that are specifically suited to either a task or groups that balance one student's flaws with another learner's talents by monitoring learner data.In recent years, the popularity of voice assistant services like google assistant, Siri, Cortana, and Alexa increased. These platforms are very useful for students to collect study material from the internet very easily. AIED (The International Artificial Intelligence in Education Society) is a collaborative organization thatwas established in 1997, helps at the intersection of computer science, education, and psychology. Analysts predict that the implementation of Teaching and learning will expand by 43 percent between 2018 to 2022, as per the 2018 Horizon research.

AI technology is used in plagiarism checking, APA Citation generation, transcription of lecture notes, academic research purposes, to increase the integrity of examinations, managing learning systems, to connect different campuses in a university, staff scheduling, timetable making, parent-tutor communication, automation of administrative tasks, in smart classrooms,maintenance, personal development, and cyber security as well.

AI-based solutions in education

Many online platforms use AI techniques to improve their productivity and reduce manpower.AI technology can be used in both the higher education sector as well as lower education sectors. Grammarly is an online platform that can be used for checking grammatical, spelling, and punctuation mistakes in a text document.Nowadays, they provide real-time suggestions and real-time semantic analysis of text data as well.A powerful artificial intelligence algorithm created to evaluate sentences written in English underpins all of Grammarly's products. Grammarly's team of computational linguists and deep learning technologists uses cutting-edge algorithms that analyze millions of lines from research corpora to discover the rules and hidden patterns of effective writing.Reading and re-reading detect plagiarism, allowing educators and students to promote originality while still respecting the work of others. Similarly, English Language Speech Assistant (ELSA) is another platform in which AI helps the students to improve their fluency and performance in the English language. Brainly also uses AI technologies. It is a platform, designed for mostly high school and middle school students to solve homework and assignments. Brainly mainly uses Machine learning and AI techniques to provide the most reliable and accurate information to users. They use Machine learning algorithms, especially, for automatic spam detection and to filter language.

Mikais a virtual tutorthat uses AI techniques to deliver a personalized learning experience to students by interacting with them. To make mathematics easier platforms like Thinkster Maths, MATHiaU,Third Space

Learning, Socratic and iTalk2Learn uses different AI techniques like adaptive sequencing, voice recognition, AI-enabled chatbots, etc. Nowadays, AI-powered assistants are also available on the Internet. DataBot, Hound, and Youper are AI-powered virtual, voice, and emotional health assistant platforms respectively. The Georgia Institute of Technology created Jill Watson, an AI-enabled virtual teaching assistant, in 2016. Nowadays there are platforms like 'essayservice' to get proper guidance to assignments and tasks given by tutors in classrooms also.

SmartEd is an app that allows users to learn in real-time collaboration with the teachers with the help of personalized learning techniques and gamification. It helps the students to learn the subjects with fun.Nuance is a speech recognition platform designed for students and tutors. Similarly, KidSense is a platform designed for children to recognize and translate the voice of younger learners. Coursera is one of the biggest online course platforms available for learners which provides access to more than six hundred courses from high-ranking education institutions across the globe, in many languages. It also uses different AI technologies and enables busy students to learn remotely or on the go.

Cream101 is another AI technology that can turn any textbook into a smart study guide and thereby students learning experience can be improved.At the same time, Palitt is another AI technique that is designed to help the tutors to create theirs on customizable lecture series. Similarly, JustTheFacts101 is designed to behave as the AI counterpart of a traditional yellow highlighter, marking and creating book and chapter summaries in real-time. The Quizlet app is a cutting-edge tool for today's students, giving exam preparation suggestions. Students may put their memory to the test while also learning about coding, other languages, and science. Students can make their flashcards or use existing ones to learn about their chosen topic. In short, nowadays most learning platforms use different AI techniques to improve the productivity and learning experience of students.

Impact of Covid-19 lockdowns

The novel SARS-CoV-2 coronavirus disease was first reported in December 2019in China [5]. for preventing the widespread virus, the Indian government announced a national lockdown from 25th March.After announcing lockdown, educational institutes, most of the industries, shops, flight services remain closed, reduced the vehicles on the road and people started to stay home.So that, the use of traditional teaching or educational methods declined and the use of online platforms like zoom, google meet, google classroom, and Moodle increased after lockdown phases. According to the analytics results of Statista on the covid-19 lockdown period, the demand for educational apps increased due to the lockdowns. Similarly, the number of learners using educational apps like Coursera, Byju's, Vedanta, Khan Academy, and Simplilearn also increased during the pandemic situation. In short

Disadvantages of AI in education

AI is revolutionizing education in every way, from program creation to testing.At the same time, there are some disadvantages and challenges for Artificial Intelligence.When the expenses of implementation, repairing, and maintenance are summed up, it's undeniable that AI is expensive. So, only the most well-resourced institutions will be able to take full advantage of Artificial Intelligence.Another very important cons of Artificial Intelligence are, it may Make teaching more efficient and it may reduce the demand for tutors in the real world.

The introduction of massive open online courses (MOOC), and AI implementation at the school and college level may result in a reduction in teaching aids and helpers. It may lead to the increase of unemployed, educationally qualified, experienced tutors.As we have seen in many movies and Sci-Fi books, there is a possibility to teach one computer to another and which has a negative side as well. Similarly, we risk becoming addicted to technology as we depend on technologies to make work more efficient. Although intelligent technologies increase the learning experience, they should not be viewed as a replacement for social connection. Depending too much on those technologies to grade or assist students may lead to educational errors that harm rather than help students.

Conclusion

AI is an emerging field in computer science. Using different techniques of machine learning, data science and computer vision in education helped the education sector to change its traditional ways, and AI opened a new door that enables the learners to study more clearly. Using AI technologies in education reduces the workload and mental pressure of tutors and students as well. There are more positive aspects when it comes to artificial intelligence. To truly benefit from AI, however, equilibrium must be maintained between the computers that enhance tasks and the humans who employ them. Inside the classrooms, AI technology should not be used to substitute teachers. Their occupations should be made simpler as an outcome of this. Another important thing is, AI ensures that students, regardless of social status, ethnicity, gender, sexuality, racial origin, or physical or mental disabilities, have access to quality education.

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Modern teaching and learning techniques for today's classroom instruction

Sreeshma, K. S.
B.Ed. Student-Teacher, Krishna College of Education for Women, Elayampalayam, Tiruchengode

Samidass, S.
Assistant Professor in Education, Krishna College of Education for Women, Tiruchengode

Rajkumar, R.
Assistant Professor in Education, Krishna College of Education for Women, Tiruchengode

Introduction

In the pandemic period, the education system found a new way of approaches through many Modern techniques. These modern techniques are a new and innovative way of learning. It nurtures the mindset in students, emphasizing future ready skills to help them thrive the jobs and overcome the difficulties in future. Education for the future should be able to play its role in creating innovative and effective learning. "Technology and Knowledge would play an important in value addition to our core competence of natural and human resources, a must of achieving our vision of 2020 that is of sustained development." –Dr.A.P.J.Abdul Kalam, 2003. Modern Teaching and Learning Technique is a important in this technological age. Nowadays, as classes are modified and equipped with Modern teaching aids such assailers, Online Streaming videos, Interactive white boards, Projectors, Educational Software, etc it helps the teacher to explain the concept better and faster. The aim of this paper is discussing the importance of the modern techniques over the traditional methods and their advantages and types.

Traditional methods of learning

Traditional method of teaching is a method of learning there where both the students and the teachers are physically present in the classroom. Traditional methods of learning is mostly teacher centered learning where the teachers recite the whole things and the students just follows those. In traditional methods of teaching the whole thing the books are memorized by the students rather the understanding their meanings or its importance. Some methods of classroom learning include chalk and talk method, direct instruction, homework, memorization, etc.

Need for modern techniques over traditional techniques

- In traditional methods of learning, teachers used to talk for hours without even realizing whether the students are listening or not.
- The materials available were will be teacher centered notes.
- Students got obsessed by Rote learning method since understanding is very less.
- Traditional methods were mark oriented rather the result oriented.
- Theoretical knowledge is given much importance rather than practical knowledge or real life situations.
- The student teacher ratio was very high, that the individual attentions for the students are were very less.
- Traditional methods of teaching had limited scope, and had been failed both a the nation and personal level.

Modern teaching and learning techniques

Modern techniques of teaching and learning are student centered learning where the importance is given to both the teachers and the students. The teachers primary role is to coach and facilitate student learning and overall comprehension of material, and to measure student learning through different forms of valuation. In recent years the advancement of technology and internet has made anew reform in the field of education. Teachers and students are using internet as a main base of communication through which the information are passed and group discussion are done. Some of the modern methods of teaching and learning are discussed below.

Objectives

- Students like the way the subject is presented since it is done in an innovative way.

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- The use of modern techniques in teaching and learning provide one to one interaction with the students.
- Modern techniques aim at the time management and coaching the students to the maximum extent.
- Students are made available with the quality materials for learning rather that the teacher notes.
- Students are enhanced with cooperative as well as collaborative learning activities.
- Modern techniques, in learning identify the problems faced by the students and help them to overcome those.
- It helps in developing self learning habits in students.
- To help the students to gain the knowledge about the recent development in the field of science and technology.

Characteristics of modern teaching methods

1. **Learner centered:** Modern techniques aims at being student centered rather the teacher centered as in traditional method. Teachers, here only act as a role of a guide or a mentor. The subject can be learned with the complete involvement of the learner.
2. **Activity based:** The teacher or the guide prepares the activity for the students to get involved in learning process rather than just being listeners in the class. This helps the students to get eagerly participated in the learning process.
3. **Resource based:** The teachers should collect materials from various sources and that can be used up the students for learning and to understand the topic clearly. The resources can be collected from various sources or any other place from which the sources is available.
4. **Interactive in Nature:** Modern teaching and learning methods are mostly in interactive in nature. In this technique the teacher asks students to form groups to perform learning tasks and come up desired results. This helps the students to learn about the importance of team work and help them to develop a sense of cooperation.
5. **Integrative in Nature:** In modern methods teachers try to link the topics within the subject and also with related subjects. This helps the students to relate the topics with each other and helps to get a variety of topics to be understood clearly.
6. **Peer collaboration:** Modern techniques allow the students not only to present their knowledge, their abilities but also select students based on their interests, needs and feelings. Through instructional activities, students learn to work cooperatively, and they appreciate their companions work as well.

Modern teaching techniques

1. **Brain Storming:** Brainstorming is creative idea generation technique. This technique provides free environment to present individual ideas, without attracting criticism from anyone. Every generated idea is recorded and considered as solution to a problem. It is sometimes called a casual discussion for new ideas. Some people criticize to involve brainstorming is a waste of time and entertainment of executive. But it shows collective creative power of group of people. It is group productivity. This is used to find out large number of ideas about a problem.
2. **Micro Teaching Technique:** Micro teaching was first used in medicine at Stanford University in 1960s to promote the quality of students and then applied for teacher training. Micro teaching helps to promote real time teaching experiences. The core skill of microteaching such as presentation and reinforcement skills help the teachers to learn the art of teaching at a ease and to the maximum extent. In micro teaching the teachers should plan, teach, observe the students, re-plan, re-teach, re-observe the student which helps in the better interaction with the students.
3. **Mind Map:** Mind Mapping is one of the innovative techniques of learning in which the students create a flow chart or a pictorial representation of what they want to learn and then that is applied on the studies for better understanding. From the improvement and advance in technology the students makes it easier to create the better maps using the technology and that helps for the better learning. The importance of Mind mapping includes Recall of information and critical thinking, Promotion of student engagement. The mind mapping techniques can also be used as tool for teaching and assessment. Nowadays, various software are available for preparing a mind map. These software are of good use and has excellent features. E.g. XMind, FreeMind, Mind Manger, Mind Maple, etc.
4. **Audio Visual Aids:** Audio Visual aids are the means of communication in which hearing and seeing is very clear. Using such techniques for learning helps the students to get the real experience of visualizing. According to Kinder "Audio Visual aids are any device which can be used to make the learning more effective, concrete, realistic and dynamic". It helps to grab the attention of the students, and it builds the interest in students. This provides students a realistic

approach and experience to the students. These tools are very relevant, accurate, increase the interests in students, create motivation to the teachers and are much comprehended.

5. **E Learning:** E Learning is a method by which the Information Technology is used for learning. This type of learning can be done anytime at anywhere. In the current era, where technology is rapidly evolving, education has also taken support of ICT and now offers convenient ways to help increase the knowledge, education and literacy status of people. In this type of learning the learner can decide the time of learning by themselves. Earlier this type of learning was not accepted and was considered as a non effective type of learning. But the importance of e-learning was understood during the pandemic period where the education system was halted the option of e-learning was sugar candy for the student and the teachers. In past CDs, floppy discs, computers were used. But now, they are being replaced with mobile phones, internet, social media, etc. People who considered social media only as a source of entertainment enhance their knowledge in the method of using social media in useful way in the field of education. –learning platform provides a way for the quicker way of sharing knowledge and communicating with a large number of audiences.

Disadvantages of modern techniques

- E-learning techniques are one, the reason for social isolation as the students do not see their teachers and classmates they lose a interaction between them.
- The accessibility of these methods is not possible through the world as there is some places devoid of internet connection.
- There are no teachers to guide them and they should learn their own self time management and self motivation.
- The hands on experience in the experimental techniques are not received as they have only virtual learning.

Conclusion

In these recent years a lot of improvement in the field of education can be seen. Rather than the only teacher based, modern teaching and learning methods focus extra questioning, demonstration, explaining, practical, collaboration, strategies and are more activity based. To cope up with the modern world and the knowledge pushed technology for adopting modern approaches are the only way to survive. Modern teaching methods mostly a consider traditional strategies of teaching as their base and learners most not overlook it completely even as incorporating the brand new ones.

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A survey of virtual and augmented reality for enhancing learning perspective

Shylaja, P.
Asst. Professor, Dept. of Information Technology, Kannur University, Kerala, India

Introduction

Learning in the previous era comprised lectures and recitations. It is observed that learning becomes more innovative through physical activity by using their senses [1]. VR and AR stimulate the senses of the learners in learning activities. The fundamental device used is the head-mounted display (HMD) which gives the effect of Virtual Reality to the wearer. Virtual Reality takes us into the world of imagination irrespective of physical presence. This will be possible with the help of headset devices like HTC Vive, Oculus Rift, Google Cardboard, etc. Two monitors of high resolution named OLED and LCD that bring forth discrete images for each eye, audio system, and real-time head tracking with six degrees of action comprises a virtual reality headset [2-4]. Human vision is accomplished by merging the left eye viewpoint and right eye viewpoint into a single image. The stereoscopic display is vitally important for Virtual Reality filmmaking [5].

Augmented reality (AR) is considered to be a kind of virtual reality technology that blends computer-triggered images on a user's view of the real world. It will enhance the situation much better by combining the virtual world with the real world to some extent. Special 3D programs need to be written for AR applications to tie contextual information or other animations to real-world video [6-7]. Through the integration of immersive sensations, components of digital world such as 360degree camera supported mobile applications that blend to the perception of the real world, enriching experiences.

Forms and Methods

The technology of Virtual Reality includes mainly three types. In the first type, a computer controls the user who uses a helmet, earphones, and gloves to be a part of a virtual world with the assistance of graphics and special sound effects. The second type uses video cameras, which track the user's image to an artificial virtual world and the user will be even able to move the objects. The third type is the most popular in 3D video gaming, where the screen is a curved shape so that the image appears to be closer than the actual one [8]. Simulation based virtual reality is applicable by the use of driving simulators by giving the impression for actual driving. Avatar image-based virtual reality allows appending the virtual environment for the people like a real video by selecting the type of participation depending on the potentiality of the system, a most popular type in the computer vision and graphics communities [9-10].

Modeling of the real environment is the ultimate aim of project-based virtual reality that is used for construction modeling, simulation of airplanes as well as robot navigation. For accruing 3D data in a short distance, a high-performance camera is required. In Desktop-based virtual reality aims to view 3D virtual world on a desktop display instead of having a sense of peripheral vision using specialized VR positional tracking equipment [11-14]. The dynamic view of the situation can be captured using a 360-degree camera and can add digital elements such as sound, graphics, feedback, or even smell on top of it by applying the Augmented reality techniques by virtual objects smeared on the real environment [15-18].

Four categories of Augmented Reality include Marker-based, Marker less, Projection-based as well as Superimposition based Augmented Reality. Some types of visual marker especially QR/2D code has been used to interact with a user in the Marker Based Augmented Reality and Marker less AR makes use of GPS, Velocity/accelerometer, and digital compass to access data on the user's location. Projection-based AR projects lay an artificial light on actual objects and the Superimposition makes an entirely new augmented view by replacing the original view. Augmented Reality gives the user a feeling that he is in the movie while watching it [19-22]. Augmentation technique is used to integrate computer generated image or augogram into real world in which the technique derives real world coordinates independent of camera images. In future, students will get information in multimedia format by scanning the embedded markers attached in their text book using their AR device [23].

Advantages and Limitations

A. Advantages of Virtual Reality:

- The veracity of data forms can be made available by the use of Virtual reality in a classroom.
- Objects or things can be seen in different view perspectives which enable one to understand the concept well.
- The person can visit those areas where physically not possible by human beings such as space, caves, museums, etc.

B. Limitations of Virtual Reality:

- The imaginary illusionary world cannot be compared exactly with the real world.
- Moral values among human beings get devaluated in the education environment, especially in primary education.
- There is no flexibility in VR as seen in the real world scenario.

C. Advantages of Augmented Reality:

- AR-based app enables to satisfy the customer needs by verifying their requirements in a 3D view and eventually increases application in business.
- AR is more interactive with the real world by enriching the content as well as the user experience than VR.
- Useful in skill development applications: Since AR is a blend of both virtual and real-world, the applications of this include military, loco-pilot training, nuclear plant pieces of training, etc.

D. Limitations of Augmented Reality:

- Content may deviate from the user's interest in specific cases. The exact construction of the environment may not be possible when the number of layers increases.
- Maintaining privacy in the environment is difficult.
- It is very expensive to develop AR technology-based projects.

Difference between VR and AR

Although Virtual Reality and Augmented Reality are having similar technological architectures, there are some differences. The dominant differences are listed in table1.

Table1. Difference between VR and AR [24-30]

S. No.	Virtual Reality	Augmented Reality
1	It is a whole digital world, independent of real world	It merges real world with the digital information daubed
2	Users need to be present for experiencing the imaginary world	Users presence is required for the experience
3	Fabricated experience with no sense of the reality	Real world is the median enhanced by virtual details
4	Within 2-4 years, can expect VR in various fields	It will take 3-7 years to the adoption of AR
5	Delivered through head mounted displays or hand held controllers	Delivered through mobile devices and headsets
6	75%virtual and 25%real	25%virtual and 75%real
7	Headset device is required	No headset is required
8	User is in a fictional world of imagination and not aware of the real world	Although the user is in touch with the real world, he is able to interact with the virtual objects.
9	Immersive virtual shop experiences	Visualizing virtual world products in a real environment

Conclusion

Augmented Reality is a 3D technology developed as a blend of real and virtual world images by the use of a computer. It superimposes the virtual body in the actual world. With the feature of deploying new content as per user requirements, Virtual Reality and Augmented Reality has become an unavoidable technology in the scientific as well as in the industrial field such as manufacturing, medical, education, navigation, and remote assistant. Virtual Reality increases user experience, enjoyment, and satisfaction level of users to some extent, and Augmented Reality adds new things in 3D videos which will enhance the innovation of a student. Virtual Reality/Augmented Reality is not the ultimate solution for the education system, but will enhance the current education system up to an extent.

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Deep Learning: The impact on e-learning during COVID-19

Amritha Pavithran, K.
PGDDSA Scholar, Department of Information Technology, Kannur University, Kannur, Kerala

Ebin Antony
Assistant Professor, Department of Information Technology, Kannur University, Kannur, Kerala, India

Introduction

As a result of the social isolation caused by COVID-19, students were forced into online class. This had a significant impact on the education system, and interrupted the traditional individual learning method. This movement is forcing governments to devise new strategies to motivate students while ensuring fully digital learning settings and addressing the challenges of transformation. Almost every educational institution in the world is now focusing on the use of digital media for learning [1]. It is recommended that steps be taken to reduce anxiety and ensure learners' active participation. This indicates that the number of people who use online education is growing. As a result of the modern advent of Information and Communication Technology, there have been a wide variety of applications in higher education. E-learning was introduced in this environment as a way to address new educational opportunities [2].

It's an area related to self-learning and developing computer algorithms. Machine learning uses simple principles, while in-depth learning uses artificial neural networks that mimic how humans think and learn. Processing capacity previously limited the complexity of neural networks. Larger, more powerful neural networks are now possible thanks to advances in Big Data Analytics, allowing computers to monitor, study, and respond to complex events faster than humans. Image classification, language translation, and speech recognition have all benefited from in-depth research. Without the assistance of a human, it can solve any pattern recognition problem. Just as much has changed the industry with the advent of Industry 4.0, so has the education sector with the advent of machine learning [3]. Multi-layered artificial neural networks are used to improve deep learning. Deep neural networks (DNNs) are multilayer networks that can understand images, sound, and text by performing complex functions like representation and abstraction. Deep learning, the quickest-growing branch of machine learning, is a highly destructive digital technology that a growing number of businesses are employing to develop new business models.

Deep Learning

Like Machine Learning Deep Learning, isn't quite new. The heart of Deep Learning systems, are a type of artificial neural network, were first developed in the 1940s, with significant advancements in the 1960s and subsequent decades. In recent decades, the use of Deep Learning has increased. Because ofCrowd sourcing of rich datasets over the internet, which aids in the development, capture, and curation of the necessary tagged datasets on a massive scale. The availability of low-cost, high-performance computer technology.

Indepth study, a neural network is made up of interconnected layers of software-based calculators known as "neurons". The goal is to simulate a simple understanding of how the human brain interacts with similar data and learns from its environment and sensory input. The network processes large amounts of data through multiple layers of neurons, each of which studies the complex features of the data.

Supervised learning uses labelled datasets. These datasets are used to "supervise" algorithms in order to classify data or predict outcomes. Unsupervised learning used to analyze unlabeled data. Without humans' intervention, it can extract hidden pattern from data. It mainly uses: reduction of dimensionality, clustering, and association. Unlabeled data is combined with human-based training in semi-supervised learning. As part of the reinforcement learning algorithm, the system should complete a specific task. It learns desired behaviors and uses reinforcement signals to learn the most effective approach by receiving feedback throughout the process.

Difference between Machine and Deep Learning

The ability to recognize patterns in data and learn how to perform tasks while improving over time with more input. Machine learning and deep learning, on the other hand, differ greatly in terms of methods and applications. The differences between machine learning and deep learning are:

1. **Data consumption:** For deep learning to work, we need a large number of tagged examples. As a result of the proliferation of data over the last few decades, deep learning has become a viable technique. However, preparing a large amount of data is not enough. It also needs to be of high quality. H. Will be marked. Not all data is labelled, not all data is labelled correctly, and not all

data is labelled in a way that is suitable for Deep Learning. Such information isn't always available to the general population.

2. **Dedicated hardware:** Dedicated hardware, such as graphics processing units (GPUs), are often used during the training phase of deep learning systems to reduce execution time to hours, days, or weeks instead of years. These systems, while becoming less expensive, are still prohibitively expensive when compared to the needs of smaller ML setups.
3. **Feature extraction:** It's the process of incorporating domain knowledge into feature extractor development in order to reduce data complexity and make patterns more visible to learning algorithms. This approach is difficult and costly in terms of time and experience. Figure 1 summarises the differences between machine learning and deep learning:

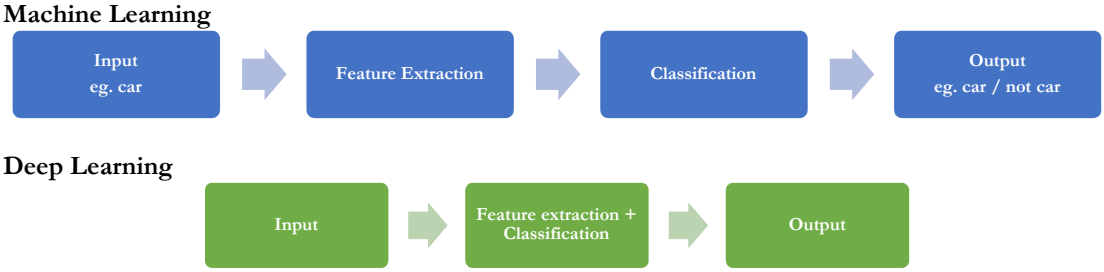

Figure 1 Machine Learning vs. Deep Learning

Deep Learning in E - Learning

Application in e-Learning

- *Personalized learning path:* It is an e-Learning curriculum that focuses on the goals and objectives of the learner as well as their preferences. It is tailored to the learner's job roles, areas of interest, progress, and knowledge levels, among other factors.
- *Chatbots:* Chatbots are computer program that automatically respond to messages. They could be trained to respond in same way every time, or to react differently to messages that contain specific keywords, and they can even learn. Cleverbot is a wacky chatbot that converses with real people while also learning.
- *Performance indicator:* "It's used to identify a particular learning pattern, such as significant shifts in course failures, so instructors can intervene before it's too late. It will also facilitate the analysis and identification of patterns in student engagement data. As a result, learners who fail to finish a course or a learning activity will be offered additional assistance in the form of a content redesign proposal" [4].
- *Virtual teaching assistant:* **"**Online classes to help students solve problems that had clear and obvious answers. Students can repeatedly ask the same questions, which will help them broaden their knowledge base in a variety of situations" [5].

Framework for e-Learning

Sequences, Associations, Classifications, Clusters, and Predictions are used to organize the data. The figure 2 shows the framework of deep learning [6]. The following are examples of deep learning models that are frequently used in e-Learning applications:

Convolution neural network (CNN): It was the first method to be proposed and used for high-dimensional image analysis. It is made up of convolutional filters that convert 2D to 3D [7].

- It forecasts the learning resources' latent factors [8].
- Detecting students' emotions by looking at their faces [9].
- It has the advantage of providing excellent performance for 2D data.
- Its limitation is that it requires a large amount of labelled data to classify.

Recurrent neural network (RNN):"It has recurrent connections between hidden states and can learn sequences and model time dependencies. Recurrent connections are used to detect relationships between inputs and over time" [10].

- It predicts Students Feedback using Kinect.
- It has the advantage of learning sequential events and modelling time relationships.
- It performs well in speech and character recognition, as well as NLP-related tasks.
- Its limitation is that it necessitates large datasets. Because of the gradient vanishing

Deep belief network (DBN):"A unidirectional connection exists between two layers on the top of layers in this model. Each sub-hidden network's layers serve as a visible layer for the next layer" [11].

- Its application in e-Learning are;language understanding andspeech recognition [12].
- Its limitation is, training process expensive.

Deep neural network (DNN):"It has multiple layers, allowing for a complex non-linear relationship" [13].

- Visual representational transformations in distance learning its application.
- Used with better accuracy.
- "The training process is not trivial because the error propagates back to the previous layers and becomes very small. The learning process is also very slow" [14].

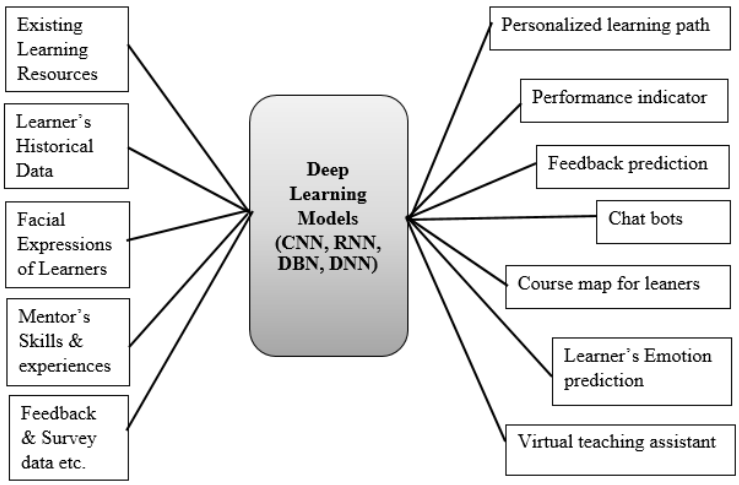

Figure 2 Deep Learning Framework

Deep Learning Tools for E - learning

List of deep learning technologies & platforms available in eLearningplatform is published by the Association for the Advancement of Artificial Intelligence (AAI) - an organization that develops and applies.

- AIaaS (AI as a Service):AI tools and algorithms for eLearning development on the cloud
- Microsoft Azure:Image recognition and bot-based apps are examples of cloud-based AI applications.
- IBM's Watson: Watson platform will use cloud-based AI services.
- Amazon Web Services: AI service based on Amazon Cloud.
- Google's TensorFlow: An open-source artificial intelligence library that allows developers to create large-scale neural networks with many layers by using data flow graphs to build models.
- Caffe: C++, Matlab, and Python programming interfaces are all supported cross-platform.
- MXNet:An open-source software library that supports DL architectures and uses data flow graphs for numerical computation. CNN and RNN are two types of neural networks.
- Theano:Provides features such as a symbolic API that supports looping control (scan), making RNN implementation simple and efficient.
- Keras:Deep learning library based on Theano
- ConvNet:Convolutional neural network toolbox for Matlab
- Deeplearning4j:A distributed neural network library in Java and Scala that is open-source and licensed under the Apache 2.0 license.
- Apache Singa:Deep learning library that is open source.

Thanks to the availability of DL tools and components, developers can now purchase or license algorithms rather than spending the time and money to design their own. Each framework has its set of benefits and drawbacks, which are determined by developer and learner requirements.

Discussion on Future Trends of Deep Learning in e-Learning

DL can benefit organizations that invest in e-Learning platforms with intuitive algorithms and automated delivery. It predicts outcomes based on previous performance and personal learning goals,

resulting in more personalized e-learning content. For more advanced online learners, it may skip modules, while for those who still lack basic knowledge, it may take a more comprehensive, linear approach. Deep learning makes it easier to allocate online resources more efficiently. Can automate the delivery of online resources or schedule online learners' coursework based on their e-Learning assessment results or simulation performance [15, 16]. Artificial neural network techniques were used to propose a framework for automatic online personalization via the recommendation process.

In the unprecedented era of Covid-19, thousands of educators and learners are flocking to academic cyberspace and OLEs, signaling a shift in the environment for online education. As the unexpected pandemic of Covid-19 ushers in educational practices in video conferencing platforms (e.g., Zoom, WebEx, MS Teams) and LMS-based usage. When providing remote teaching to their students outside of the physical classroom, there is undoubtedly a great deal of variation in how instructors operate online. Furthermore, in such a short period of time, this instructional transformation risks producing a mediocre copy of today's best web-based learning strategies. The current Covid-19 problem is hastening this shift, highlighting the need for HEIs to improve teachers' digital skills. These digital skills can combine a quick response to a crisis with a long-term digital transformation of educational environments.

Private virtual tutor may provide schoolwork that is required of students in future. Deep learning systems provide a comprehensive perspective of massive data and utilize it to forecast outcomes. For example, the results of an online evaluation or the results of a survey. It has the potential to improve peer-to-peer interactions. Mentors should be matched with online students who can benefit from their specialized skills or prior experience. Aside from the learning quality, deep learning is a highly valuable solution for training in industries with a high rate of dynamic and adaptive learning environments. Deep learning can anticipate how course content will enhance and adapt in the future, which is beneficial to businesses that need to update their course materials. Adaptive learning technologies would enable completely personalized learning environments, with content that not only changes but is also created based on the learner's specific requirements.

Conclusion

Digital learning and e-classes have become more common in the education sector as a result of the COVID-19 epidemic. It can be difficult for teachers and students to maintain the same level of learning. In this study, we sought to give some legitimacy to digital learning platforms while contributing to the education system. In-depth learning-based techniques were used to determine the level of student engagement, which was then combined with facial expressions. The use of technology to deliver e-learning has become a popular trend in industry. Students should be encouraged to demonstrate a method by modeling, analyzing arguments, or applying an idea to a real-world problem. As a result, careful organization of data on e-learning platforms and how students interact with learning resources is crucial. Students should actively participate in class and work with classmates and teachers.

Students must have the tools to manage the learning system and interact with them in smart in-depth learning environments. Personalized learning interfaces and adaptive learning have been the subject of several studies. These efforts are primarily focused on technological advancement, with no emphasis on effective education or teaching. In-deep learning can create new content, understand target learners, and design according to their needs using user-centric design principles. Learners will be able to deploy the learning that best suits them as they gain knowledge and process information, allowing for greater personalization of learning.

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Role and impact of virtual reality and augmented reality in Indian higher education sector

Sahin Sahari
Asst. Prof., Department of Education, Belda College

Jayanta Mete
Professor, Department of Education, University of Kalyani

Objectives of the study

Objectives of this study are mentioned below -

- To elaborate the concept and impact of virtual reality and augmented reality in Indian Education Sector.
- To explain the impact and role of Augmented Reality in Indian Higher Education.
- To discuss the role and impact of Virtual Reality in Indian Higher Education.
- To Identify the role of Virtual Reality & Augmented Reality in Present Scenario of Indian Higher Education

Data Source

All of the information in this study is derived from primary and secondary data that has been obtained from a variety of sources, including journals, news stories, books, edited book chapters, and online news portals, online journals, and online articles, among others. The researcher used the document analysis approach to conduct the data analysis for this particular study, which yielded the following results:

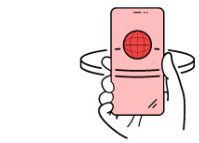
Introduction

Traditional teaching methods are being rethought by educational institutions throughout the world. In this revolution, virtual and augmented reality are the two most important aspects that define it. Virtual and augmented reality have had a profound impact on the way teachers and students learn.

Virtual and Augmented Reality are the two technologies that have had the most impact on the education industry's use of technology, despite EdTech's emergence as a forerunner of a wide range of new technologies. There is a lot to like about the incorporation of AR/VR in education technology since it spans such a wide range. AR/VR is not restricted to a specific age range. All ages are welcome to participate.Experiential learning is the most effective mode of learning, and this conclusion may be easily drawn. Proprioceptive learning is aided by AR and VR, which provide classrooms with interesting and thorough immersive learning experiences. These technologies are capable of revolutionising classroom learning and making it more participatory and entertaining at the same time.

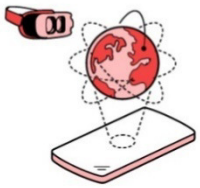
Virtual, Augmented, and Mixed Reality

1. **Augmented Reality:** To put it another way, augmented reality is the consequence of employing technology to superimpose information on the world we view. The camera of a smartphone is frequently used to add digital features to a live view in augmented reality (AR).Mobile games have become a popular method for augmented reality to permeate our daily lives. CNET estimates that Pokemon Go had over 100 million users at its height in 2016, making it one of the most popular augmented reality games ever.



AUGMENTED REALITY

Layering virtual information on top of a real world scene



MIXED REALITY

Compositions of real and virtual objects

2. **Mixed Reality:** Mixed reality (MR), or hybrid reality, is the mixing of real and virtual worlds to create new landscapes and representations where physical and digital items coexist and interact.Examples include construction engineers who must locate pressure points and flaws in their bridge designs, or researchers who are trying to understand how our brain functions under extreme stress.

3. **Virtual Reality:** Three-dimensional, computer-generated environments that can be explored and interacted with by humans are referred to as virtual reality. An individual who is immersed in a virtual world can manipulate items or conduct a sequence of activities in the virtual world. For virtual reality to be considered full, the user must be completely cut off from their surroundings.For example, rather than learning about history in a traditional classroom environment, students can virtually go back in time and witness events unfold before their very eyes.

VIRTUAL REALITY

Virtual representations of real environment objects

Impact of Augmented Reality on Education Sector

One of the most often asked questions of the millennial generation is whether virtual reality or augmented reality is superior. Which of the following has the most influence on our future? In response to such a question, the answer is that each have their own benefits. The movement or any other form of data may be overlaid on top of the natural surroundings in Augmented Reality. In fact, it bolsters the validity of the claim. The major advantage of developing an Augmented Reality application is that it does not necessitate the use of any special display gadget. These advantages have made innovation a staple of today's technology revolution.

Words can't do justice to a picture. Using Augmented Reality as a motivator is a great way to get things done. It will be easier to visualise the subject if you don't just read a section. It aids pupils in gaining a deeper knowledge of the subject matter. The Augmented Reality, on the other hand, provides students with intelligent experiences that keep them excited and captivated by fresh learning.One of the most significant advantages of Augmented Reality in Learning and Development is that it doesn't require any budget issues or equipment investment. Using our smartphones or tablets, we may experience Augmented Reality.

Impact of Virtual Reality on Education Sector

Virtual reality lives in a wholly man-made environment. Thus, in order to create a virtual reality application, we must first create a circumstance and then develop an activity around it. A downside of Virtual Reality is that it requires a dedicated VR headgear to run any programme, unlike Augmented Reality, which does not require one. Augmented reality has the potential to fundamentally alter the training landscape. Virtual reality (VR) will be used throughout the training process, from the first examination through the classroom. A wide range of topic matter may be brought to life for students in virtual reality (VR).

In addition, students have a more concrete understanding of the subject matter since they are immersed in the virtual environment and may interact with it as if they were a part of it. As a result of their partnership with virtual reality content, they are able to examine the issue more thoroughly. When kids are too immersed in the virtual world, they are unable to focus on the here and now. Additionally, it increases their capacity for sustained focus and attention. Using sensors, students may touch, see, and hear the functional material at the same time in a comprehensive tactile engagement through virtual reality.

Augmented Reality & Virtual Reality in Indian Higher Education

Virtual reality and augmented reality (AR) are slowly but surely changing the way students' study. However, India is not far behind when it comes to taking use of new and advanced technology. Currently, virtual and augmented reality (VR/AR) technologies are reshaping the education sector in schools and colleges.

At this moment, educational institutions are replacing conventional classrooms with contemporary classrooms to better serve students. However, even if online learning provides greater ease and flexibility in the learning process, it also presents a number of difficulties. One of the most significant difficulties associated with remote learning is the level of distraction experienced by students as a result of the variety of different information available on the devices they are using to study. Students' attention span and level of engagement have both decreased as a result of the transition away from traditional textbooks and toward digital devices for learning. Apart from providing amusement, physical education sessions also allowed students to engage with one another in person as well as get intimate guidance from their lecturers. In addition, the reproduction of practical-based learning, which is necessary for technical courses such as engineering, medical, architecture, and other related fields, is a significant hurdle that online courses must overcome.

As a result, technological upheaval might be seen as a gift. India's higher education scene is being reshaped by new-age technologies including immersive ones like VR and AR. They address all of the issues of the new-age remote learning process and assist to reimagine teaching and learning. They created educational experiences that were fun, educational, and educationally relevant.Indian education will undergo a paradigm shift when it comes to the use of virtual reality and augmented reality (VR/AR). As a

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result, educational technology companies will be motivated to develop a wide range of AR/VR applications that can further grow the educational sector.

Impact of Virtual Reality and Augmented Reality in Indian Higher Education

Virtual reality and augmented reality (AR) have the potential to enhance the teaching-learning process by increasing student involvement and involvement. Higher education students can benefit from using virtual reality (VR) to help them learn about a variety of subjects, from history to the human body. Students may fully immerse themselves in their studies thanks to virtual tours. It is therefore more productive and effective to get them involved in the learning process. The use of images, sounds, text, and other data to create dynamic, real-world ecosystems and visualisations is common in virtual reality and augmented reality (AR). Engineering, medicine, and defence are just a few of the areas in which virtual reality may be used in the classroom. As a result, students can study topics in a virtual environment rather than in a traditional classroom setting.

AI, VR, and AR will all be a part of the future educational system. New advances in technology are reshaping the way students learn in the classroom. Even still, technological advancements are benefiting many students. Including digital transformation in both the K-12 and higher education sectors is one of the most significant developments in recent times that directly impacts the Indian education system. Because of this, virtual reality (VR) is likely to have a lot more traction and impact in the next years. Teachers and students will soon have access to more powerful tools for augmented prototyping of real-world experiences in the country.Incorporating VR and AR into a lesson plan has the potential to enhance student learning and retention. Millennials' mentality and wiring have been fundamentally altered by technological advancements. Students these days aren't as excited in reading as they once were. It's more likely that they'd like to learn through more hands-on activities, such as watching movies and visual presentations of lessons from books. This shift in the way education is delivered can be attributed in large part to advances in technology.

Present Scenario of Virtual Reality & Augmented Reality in Indian Higher Education

Virtual and augmented reality technologies are still in their infancy in the Indian market. Several Indian start-ups are now striving to find AR and VR solutions for Indian higher education. A mentorship guide for VR and AR start-ups is available from several Indian state governments. AR/VR solutions for education are expected to grow in demand over time, according to educational experts. According to industry forecasts, the K12 education market is estimated to increase six times its current size and be worth $1.7 billion by the year 2022. According to the authors of the report, educational institutions are implementing hybrid learning models and using immersive technology to provide students with high-quality educational experiences.

Futuristic Aspect of VR & AR in Indian Higher Education Sector

irtual reality and augmented reality (AR) are burgeoning industries with enormous promise to improve education. Learning by doing is more successful when it is facilitated by deep learning experiences that allow students to learn by doing.In the future, AI-driven private tutors who can keep track of your learning choices and behaviour, offer advice on progress, and suggest solutions for creating personalised learning modules won't be that far off. There will be an annual investment in AR and VR in education of over $6 billion by the year 2023, according to a new estimate from ABI Research. The market is expected to reach $5.3 billion by 2023, according to the report. India's AR and VR educational sector, according to another report by IndustryARC, is now thriving and predicted to rise at an exponential rate in the times to come.India's status as a growing market means that these new-age technologies will be progressively used by the Indian higher education sector. Increasing usage of linked devices in the educational system, as well as advances in immersive technology, are all key contributors to this development's rapid acceleration.

Conclusion

In the fourth industrial revolution, technology will have a major impact on education. Every area of our life has already been affected by this new technology. The process of natural growth is also aided greatly by the medium of education. Briefly said, the future holds great potential for those regions that are ready to adapt to change and new technologies. In the next decade, the Indian education sector is going to be a fascinating and engaging place to be.

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Influence of machine learning on modern educational system

Ebin Antony
Assistant Professor, Department of Information Technology, Kannur University, Kannur, Kerala, India

Jacob Antony
MTech Scholar, Department of Mechanical Engineering, Srinivas Institute of Technology Mangalore, Karnataka, India

Saji Sebastian
MCA Scholar, Department of Computer Application, SJCET Palai, Kottayam, Kerala, India

Introduction

Currently, technology is a gift in every industry, together with educationto be essential to achieving student learning goals. faculties now do not teach textbooks and students no longer got to study manuscripts. Within the class room and beyond, the educational method has evolved into a quantitative activity with measurable outcomes. Educational strategies have evolved over time into dynamic aspects of the learning process, such as inputs and outputs. In addition, these systems have become important factors in the evolution of educational system components and improving the effectiveness and originality of curriculum foundations [1].

These components are used for goal planning, implementation, evaluation, follow-up, and development. In education, machine learning has become a replacement frontier. together with the foremost powerful modern technologies, machine learning is one of the foremost important components of AI and human intervention. Machine learning is a complicated tool want to fight cancer, global climate change, and terrorism. After all, this is often new infrastructure. As a result, machine learning allows computers to get hidden information without training. Also, machine learning may be a good predictor [2]. In education, machine learning works at a time and place convenient for students' needs. Virtual assistance is an important part of training and is a great place to apply machine learning. Students can chat with their virtual assistants. Communication agents assist students in this regard through their app or website. The procedure is simple. Just enter your student text. The agent, on the opposite hand, performs the task and determines right response to the input before the scholar presents an easy-to-understand answer.

All analyzes have the same goal of improving the student model. These models represent students based on their current knowledge level, cognitive, and motivation ability. Relationship mining, association mining, correlation mining, and sequential mining are some of the technologies used to achieve these objectives. Data mining is a way to identify the most effective teaching method for groups or individuals of students in different situations. ML-based data-driven predictive models, according to researchers and scientists, can help hypothesis and test problems that affect these massive datasets. Educators can use the platform to save time by preparing lectures, writing quizzes, grading documents, writing documents, and doing simple research. The proposed structure makes it simple for students and teachers to use modern technology to improve education quality. Another benefit of ML and virtual assistants is that they are less prone to human performance errors. The framework enables you to quickly troubleshoot and find a suitable solution in the event of a mistake. Just as much has changed the industry with the advent of Industry 4.0, so has the education sector with the advent of machine learning [3].

Related Works

Son et.al. (2021) [4] gives an outline of application of ML in education. Trend and strength in education science research is the use of technology in learning and teaching, collecting information, analyzing and processing data to provide high-accuracy answers or advice in solving educational issues. Nafea et al. (2018) [5] shows how teachers can use machine learning to save time in human lessons. For example, hire a virtual assistant to work from home for students. This type of support can increase student progress and achievement by increasing the student's growth potential. Teachers are now better able to understand how students are learning. Korkmaz et al. (2019) [6] examine trends in educational technologies from 2007 to 2017. Vectors and decision trees were the most commonly used machine learning methods. Gummadi et al. (2020) [7] demonstrate how machine learning was used to evaluate a student's performance and assist the student in succeeding and avoiding failure. Machine learning has changed the education sector with various methos implementation such as increasing efficiency, learning analytics, predictive analytics, adaptive learning, personalised learning, and assessment.

Machine Learning

It is a type of AI that enables software applications to predict outcomes more accurately without having to program them explicitly. ML algorithms predict new output values based on historical data. It is commonly used by search engines that make recommendations. "Fraud detection, spam filtering, malware threat detection, business process automation, and predictive maintenance are examples of applications. The process by which an algorithm learns to make more accurate predictions is known as traditional ML. Supervised learning, unsupervised learning, semi-supervised learning, and reinforcement learning are the four basic approaches" [8].

1) **Supervised learning:** "It distributes the algorithm along with the labelled training data and defines the variables for which the algorithm evaluates the correlation in this type of machine learning. The algorithm's input and output are specified" [8].
2) **Unsupervised learning:** Unlabeled data is used to train machine learning algorithms. The algorithm looks for connections between data sets that are meaningful. All training data for the algorithm and the predictions and recommendations that the algorithm makes are pre-determined.
3) **Semi-supervised learning:** It is the combination of the two previous ones. The model is free to inspect the data and form its own understanding of the set, even if it is annotated with algorithm-labelled data.
4) **Reinforcement learning: "**Data scientists use it to teach machines how to complete a multi-step process that follows well-defined rules.Data scientists create algorithms that perform tasks and provide positive or negative feedback on how to complete them. The algorithm, in most cases, determines the steps to take along the way" [8].

Applications of Machine Learning within the education field

The applications of machine learning in education as follow:

i. Adaptive Learning
ii. Increasing Efficiency
iii. Learning Analytics
iv. Predictive Analytics
v. Personalized Learning
vi. Evaluating Assessments

In real time Adaptive learning evaluates a student's performance and adopts teaching methods and curricula. The program assists in recommending learning methods to the scholar. It encourages personal engagement and seeks to adapt to the individual in order to provide the best possible education. Machine learning has the ability to organize and manage content and courses. It makes teachers and students work easier and make them more satisfied with their education. Machine learning can enhance teachers' efficiency by performing tasks such as classroom management, scheduling, and other similar tasks [5].

Teachers can use Learning Analytics to gather insight into data. She or he can filter and interpret many pieces of data and then come to conclusions. It have a positive influence on teaching and learning process. Students can take advantage of this software's advice on resources and other learning approaches.In education, predictive analytics is all about deciding what students want and the way they need it. Using class assessments and half-yearly results, you can predict which students will perform well on the exam and which students will struggle.This alerts the instructors and parents, giving them enough time to respond. As a result, a student may receive additional assistance and work on his or her weak subjects [9].

Personalized learning is the foremost effective machine learning application. Because it's adaptable, it can meet a spread of needs and a selection of needs. the teacher they want to learn, so the curriculum, norms, and pattern they want to follow. Evaluating assessment is the foremost effective machine learning application. They have the freedom to choose the subjects they are interested in, the teacher they want to find, and therefore the curriculum, criteria, and pattern they want to follow. When a machine does the work, however, the results are more legitimate and reliable because there is less chance of error [10].

The primary goal of education and learning is to provide students with information in the hopes that they will remember it. Machine learning can, in fact, accommodate a wide range of students. To improve teaching abilities, tools supported by machine learning and AI are often used [11, 12]. Figure 1 shows the flow chart of machine learning application education.These programs are most commonly used in the following fields:

i. Lecturing
ii. Customized Learning
iii. Automated Assessment
iv. Teachers Support

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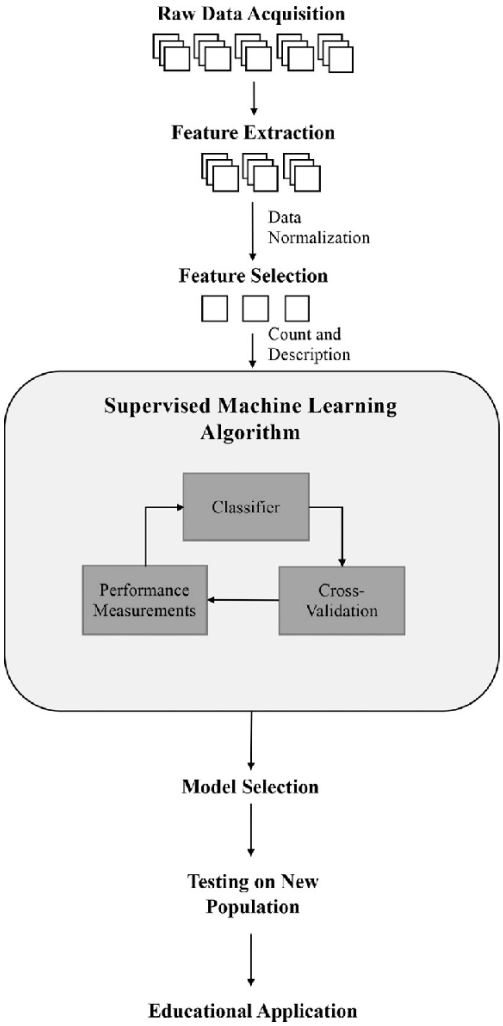

Figure 1, Flow chart of machine learning application education

Testing of the Educational Software

Educational software affects students' learning processes, it must be extremely precise. They're also used to assess and tutor students. As a result, they must undergo extensive testing before being implemented. Software testing ensures that a piece of software is compatible with the system's characteristics and capable of achieving its goals. As the software becomes more complex, the testing process becomes more involved [13]. Analyzing problem domains and associated datasets, algorithms, and implementation runtime options are necessary steps for software testing. Automated testing procedures are used to reduce testing time and costs. "Artificial neural networks, decision trees, genetic algorithms, Bayesian learning, instance-based learning, clustering, and other machine learning algorithms are all evaluated with this program" [14].

Intelligent learning environment Virtual Learning

In intelligent learning environments, both supervised and unsupervised studies are used. The majority of these systems work by recognizing statistical patterns. This can be accomplished by manually labelling the data and detecting patterns using a supervised learning algorithm. Intelligent learning environments provide tools to help students explore a subject, in addition, adaptive models can be customized to help them succeed [15].The education sector is responsible for more than 78 percent of all virtual learning systems. "Adaptive learning systems, intelligent tutoring systems, cognitive systems, and recommendation systems are among the technologies developed for education, research, and development" [16].

Career Prediction and Planning

1. **Career Prediction:** Activities of social media users on various websites are used to predict future career prospects. For best results, multi-view multi-task learning is used. "Lasso regression is utilized to find task sharing and task-specific characteristics that are important in determining a user's career progression" [17].

2. **Career Planning:** Dijkstra's algorithms help users plan their careers by recommending optimal career paths. Data on the user's eligibility, current and past work experience is collected and the user is presented with the best career options based on the specified profile. To build this model, users with similar backgrounds are identified using kmeans clustering [18].

Automated Assessment

The student evaluation process should be consistent with curriculum goals and educational goals. Recommends the use of different validation tools to adapt to different domains and learning styles. Machine learning has been used differently to create questions and evaluate.

1. **Neural Network**: It has three layers: input, hidden, and output. The weights assigned to each section of the network, as well as the levels of accuracy and difficulty for each section, determine the difficulty level of the next question [19].
   (i) Long Short-Term Memory: A type of artificial intelligence (AI) that can accurately model long-term and short-term dependencies, as well as reward-based systems that respond quickly [20].
   (ii) Convolutional Neural Network: Pattern recognition is more efficient with this method on systems with more images. It reduces the number of free parameters for each image by using a feature extraction process and a feature map [21].
   (iii) Deep Learning: Algorithms can change the results of their own actions based on communication and reward. It operates on the basis of trial and error and can be used to find difficulty level of the next query in automated evaluation [22].
2. **Natural Language Processing**: To locate the key and destroyer, useful phrases have been chosen. Through a set of coded grammatical rules, NLP classify word as part of its speech. These grammatical rules are based on algorithms such as maximum likelihood estimation, parametric estimation, and nonparametric distribution that are based on statistical laws. Semantic analysis is performed using a variety of methods, including contextual grammar. Using the syntax and dictionary features, I found descriptive phrases, keys, and destroyers. With the help of all these entities, questions and answers are determined by all existing knowledge in the database [23].
3. **Fuzzy logic:** Many parameters are taken into account when designing a questionnaire, such as difficulty, numerical and theoretical content, and weighting of grades for a particular question. Systems that use vague logic are good at approximate and accurate reasoning. This capability of these systems is utilized in the arrangement of the question paper [24].
4. **Genetic Algorithms** Great for picking up great and potentially great-searching spaces, navigating them and looking for the best combinations. They take inspiration from evolutionary processes, and a variety of solutions have been optimized for better results [25].

Predict Learning Outcomes

When a machine learning algorithm is used to predict student performance in the early stages of training, the system is accurate, sensitive, and specific. That is, they primarily complete the following tasks. Exam scores will be collected automatically and data on exam scores will be available. Based on this data, unpredictable variables such as student's prior knowledge, ability, and enthusiasm are identified. A predictive model has been developed based on these data to predict student learning outcomes [26, 27].

Educational Data Mining and Research

All analyzes have the same goal of improving the student model. Students are represented by these models based on their current knowledge, and cognitive ability. Relationship mining, association mining, correlation mining, and sequential mining are some of the technologies used to achieve these objectives. Data mining is a way to identify the most effective teaching method for groups or individuals of students in different situations. Machine learning-based data-driven predictive models, according to researchers and scientists, can help hypothesis and test problems that affect these massive datasets [28].

Conclusion

AI and machine learning will have a significant influence on our educational future. We're moving away from an all-encompassing methodology with machine learning. Because of its ability to adapt and provide customized curricula, it is an effective teaching tool. Machine learning-enabled tools can be used to assess a person's current level of understanding, identify learning gaps, and provide real-time solutions. Teachers can use this technology to identify areas that are larger than their students and create customized learning program that benefit the most students. Here are a few of the benefits of machine learning: It demonstrates that it is becoming a game changer in the educational field.

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Impact of machine learning in education sector – An overview

Shylaja, P.
Asst. Professor, Dept. of Information Technology, Kannur University, Kerala, India

Introduction

The intension of Machine Learning is to solve a given problem from the experience of past data. It became the admired technique for predicting what lay ahead or to stratify information from historical data which ultimately useful for making further decisions by making the information into intelligent actions in an autonomous way [1]. By training machine learning algorithms, we can create more data from the basis of historical data which we have used for training purpose and in more distant, handy in data science and in data industry [2]. The hardware devices which we are using or the applications where we share information are powered by Machine Learning algorithms.

Types of Machine Learning

Different types of Machine Learning algorithms include Supervised Learning, Unsupervised Learning and Reinforcement Learning. In the supervised learning, previously labeled data has been inputted to the algorithm to train the model where there is a clear and distinct mapping between input and the output. Depending upon the labeled input data, the training algorithm detects whether it is a spam or ham. Support Vector Machine, K Nearest Neighbour, naïve bayes theorem and decision tree are the methods of supervised learning in addition to classification and regression [3-4].

Findings are grouped into clusters based on the similarity of data is happening in different types of clustering techniques. The connectivity of graph, distance between data density are some of the criteria's. Since clustering is an unsupervised technique, there is no labeled data or no direct mapping between input and output. The algorithm does not need no previous data as input which itself pinpoints the patterns that were not detected previously. Principal Component Analysis and K-means clustering are unsupervised type of learning for finding patterns and then make model depending upon that. The tools used to design intelligent machines are the neural network [5-6].

Reinforcement learning algorithm works in a dynamic environment that enforces models to learn how to make decisions and is used in automatic self driving cars and robotics and became an emerging type of machine learning nowadays. Various types of simulations have been developed to meet the time ahead problems [7].

Figure1 illustrates different machine learning techniques as well their usage in current scenario.

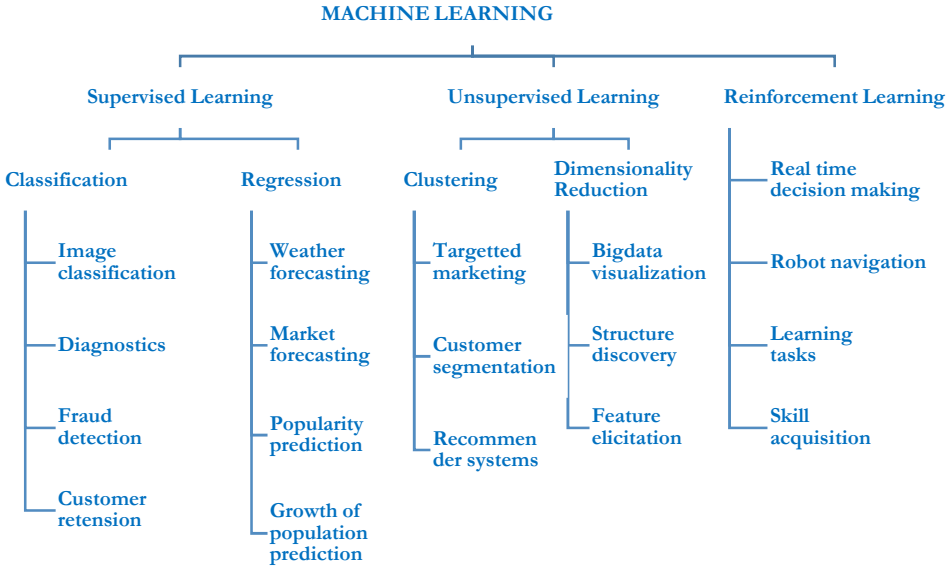

Figure1: Types of Machine Learning

Difference between Machine Learning and Deep Learning

Deep learning is the concept of thinking of computer like human brain, which is an advanced version of machine learning [2-3]. Table 1 lists out the difference between Machine Learning and Deep Learning.

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Table1. Difference between Machine Learning and Deep Learning

S.No.	Machine Learning	Deep Learning
1.	It is the method of knowledge analysis which automates analytical model building	It is the a superset of machine learning supported by artificial neural network with representation learning.
2.	Structured data has been used in Machine Learning	Artificial neural networks (ANN) is used in Deep Learning
3.	It is an advancement of Artificial Intelligence	Deep Learning can be thought of as an extension of Machine Learning
4.	Machine Learning has thousands of data points.	Deep learning handles even bigger data such as millions of data points.
5.	Outputs are the numerical values like categorization of outcome	Output is to be generated as free-form elements
6.	Model prediction from the existing data using different types of automated algorithms	To interpret the features of data and find out relations among them using neural network processing layer
7.	Detecting the algorithms are done by data analysts.	Algorithms are principally self-illustrated on data analysis
8.	Learning new things from existing data or instances without the need of explicit directions is the major advantage	Very complex machine learning issues can be solved in deep learning by the use of artificial neural network

Applications of Machine Learning in Education Sector

Real time student performance can be analyzed with the help of Machine learning technique and that will modify the teaching method in adaptive learning. Students can opt different learning methodologies to improve their knowledge. Commonly used machine learning approaches include Support Vector Machine, Artificial Neural Network, Decision Tree Learning, Association Rule Learning, Bayesian Networks and Representation Learning [8-10].

Student or Learner judgment is the basic practices in the education sector. It is the social developing field for both individual as well as societies. Technology provides various tools which can be used to assess students effectively depending upon the available data and thereby providing consequential feedback to the students especially slow learners [11-13].

Machine Learning helps to quantify the efforts taken by a teacher and also can make a frame work for identify an optimized method and employ an intelligent tutoring method which may further empower the quality of learner [14-15]. It will give an individual educational experience for each student. Academicians use ML techniques for the earlier detection of weak students and take actions accordingly to improve them.

The idea of Machine Learning is to make the machine learn from experience or previous examples by putting data in to the generic algorithm and using statistical algorithms based on the given data, machine build a model [16]. Artificial Intelligence can integrate the already existing LMS. Artificial Intelligence has extensively adopted in education sector in various forms starting from computer and computer related technologies, moving onto web based accessing and intelligent system usage, humanoid robots to replace instructors, virtual reality in laboratories as well as augmented reality in class rooms [17]. LMS provides grading and assessment more efficiently and effectively by incorporating machine learning algorithms. Machine Learning can help in some way to create recommendation to choose their universities or higher study options by using the technique of decision tree learning [5, 18].

Student-Teacher communication as well as the resource sharing will improve with the advent of Artificial Intelligence in the Education sector. Students can improve their personal learning network and be able to cop up an international level without going physically. Virtual reality makes one's way up to see places and explores things in a convenient way. Moreover, the grading of online works can be done instantly, possible to conduct online quizzes and can consolidate and visualize data as per the requirements [19-21].

Advantages

- It has the ability to track learner's information after the advent of machine learning in education field
- Students can adopt appropriate courses as per their interest since it easily identifies trends and patterns.
- Tutors can follow intelligent tutoring system with the help of machine learning techniques
- It became the most competitive feature of training programs as it offers efficient manipulation of data.

- Handling of multi-dimensional as well as multi-variety of data makes the automation of intensive administrative task productively.
- Analysis of vast amount of data became easier. Teachers can allot works to students after evaluating their potential.
- Unbiased assessment can be done with in a limited time which will be more benefitted to both teachers and students [4-6, 22-24, 27].

Limitations

- As technology idea is used to learn information, there are some limitations too. It cannot restore the cultural constituent of learning which got from other human only.
- Learning not only means to say the downloading or capturing information through online and clearing the exam. Rather than instructing students through machine, it is an exclusively human activity.
- Learners have to search different websites or choose different application software's to learn different things. But a teacher can teach different things at a time and can give moral values to students.
- Computers can't able to analyze emotionally as the teachers do. Also assessment of essays needs manual intervention.
- Morals and biases exist in human world where as computer depends on machine language only.
- Complex environment of class room contains human elements that no computer can replace [13-14, 25-27]

Conclusion

The whole world is in the path of digitization. Learning is not a daunting task for anyone as surplus information is available in the internet and the machine learning algorithms provide the needy data to enhance the knowledge in an interested area. Deep learning algorithms handle variety of data from different sources, the superset of machine learning. The wall-to-wall implementation of Machine Learning in education needs lot of research work.

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Flipped classroom approach is need of the hour

Jeyaraj, I.
Assistant Professor in Psychology/Guidance Counseling (Contractual), Department of Education, Regional Institute of Education (NCERT), Mysore, Karnataka

Introduction

Teaching is the profession which inculcate knowledge and values to the students, it may occurs through interaction between teacher to student, student to student, student to resources, even student to teacher. As we know, teaching is the two way communication, one is sending the information and other one is receiving the information. Once upon a time, there was a belief that learning occurs from more matured personality (Teacher) to less matured personality (Student). Now the trend has changed, students also plays vital role in teaching learning process, he/ she is the creator of knowledge.

Now a day we focus on innovation in teaching learning process, this encourages the learners and teachers to investigate, discover and utilize of various digital and traditional resources for gathering information. This innovation leads to solve the issues which occurred in daily life experiences and also develop higher order thinking skills. Out of various innovative methods of teaching and learning, Flipped Classroom Approach (FCA) is one of the methods, which is need of the hour. Flipped learning (FL) is a methodology that helps the teachers to enhance active learning during class time by assigning the students to go through the study materials and watch video lectures in online or offline which could be viewed at home and outside of the class.

Meaning of FCA

FCA is just reverse of the TC approach methods, in traditional classroom the concept is dealt by the teacher and the homework is given, in flipped classroom approach, the teacher is given brief introduction about the topic, the study material is given to home to read. The students come to the class with prior knowledge and discuss about the topics which he learned at home for better understanding. In flipped classroom approach the learners used to discuss, perform activities in the presence of teachers, after the class hours they involve more in online discussions, do experiments and link with day to day activities. Flipped classroom strategy helps the student to learn at home and discuss in classroom. Students get prior information before the teacher teaches the content. Here the teacher assigns the homework's and other tasks are done by the students autonomously at home. Flipped classroom (FC) is a transactional strategy and that leads to blended learning (BL), which aims to promote the student engagement. It gives opportunity to learn at home and discuss and solving the problem in classroom itself.

Definition of FC

Flipped Learning Network (FLN), 2014 states that, FC is a pedagogical approach, the transaction moves from individual to group, then learning is strengthened from group to individual. Here the learning process will be more dynamic and interactive one.

Evolution of the FC

FCA was introduced by 2007 two high school Chemistry teachers in Colorada, US namely Jonathan Bergmann and Aaron Sams. They developed a innovative software tool to record the PPT Presentations, using this tool they recorded their lecturers and uploaded in online video lectures. This was useful to those who absentees on that day and also students who attended the classroom earlier also.

By the same time, Salman Khan created few short video lessons in mathematics for his nephew, which was uploaded in YouTube. Those video lessons were followed by the most of the students whom needed mathematics tuition; it was followed by most of the students, and was interesting also. Khan resigned his job to set up Khan Academy, and his mission was to publish lot of video lessons for different subjects.

This was the initiatives taken by various people, by delivering the content through video lessons/ online tutorials including higher education. These practices save lot of time in classroom activities to involve more actively. This innovation leads to the concept of FC.

Steps involved in flipped classroom

1. Plan: Plan which topic you are going to teach through flipped classroom
2. Record: Record the lesson with the help of video
3. Share: Pre recorded video will be sent to the students, let them observe and reflect the same
4. Change: After going through the video, they get more in-depth knowledge in the subject
5. Group: Here, the students are formed a group and discuss in the groups with respect to their topics

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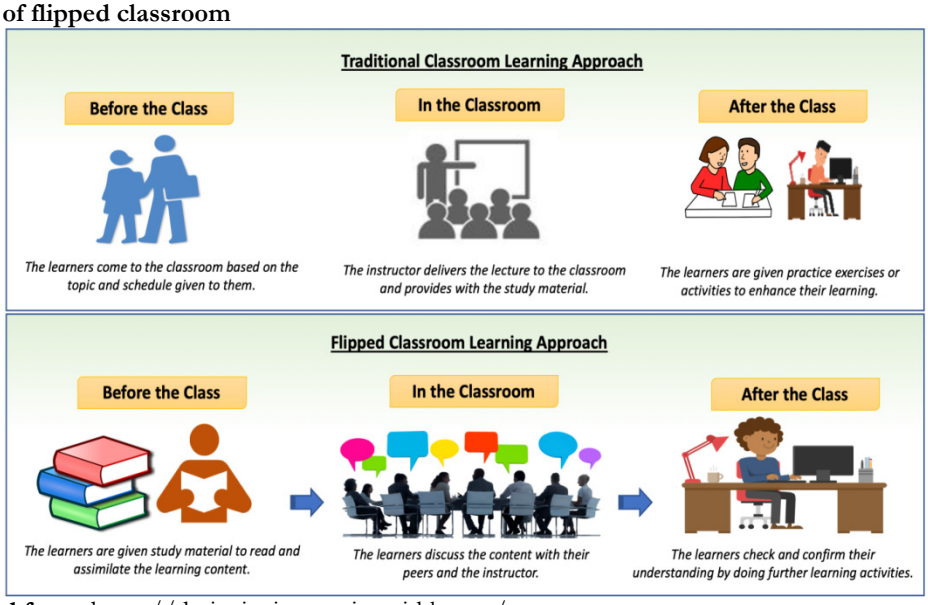
6. Regroup: once the discussion was over, the whole class join together share the individual's group contribution with everyone, get detailed information.

Process of flipped classroom

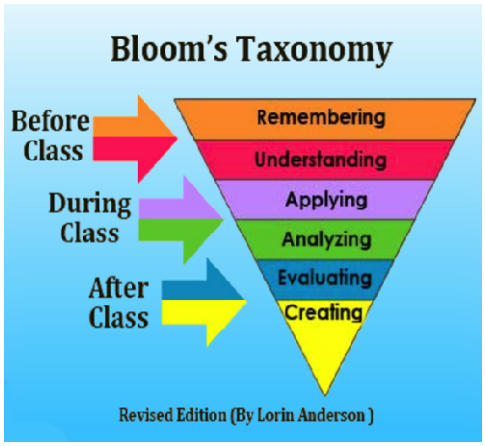


Retrieved from: https://designinginstructionwithk.com/

Flipped classroom strategies occur through blended learning approach, i.e., both online (By utilizing electronic gadgets) and offline (Face to face approach). The content is given in digital form which includes online lecture and videos. Here, in classroom the students interact with peers and teachers and ask questions to the teacher in order to clarify their doubts and get feedback from their teachers. In flipped classroom approach, there is a shift from instructor controlled to leaner controlled, linear to non-linear. In traditional classroom the teacher controls the learning environment, but in flipped classroom the students plays a vital role by engaging the class activities. In the context of linear to non-linear, in traditional classroom practices knowledge is transferred from teacher to student, whereas in flipped classroom approach students do not follow the predetermined activity by the teacher.

Flipped learning fit into the revised Blooms taxonomy

In Flipped learning, before teaching the content, brief introduction given by the teacher and necessary study materials given to students to their home to go through the same, and also video lecturing also sent to their students.
During the class, the student interacts with the students and discuss with their peer group and teachers to get detailed information related to subject matter.
After the class, the student can reflect the learnt material in their day today life experiences, they are able to solve the problems, and they can able to produce new innovations.



Differences between Traditional classroom approach and Flipped classroom approach

Sl. No.	Characteristics	Traditional classroom approach (TCA)	Flipped classroom approach (FCA)
1	Instructional strategy & approach	Face to Face instruction Linear (Teacher to student) Instructor- controlled	Blended learning approach Non- linear (Learners do not follow the set sequence) Learner- controlled
2	Before the class	Teachers used to motivate the students regarding what is going to discuss in the class	Here, the topics are introduced by the teacher and given study materials to read, analyze and comprehend the subject matter

Sl. No.	Characteristics	Traditional classroom approach (TCA)	Flipped classroom approach (FCA)
3	During the class	Instruction is given by the teacher, student learn from the teacher by using the milestones	Here, the learners used to discuss with fellow students and their teachers, perform activities under the guidance of teacher
4	After the class	Students got information from teachers	Students analyze, comprehend and reflect the content which was discussed in the class
5	Study materials	Study materials given once the topic is covered	Study materials are given before starting the class
6	Home work	Is given to practice and for follow up activities after the teaching.	Home work is given before the teacher teaches the content.

Research studies that supports the flipped classroom strategy

Generally the students attention decrease after 15 to 20 minutes of a class, in flipped classroom students are actively involved in whole teaching learning process (Medina, 2008), since they learn convenient time and pace. It is suitable for gifted students, who can view the video tutorials and learn quickly and minimize boredom compared with when they learn along with less gifted students (Hattie, 2013). According to Beesley and Apthorp (2010) in FC, the instructor observes and interacts with students when they involve in discussion or activities. This can be solved their problems or misunderstanding in immediately i.e. "Just in time". He believed that in-class feedback was much better than the given as homework. Hamre and Pianta, 2005, state that flipped classroom develops interpersonal interaction and also helps the student to achieve better learning outcomes.

Why should we use flipped classroom?

According to the founder of FCA in their book, "Flip your classroom: reach every student in every class everyday (2012), they discussed why flipped learning (p.20-33) can be used.

1. Flipping helps the struggling students, they can view the videos multiple time to get deeper knowledge
2. It helps to excel their abilities
3. It allows them to read, pause and rewind the content
4. It improves teacher- student, student-student interaction.
5. It modifies the classroom management
6. It helps to mastery over the content.

Advantages

1. Learners are more responsible than the teachers to achieve the learning goals
2. Since it is a child centered approach; students are actively involved in the teaching learning process.
3. The learning process will be more effective. Learners are actively involving with peers in discussion, get assistance from the teacher, analyze and reflect the content.
4. Collaboration and teamwork increases in this method
5. Higher order thinking skills developed rather than mere understanding the content.
6. Students get opportunity to learn through video lesson and clarify their doubts in next day.
7. Since the students get adequate time to learn and access the information, they can widen their knowledge and understanding. More chance to access the content.
8. Even absentees student also learn through video lectures and if required they can learn again and again, self paced.

Limitations

1. Lot of preparation is required for the students to face the classroom discussions
2. Achievement FCA is fully depend on the learners preparation and interest
3. They have to depend more on digital Medias to equip knowledge.
4. Students have to spend more time on screens, and also required internet connection.
5. It may not be suitable for children who come from illiterate family background, because he /she may not get opportunity to clarify their doubts with their parents.

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Conclusion

Of course in present scenario both teachers and students are comfortable to teach and learn through electronic gadgets with the impact of Covid19. This pandemic period taught us to use many teaching apps, learning apps and assessment forms / apps. At present the role of teacher and students also varied, so this is the right time to switch over towards flipped classroom strategy. Perhaps, FLA may be boon to the learner's community.

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Metaverse in education – A multifaceted growth partnership

Mugil, M.
Manager – Business Development, Cognizant Technology Solutions

Metaverse, the history till today

In 1992, the science fiction writer Neal Stephenson coined the term 'Metaverse' to describe 3D virtual space. Today, it has been unearthed to be the new buzz word that has been branded by the internet conglomerates, facebook.com naming their parent company as 'Meta', Microsoft unveiling their virtual collaboration platform ('Mesh'), and much more. Internet is where people browse and exchange messages. But in Metaverse people start to live in it to an extent as it blends the real world with immersion. In the Metaverse world, people build virtual community where they can communicate with each other by creating their virtual self as avatars.

What does Metaverse has to offer for Education industry?

Metaverse gained attention world-wide via gaming and financial(cryptocurrency) industry. While its applications are being experimented across industries, Education industry is the primer which is already cashing out the advantages of Metaverse via virtual platforms via Augmented Reality (AR), Virtual Reality (VR), Artificial Intelligence (AI) and Cloud Computing. The product outcome that these technologies put together has created a whole new universe for ICT in education space that is self-reliant, highly intelligent, adaptive to changes and has brought in elixir of motivated learning – gamification. Ingelsoong.com has depicted a good picture of the virtual classroom. This gives the teaser of virtual classroom in future.

Image Source: ingelsoong.com

AR/VR in Education

AR/VR provides enriching experience for students to learn and engage with the objects in virtual world. It has transformed the mode of content delivery by creating a virtual world by mixing the reality and imagination. It allows teachers and students to interact with the objects they see. As they get immersed into the content, they get motivated to fully understand the content. The cognitive capacity required to process the content is relatively less compared to other modes of learning.

VR is brought to classrooms by projecting videos in classroom walls and VR headset. The common and practical method to implement VR in using VR headset. It requires minimum equipment and space at a decent cost.

A common use case of VR is taking students on virtual reality tours to anywhere in the world. These virtual field trips give ease of access to students to explore the wonders of the nature. The virtual leanings from vehicle assembling to understanding human anatomy, gives real life learning experience to students and stimulates their motivation to learn more and better. It brings new perspective to a student which nurtures them to become the innovators.

Some of the key sectors of Education where VR's power is harnessed are – Humanities (learning history, art, politics via virtual tours), Sciences (anatomy, molecular biology, chemistry, physics) and

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Architecture and Engineering (3D modeling). Also used in soft skill areas like communication and business management.

Image source: google images

Here are some of the real-world applications of VR currently in place –

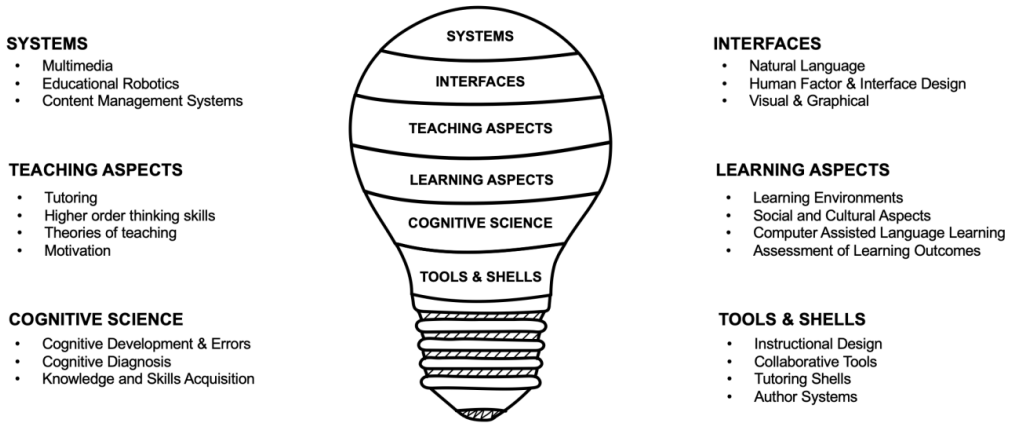
- BBC has brought in 360° view of real-life video footage where it showcases the nighttime raid of Nazi Germany in 1943.
- Google Expeditions takes the students to places where their teachers even wouldn't have the chance to see like Mount Everest base camp, the Louvre Museum in Paris
- The VR Museum of Fine Art allows students to view the fine arts and sculptures (like Mona Lisa) without having to waiting in queue or spending money and time to visit various museums to see all these world wonders.
- Firms like Mondly provide immersive language-learning experience which is much better than theoretical learning
- Microsoft HoloLens helps future doctors to understand and visualize human anatomy
- The Froggipedia app explores the internal organs of a frog using AR technology

To summarize, some of the key advantages thatAR/VR has brought into education are

- it gives more experiential & immersive learning
- students able to retain the learning for a longer time compared to other modes
- helps teachers to share knowledge in a simplified and highly interactive form
- supports remote learning via self-sufficient learning

AI in Education

From Alexa reading e-books to Google assistantordering swiggy delivery, Artificial Intelligence has crossed a long way from sci-fi movies to real life. The power beyond speech processing, machine learning, image processing AI's applications are limitless and leads as the front-runner in every industry including Education. AI helps education sector to evolve into new dimensions to provide teaching and learning experience. eLearningIndustry.com has assessed that 47% of Learning Management Systems (LMS) will be enabled by AI in next 3 years. AI supports Education in multiple facets that runs around systems, interfaces, tools, teaching and learning aspects, collaboration, and cognitive science. Below is the summary of services where AI is driving the change in EdTech space -



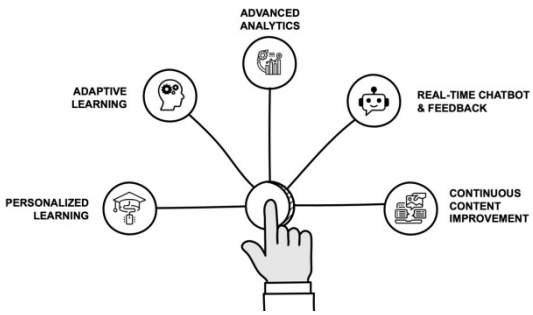
Personalization is the core of all the services that AI has to offer. It analyses the abilities of students based on their performance history and provides insights on the need's specific to individual students. Based on this, the teacher can pick-up and deliver lessons catering to the student needs. And students on other side can track their progress and decide on their learning path. Students gets to pick their preference and gets the right attention from teachers. This is not possible in regular form of Education because of the time and effort that needs from the teacher, the big investment from the educational institution.

Automation of responses (chatbots), auto evaluation of tests, lessons planning, monitoring of patterns to help teachers to reduce their administrative work burden and use efforts in right direction to nurture the students.

Some of the real-world examples where AI is making a difference in Education sector are listed below –

- **Nuance** firm helps teachers and students using its speech recognition software which can transcribe up to 160 words/minute. This enhances the ability to recognize words along with spelling.
- **Querium** offers customized AI solution in STEM education for high school students. It analyses the time taken to finish lessons and probe the answers.
- **Brainly** provides the platform for students to collaborate, share knowledge and enables self-sufficient problem-solving skills.
- **Century Tech** uses cognitive science and data analytics to recommend personalized learning plans for students
- **Kidaptive**powers schools and colleges with Adaptive Learning Platform that uplifts student's engagement and improves output

Here is the quick summary of benefits that AI has to offer in Education –



Cloud Computing in Education

Cloud computing has given a significant shift in education. It provides the opportunity to access the content anywhere, anytime in a secured and cost-effective environment. It supports the innovation that students bring out to the world. For example, if a student decides to work on an assignment that involves video, pictures, constant editing, listening to podcasts, search through 100-year-old historical documents, all these are brought before the student in a few clicks. All this is made possible because of the advancements in cloud computing.

Accessibility, Reliability and Cost-Efficiency are the key terms which made the tech world to look back on cloud computing. Data protection obligations of schools on students and teachers; reliability on information availability and data restoration even on multiple device failures; breaking barriers by

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connecting teachers and students across the world – all became possible when Cloud computing met Education industry.

The below picture represents how the personal learning environment is cloudified –

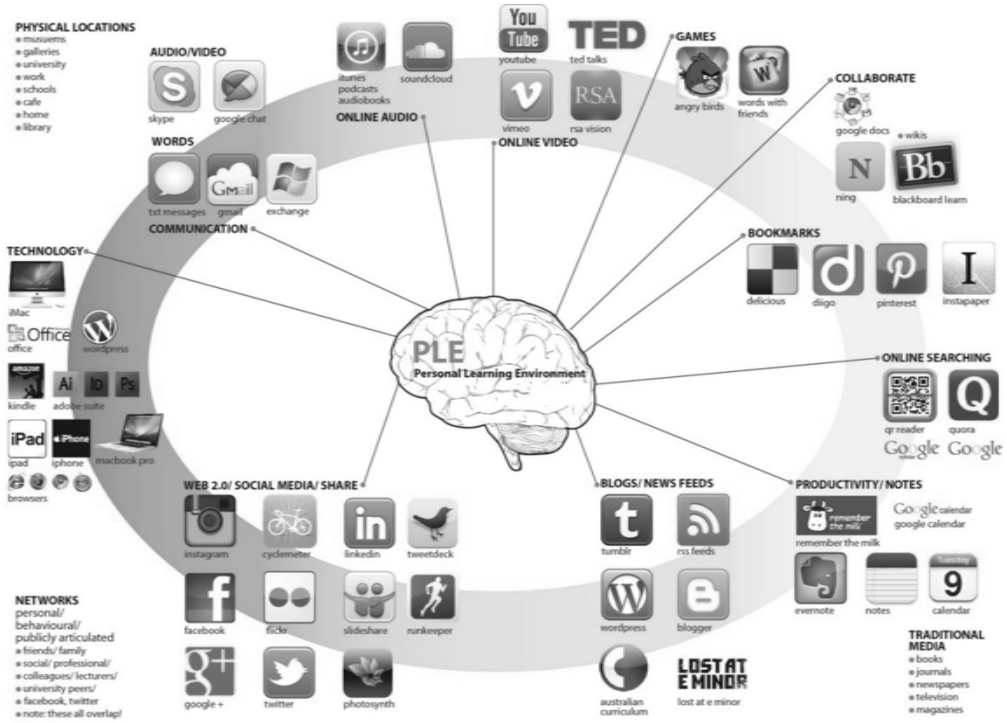

Image source: medium.com

Below are the real-world applications that use cloud computing in education to a greater extent –

- Google Classroom, a widely used online learning management system is powered by Google Cloud Platform
- Coursera, a cloud-based eLearning platform provides degrees from multi-national universities
- Microsoft Education Center, an online learning platform brought in for students to continue learning in the best way possible is powered by Azure cloud

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Perceptual and cognitive ability among learners

Maheswari, G.
Ph.D. Scholar, Department of Education, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Indu, H.
Associate Professor and Head, Department of Education, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Introduction

Jean Piaget is considered by many to be the father of modern developmental psychology. Piaget believed and developed ingenious tasks to test that human infants and children perceive and comprehend the world differently than adults do. He was the keen observer of infants and child behaviour and took wonderfully detailed notes of his observations. In addition to being a skilled observer he performed well controlled experiments to test new hypotheses derived from those observations. His ideas were based on a biological view of development and thus differed from prior behaviourally based theories. On the basis of his observations he characterized the cognitive development in humans in four stage model, that as well we will learn has been and is undergoing rapid modification.

Piaget termed the period from birth until the age of about 2 years the sensory-motor intelligence stage. He conceived of the newborns as a new-born as a work in progress and held that the new-born faced a sensory perception and generated and only random activities. Thus according to Piaget in the first stage of postnatal life, the developing nervous system aims to achieve sensory motor integration and the integration across different sensory modalities (e.g., sound, touch, vision). Piaget also believed that the new-born could form a concept of self that could distinguish between it and the outside world, and thus the development of self-identity had to begin during the period.

Table 1 The divisions of Piaget cognitive development in humans

Stages	Age	Characteristics
Sensory – Motor Intelligence	0-2 Years	Unconnected Sensations, Representational Thought
Pre Operational Period	2-7 Years	Symbolic Representation, Illogical Thinking and Reasoning, Egocentric, Lack of Conservation and Reversibility
Concrete Operational Period	7-11 Years	Concrete Phenomenon, No Abstract Thinking, Conserve and Reverse Relationship
Formal Operational Period	11 Years and older	Development of Abstract Thought, Logical Thinking, Problem Solving

Piaget proposed that to achieve sensory motor and cross modality integration, infants develop sensory –motor schemas during the sensory motor schemas during the sensory motor intelligence period. That is they learn to do simple sensory and motor inputs to logical abstract thought. During this stage Piaget argued that infants have poor concepts of objects in the world. Even when they are old enough to interact with objects, they do not exhibit abilities such as object permanence; child's mental ability is limited to direct sensory and motor interaction with the environment. Obscuring an object from an infant during this period will at first lead the infant to ignore it. Later the infant may learn to look for it might be .for example in repeated trials if an investigator hides a toy from a child in her plain view, she will explore the hiding place to retrieve the toy. If the same hiding place to retrieve the toy. If the same hidden place is used over consecutive trials but then a new hiding place is used she will continue to search the original, well-practiced location, even though she watched the toy being hidden in the new hiding place. As the child ages this preservative behaviour diminishes. Piaget proposed that success in tasks such as this the end of the sensory motor intelligence stage and is the result of newly developed ability to represent objects and events internally; that` is infants can think about objects and acts that are no longer within the sight. Thus infants are said to exhibit object performance when they are no longer have difficulty conceptualizing the presence of an unseen object.

Many investigators have challenged the Piaget concept of the limited nature of new-born capabilities in the realms of the sensory motor integration, cross modal integration, cross modal integration and object perception. The nature of the challenge has to do with how quickly after birth an infant display a particular ability. Piaget critics have argued that the cognitive perspective focuses on thought processes and the behaviour that reflects those processes. For example new-born infants are given with adequate

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support to head theycan visually track sounds. This suggests a well-developed skill at cross modal visual and auditory integration and ability to link motor actions with cross modal perceptions.in line with this idea, studies have shown that infants only a few months can observe what elders are doing and making sounds can be identified by movements of mouth and voice synchronization.

Rene Baillargeon (1991) demonstrated this in object occlusion task .She showed infants an object and then placed it behind a vertical panel that occluded their view. The panel was dropped under two conditions .in that situation the panel was dropped and disturb the object placed it, as would be expected. In the next situation the panel was dropped during that time object had been removed secretly, then the panel fell flat to the table. The infants showed more surprise in the second condition than in first condition.

If infants have well developed object permanence even at an early age how can we explain the perseverative behaviour when the investigators hide the object. One interpretation has to do with properties of the frontal cortex. It is well known that adults suffering from frontal lobe damage cannot switch their motor set-they persevere with a previous response. Infants with preservative motor behaviour behave as though they were frontal lobe lesion patients. This similarity in behaviour can be interpreted in a surprisingly simple and gratifying way: Infants do not have complete myelination of neurons from the prefrontal cortex, and thus their frontal cortex and thus their frontal cortex is not yet fully functional.

In the Piagetian model, three additional stages follow the sensory motor intelligence stage. The first from 2-7 years old is the preoperational stage during which representational thought and object permanence are hypothesized to be well established but other conceptual processes are not yet evident. Piaget believed that children in this stage do not show conservation of quantity: that is, they cannot appreciate that two differently shaped glasses of liquid contain the same volume even though they see them being filled with the same amount of liquid for the same source. Thus ,the visual appearance of a taller thinner glass verses a shorter fatter glass dominates the children's decisions about the quantity: they believe that the taller glass holds more liquid than the shorter fatter glass, even though they actually have the same volume .Piaget proposed that a similar effect happens with numbers of objects. It is not until near the end of this stage ,at about 7 years old, according to Piagetian theory, that children learn these abstract concepts and rarely fooled if given all the information needed to make the correct decision.

From 7-11 years old `Piaget held that children become capable of some forms of some forms of quantitative conceptual thinking. He argued however that during this period that initially can do quantitative operations on concrete events. Piaget called this period the stage of concrete operations. Then from 11 years onward during the stage of formal operations, children learn to make abstract representation of relationships according to Piaget. Children at this age can generalize mathematical relationship and manifest hypothetical deductive thought –the ability to generate and test hypotheses about the world.

Research challenges Piaget's theory about the three stages. Infants show remarkable evidence of the rudimentary sense organs in early in life. They can identify the difference the three stages. Thus, infants appear to be sensitive to the concepts of more and less.

Development of Visual cognition –Object Recognition

Like Piaget, WilliamJames, one of the founding fathers of the field of psychology, speculated that new-borninfant's perceptual experience amounted to one great blooming, buzzing, and confusion. Over the past 25 years researchers have devised methods to investigate whether infant's perceptual difference is indeed as confused as James and Piaget believed or whether it is more organized. These methods involve capitalizing on and quantifying overt behaviours in which babies engage naturally.

Extensive research had made use of babies 'looking time –that is how long they took us the stimulus.it turns out that there are very predictable aspects of infants looking behaviour that render measures of looking time as a powerful tool in the developmental science.

Development of the Human Attention System

The visual perception system shows dramatic developmental changes early in life ,as demonstrated by the acquisition of the ability to recognize objects in the world. When changes in the developing brain support the acquisition of such abilities? primate visual systems have been adapted and investigated over the past 40 years. The structures and system of relevance to the oculomotor system was mapped and as a result of observation of how oculomotor behaviour develops have enlighted us about the neural substrates of a key cognitive mechanism-attentional orienting.

Development of Face Recognition

Face processing like language is an exquisitely developed skill in humans that has its origins in the first days of life. Newborns babies seem to like looking at many other interesting stimuli such as bull's eyes and checker boards. Infants just as few weeks old can distinguish their mothers face from other women's face. They rely on global aspects primarily because their visual ability is poor at birth and does not approach adult capability until the age of 3-4 months. Once normal acuity develops, babies begin to recognize and distinguish faces on the basis of their features. A hall mark of mature face processing is the

inversion effect, whereby recognition of faces presented upside down is markedly slow and difficult in comparison to faces presented right side up.The ability to facerecognizes is very important in humans that the brain appears to have an area that is devoted to the task: the fusiform gyrus. Brain studies consistently find that this region of the temporal lobe becomes active when people look at faces of others.

Facial recognition process

Bruce and Young (1986) explainedthe facial recognition phenomenon by devising a framework, that explains the facial recognition process step-by-step. The researchers said that there are four major steps involved in recognizing faces, each of which is very much salient in positively affirming or recognizing familiarity.

1. Structural Encoding is the initial stage of the facial recognition process. In this process, the holistic and featural appearance of the face is noted down by the brain.
2. Face Recognition Units (FRUs) consist of the eyes, nose, and lips, the second step in the facial recognition process creates a definition and identification of relevant and specific facial features or markers for the brain.
3. Person Identity Nodes (PINs) is the third step is highly associated with the previous one. The brain automatically looks for particular qualities (e.g. eye colour, plumpness of lips) that are associated with a familiar person.

Name Retrieval is the facial features relate to a specific person, the brain is automatically able to retrieve the name, and any other quality, that is associated with the face.

Language acquisition during development

Language development is unique to humans.It is an innate or acquired abilitythat scientists have struggled with for decades. Humans are not born with the innate ability to speak and understand the language; they must learn it through exposure from the environment –which means that language is a learned by talent. Language acquisition is a process which starts three months before birth and gradually leads to the child's mastery of native languages. Language learning, language acquisition and language development can be understood as synonymous terms.The units are words, the materials are the small set of sounds from which they are constructed, and the combinations are the sentences into which they can be assembled. Given the complexity of this system, it seems improbable that mere children could discover its underlying structure and use it to communicate. Yet most do so with eagerness and ease, all within the first few years of life.

Gesture communication in infants before speech

Gestures are a fundamental part of a baby's language and social development. They support language and social skills, and using certain gestures by certain ages may predict academic success later in life. Not using gestures could be a sign of developmental delays. Gestures emerge around 9 months. By 12 months, common motions include waving, shaking the head, reaching, pointing, and clapping. Cultural gestures (thumbs-up or high-fives) emerge by 16 months. Symbolic gestures (shrugging shoulders to say "I don't know") emerge by 24 months. The more a parent gestures, the more a baby gestures!

Commonality of language in humans

Language is an essential tool that enables us to live the kind of lives we do. Much of contemporary human civilization wouldn't have been possible without it.When people use language to describe an experience, their thoughts and feelings are profoundly shaped by the linguistic representation that they have produced rather than the original experience per se (Holtgraves & Kashima, 2008). For example, Halberstadt (2003) showed a picture of a person displaying an ambiguous emotion and examined how people evaluated the displayed emotion. When people verbally explained why the target person was expressing a particular emotion, they tended to remember the person as feeling that emotion more intensely than when they simply labelled the emotion.

Language Acquisition is similar in everyone

Many experts also believe that we are headed toward a world in which everyone will speak the same language, especially since globalization is making communication between even the most far-flung communities possible. Perhaps everyone would learn this language in addition to their native tongues. The inseparable link between language and identity, it seems unlikely that people will ever voluntarily give up their native languages. On the other hand, given the ease with which children can learn other languages — combined with the increasingly global nature of our society — it seems likely that the world will remain marvellously multilingual for years to come.

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Milestones in Neuroscience

The first 3 months of a child's life are a time of wonder. Major developmental milestones at this age are centered on exploring the basic senses and learning more about the body and the environment. During this period, most infants begin to: Demonstrate anticipatory behaviours, like rooting and sucking at the site of a nipple or bottle. Detect sound differences in pitch and volume. Discern objects more clearly within a distance of 13 inches. Focus on moving objects, including the faces of caregivers. See all colors of the human visual spectrum. Tell between tastes, from sweet, salty, bitter, and sour. Use facial expressions to respond to their environment. In early infancy, perceptual abilities are still developing. From the age of 3–6 months, infants begin to develop a stronger sense of perception. At this age, most babies begin to: Imitate facial expressions, React to familiar sounds, Recognize familiar faces, Respond to the facial expressions of other people. From 6 to 9 Months

Looking inside the mind of an infant is no easy task. After all, researchers cannot just ask a baby what he or she is thinking at any given moment. To learn more about the mental processes of infants, researchers have come up with a number of creative tasks that reveal the inner workings of the baby brain. From the age of 6–9 months, researchers have found that most infants begin to: Gaze longer at "impossible" things such as an object suspended in mid-air. From 9 to 12 MonthsAs infants become more physically adept, they are able to explore the world around them in greater depth. Sitting up, crawling, and walking is just a few of the physical milestones that allow babies to gain a greater mental understanding of the world around them. As they approach 1 year of age, most infants are able to: Enjoy looking at picture books , Imitate gestures and some basic actions, Manipulate objects by turning them over, trying to put one object into another, etc. Respond with gestures and sounds, understand the concept of object permanence, the idea that an object continues to exist even though it cannot be seen. From 1 to 2 Years After reaching a year of age, children's physical, social, and cognitive development seems to grow by leaps and bounds. Children at this age spend a tremendous amount of time observing the actions of adults, so it is important for parents and caregivers to set good examples of behavior. Most one-year-olds begin to: Identify objects that are similar, Imitate the actions and language of adults, Learn through exploration, Point out familiar objects and people in picture books, Tell the difference between "Me" and "You". Understand and respond to words. From 2 to 3 Years At 2 years of age, children are becoming increasingly independent. Since they are now able to better explore the world, a great deal of learning during this stage is the result of their own experiences. Most two-year-olds are able to: Identify their own reflection in the mirror by name Imitate more complex adult actions (playing house, pretending to do laundry, etc.) Match objects with their uses, Name objects in a picture book, respond to simple directions from parents and caregivers, Sort objects by category (i.e., animals, flowers, trees, etc.) Stack rings on a peg from largest to smallest. From 3 to 4 Years Children become increasingly capable of analysing the world around them in more complex ways. As they observe things, they begin to sort and categorize them into different categories, often referred to as schemas. Since children are becoming much more active in the learning process, they also begin to pose questions about the world around them. "Why?" becomes a very common question around this age. At the age of three, most kids are able to: Ask "why" questions to gain information. Demonstrate awareness of the past and present. Learn by observing and listening to instructions. Maintain a longer attention span of around 5 to 15 minutes. Organize objects by size and shape. Seek answers to questions, Understand how to group and match object according to colour. From 4 to 5 Years, as they near school age, children become better at using words, imitating adult actions, counting, and other basic activities that are important for school preparedness. Most four-year-olds are able to: Create pictures that they often name and describe, Count to five, Draw the shape of a person, Name and identify many colors, Rhyme, Tell where they live.

Conclusion

Cognitive development takes place over many years from birth to adulthood, but some cognitive functions mature earlier than others. This is not to say that the human infant is not capable to significant processing at very early age. Indeed the classic view of piaget has been challenged and continuous to be modified as researchers demonstrate that even young infants may have knowledge about objects around them, and that at the early age they developed the sophisticated representation for the things they encounter and for mental abilities such as numerical knowledge. The evidence argues for the nervous system that acquires knowledge quickly by selecting from preconstructed neural circuits as soon as they physically come on line. The result is that perception, action, and reasoning develop early and in parallel and not in simple progression from sensation to higher cognition. Some of biological correlates of the fantastic developments are known, such as in case of the visuomotor system and attentional orienting.

Innovative teaching strategies for children with ADHD

Nagasharmila, P.
Research Scholar, Department of Education, Periyar University, Salem, Tamil Nadu, India

Hema, G.
Assistant Professor, Department of Education, Periyar University, Salem, Tamil Nadu, India

Introduction

The primary symptoms of Attention Deficit Hyperactivity Disorder are inattention, hyperactivity, and impulsivity (ADHD). Academic success knows the significance of a child's ability to focus on tasks as well as teacher and classroom desire with clear targets. A student who masters this skill is able to obtain necessary information, homework, and participate in activities and discussions. (Forness&Kavale, 2001). When a child exhibits ADHD-related behaviors, the consequences may include academic challenges and difficulties improving interpersonal relationships with his or her peers if suitable instructional methodologies and interventions are not executed.

Attention Deficit Hyperactivity Disorder (ADHD)

Attention deficit hyperactivity disorder (ADHD) is the neurobehavioral disorder of childhood (Reif, 2003, 2005). It is also among the most prevalent chronic health conditions affecting school aged children (American Academy of Pediatrics, 2000). ADHD refers to a family of related chronic neurobiological disorders that interfere with an individual's capacity to regulate activity (hyperactivity), inhibit behavior (impulsivity), and attend to tasks (inattention) in developmentally appropriate ways (National Institute of Mental Health, 2000; National resource Centre on ADHD, 2003a). Estimates of the number of school age children with ADHD vary from 3 to 5 percent (America Academy of Pediatrics and National Initiative for Children's Healthcare Quality, 2002; American Psychiatric Association, 2000). ADHD can be classified as mild, moderate, orsevere and ADHD with a variety of characteristics following are some additional behaviors common in individuals with ADHD that are related to the core symptoms of inattention, hyperactivity, and impulsivity their difficulty with self-regulation; and the use of their "executive functions" which are the goal directed, management functions of the brain.Signs vary from child to child, and even within a child with ADHD the signs can change from day to day.

Teaching Strategies for ADHD children

Teaching is a collaborative process that includes guiding, supporting, and guiding students' learning. Sometimes the terms "instruction" and "teaching concepts" are used interchangeably. Gagné (1977) and Bruner (1960) used the terms teaching and instruction almost interchangeably in their statements. Gage defines teaching as "any activity performed by at a certain time to promote the learning of another." According to this definition, teaching is a scheduled implementation that occurs during the instructional process (CelalAkdeniz, 2016).Marzano (2003) classified strategies into nine categories: identifying similarities and differences, summarizing and taking notes, reinforcing effort and providing recognition, homework and practice, nonlinguistic representations such as mental images, graphs, acting out content, cooperative learning, setting objectives and providing feedback, generating and testing hypotheses, activating prior knowledge through questions, cues, and advance organizers.There are many teaching strategies that can be employed to enable students with ADHD to be more successful in the classroom. Following are some ways to enhance the academic and behavioral performance of students with ADHD.

Fig. 1 Innovative teaching strategies for ADHD Children

I. **Academic Instruction:** Teachers can help ADHD students succeed by introducing, conducting, and concluding each lesson with the effective teachingof principles.

(a) Introducing lessons (Effective teachers of children with ADHD also guide them)

- Provide an advance organizer**.**
- Review previous lessons
- Set learning expectations
- Set behavioral expectations

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- State needed materials.
- Explain additional resources
- Simplify instructions, choices, and scheduling

(b) Conducting lessons

The following strategies may help teachers deliver effective lessons:

- Be predictable
- Students participation support in the classroom
- Use audiovisual materials
- Check student performance.
- Ask probing questions
- Perform ongoing student evaluation.
- Help students correct their own mistakes.
- Help students focus.
- Follow-up directions
  - Oral directions
  - Written directions
- Lower noise level
- Divide work into smaller units.
- Timed tests should be eliminate or reduced in frequency.
- Use cooperative learning strategies.
- Use assistive technology

(c) Concluding lessons

- Provide advance warnings.
- Check assignments
- Preview the next lesson

II. Classroom Accommodations

Classroom accommodations are the second component of an effective ADHD education strategy. Children with ADHD frequently struggle to adjust to the structured environment of a classroom, to determine what is important, and to focus on their assigned work. Other children or nearby classroom activities easily distract them. As a result, many children with ADHD benefit from classroom accommodations that reduce distractions and help them stay on task and learn. Certain classroom accommodations, both in the physical and learning environments, can benefit children with ADHD. According to (Nagasharmila& G. Hema,2018)Classroom accommodations can conclude that;

(a) Instructional: Motivate all students to actively participate by differentiate instruction in the classroom. Provide a variety of activities, projects, and ways for students to demonstrate their learning. Clearly teach and provide tools for organization. Require the use of a binder, a backpack, a planner or assignment calendar, and color-coding strategies. Organize the classroom environment using designated areas, trays, files for turning in work, and storing materials, and provide direct assistance in organizing notebooks, desks, lockers, and filling important papers. Teach, model and consistently use daily assignment sheets, planners, agendas, and calendars.

(b) Environmental: One of the most common classroom accommodations is determining where a child with ADHD will sit. Use proactive classroom management. By providing clear rules, expectations, and procedures; anticipating problems, and structuring and planning for prevention. Provide environmental and learning style accommodations, such as preferential seating and use of tools such as privacy boards and earphones, to minimize distractions and optimize attention to task. Make high use of visual prompts, cues, and redirection to task. Increase the use of supportive partners to help students with ADHD through, for example, reminders, focusing attention to task, and clarifying directions. Collaborate learning format with groups are highly effective in keeping students engaged and participating during lessons.

(d) Informational: Teach mnemonic devices, association strategies, melody, rhythm, and other ways to aid memory and recall of information.

(e) Homework: Provide structure and monitoring of any long-term assignments and projects by chunking them into a series of shorter assignments with incremental due dates, check points, and teacher feedback along the way. Build on goal setting and self-evaluation in assignments and projects. Check that the student has the materials, books, and recorded assignments needed before leaving the classroom at the end of the day. The teacher does this directly or assigns a responsible peer or partner to make the check.

III. Behavioral Interventions

The use of behavioral interventions is the third component of effective instruction for children with ADHD. The goal of behavioral interventions is to assist students in engaging in behaviors that promote their own and their classmates' learning. Well-managed classrooms prevent many disciplinary issues and create an environment conducive to learning. There is less time available for helping other students when a teacher's time is spent interacting with students whose actions are not focused on the lesson being presented.Behavioral interventions, according to, should be viewed as a chance to teach in the most effective and efficient way possible, rather than as a chance to punish by (U.S. Department of Education,2006).

(a) Effective behavioral intervention techniques:

- While giving praise, define the appropriate behavior.
- Give praise immediately.
- Vary the statements given as praise.
- Be consistent and sincere with praise.
- Provide individualized behavioral support and interventions. Examples are the use of notes between home and school, daily or weekly report cards, contingency contracting, response cost techniques, strong efforts to build a positive relationship with the student, and close communication between home and school.

(b) Behavioral intervention strategies on praise and punishment

a. Verbal reinforcement

- Selectively ignore inappropriate behavior.
- Remove nuisance items
- Provide calming manipulative.
- Allow for “escape valve” outlets.
- Activity reinforcement.
- Hurdle helping
- Parent conferences.
- Peer mediation.

❖ **Behavioral prompts**

- Visual cues
- Proximity control.
- Hand gestures.

Children with ADHD gain from education that instructs them how to handle their own behavior:

- Social skills classes.
- Provide specific training for anger management, conflict resolution, and social skills. Something the school counselor, psychologists, and other school support professional provide such training. If it is not available through the school district, parents may be referred to other professionals in the community.
- Problem solving sessions.

Many children with ADHD benefit from functional behavioral assessments as well as positive behavioral interventions and supports, such as behavioral agreements and planning processes, positive factors, or token economy systems, in order to learn how to manage their own behaviour.

Potential strategies are identified, and the teacher student work on these strategies for a prescribed period of time. Relaxation strategies are use, music, and other calming and diversionary techniques.

Provide specific training for anger management, conflict resolution, and social skills. Something the school counselor, psychologists, and other school support professional provide such training. If it is not available through the school district, parents may be referred to other professionals in the community.

IV. Technology

Assistive learning tools can help students with attention deficit hyperactivity disorder or learning difficulties, and some of our choices are small enough to fit in the tribute of a student's hand. Learning tools and apps can support for students who are having difficulty with reading, writing, math, time management, and other issues.Word processors, Word IQ, Spelling, speech recognition software, such as Dragon Naturally Speaking, screen readers, and multimedia can all be used as part of a larger systematic approach to teaching students with ADHD.

Conclusion

This chapter has outlined a number of instructional strategies that have been shown to be effective in the education of ADHDchildren. It should be noted, however, that these techniques are

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extremely beneficial to all children.A successful strategy for educating children with ADHD includes academic instruction, behavioral interventions, and classroom accommodations.Teachers will be able to improve their ADHD students' academic performance and behavior by includingmethods from these disciplines into their regular instructional and classroom management follows. As a result, teachers will create a better learning environment for all students.

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Constructivism: A paradigm shift in teaching and learning

Rashmi Singh

Assistant Professor, Department of Education, S. S. Khanna Girls' Degree College, University of Allahabad

Introduction

Philosophy is the mother of all sciences. Psychology has emerged very late from philosophy. Psychology as a science has only a short history. From its inception, several philosophies have governed the entire span of psychological history. Starting from Wilhelm Wundt's structuralism, which was an attempt to understand the structure or characteristics of the mind to William James's Functionalism, according to which psychology's purpose was to study the function of behavior in the world. Then come the psychoanalytic theory of Sigmund Freud, which focuses on the role of a person's unconscious as well as early childhood experiences in their make-up of personality. After Gestalt psychology came, which has emphasized the perception of 'whole' in comparison to its component parts? Prior to constructivism, behaviorism was the most popular philosophy in the field of psychology as well as in educational psychology. Watson was the main propagator of behaviorism but B. F. Skinner was the most popular behaviorist to date. Behaviorists have pointed out that all behaviors are acquired through conditioning. It has emphasized that individuals' interactions with their environments have decided what they learn, who they are, and how they act. The main drawback of behaviorism is that it ignores internal states of mind. To overcome this loophole cognitivism came into the sphere, it has de-emphasized the observable behavior and put the emphasis on higher cognitive processes such as thinking, problem-solving, concept formation, and information processing (Snelbecker, 1983). After cognitivism the new philosophy has emerged, it is not a totally new philosophy but it has roots in the works of famous cognitivists like Piaget and Bruner.Piaget is widely considered the father of constructivism. Sometimes it is assumed to be a branch of cognitivism. The main difference between cognitivism and constructivism is the role of social context in learning. Constructivists have accepted the presence of the external world in meaning-making. While cognitivism has not put emphasis on the social aspect of learning, constructivism denies any sort of objective reality. They said that individuals construct their knowledge on the basis of their previous experiences and interactions with their environment. Where cognitivism viewed learning as solely a mental process, constructivism viewed learning as a combination of mental processes and human interaction.

Constructivism

Summating the above said points, we can say that the works of Jean Piaget and John Dewey which are now termed progressive education too have founded the first stone of constructivism. Commonly constructivism is regarded as a cognitive revolution against the then-popular behavioristic viewpoints. However, Lev Vygotsky was the most prominent constructivist. Constructivism has changed the notion of a learner to an active learner. Here the learner is not a passive entity who just acquired information but s/he constructs knowledge from the information gained and his/her interaction with the environment. Hence experiences play an important role and active experiences in which individual also takes part. Learner constructs knowledge with the help of two processes, assimilation, and accommodation which was used by Piaget in his theory of cognitive development. Assimilation is the process of acquiring new information and fitting it into an existing schema, here the structure of schema remains unchanged. While in accommodation individuals used newly acquired information to revise and change an existing schema. So from a practical point of view teacher has to provide such experiences to learners so that they remain involved in the process of assimilation and accommodation as well resulting in a process called equilibration.

Types of Constructivism

Constructivism is not a unitary theoretical position, rather it is a continuum. Constructivism is based on several assumptions that underlie this continuum and vary along several dimensions. This has resulted in different types of constructivism, there are mainly three types of constructivism which are:

1. **Cognitive Constructivism:** Jean Piaget was the main founder of cognitive constructivism. He was very much influenced by Alfred Binet, creator of the first intelligence test. Binet, later on, gave the concept of mental age and clarified that children's intellectual capacity is different from adults. From here, Piaget has found the clue that children are not intellectually inferior to adults but have different sorts of thinking than adults. Then he has proposed his famous theory of cognitive development in which he has explained that children follow a stage-wise thinking pattern to reach up to the most complex form of thinking. This has led to the emergence of cognitivism or cognitive constructivism. This is the weakest form of constructivism as it has not

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followed all assumptions of the continuum of constructivism and is situated at one extreme end. According to it, the learner has constructed meaning in accordance with his/her cognitive structure and developmental stage.

2. **Social Constructivism:** LevVygotsky was the propagator of social constructivism. Piaget has not taken into account the importance of society and culture, while Vygotsky has the viewpoint that cognition alone is not a sufficient pre-requisite for learning but social interactions are also equally important. On the continuum of constructivism, social constructivism comes in between radical and cognitive constructivism.
3. **Radical Constructivism:** It represents the opposite end of the constructivist continuum from cognitive constructivism, it has situated on the other extreme end. Social constructivism lies in between cognitive and radical constructivism. The notion of radical constructivism was developed by Ernst Von Glasersfeld (1974) and states that all knowledge is constructed rather than perceived through senses. It has been stated that not only knowledge is built by the individual but that his construction and adaptation of knowledge construction what is known by the knower, rather than knowledge of an outside objective truth (Lerman, 1989).Hence in accordance with radical constructivism, there is no scope of objective reality as of postmodern scientists. Radical constructivists extended the concept of equilibration as given by Piaget. It is the strongest form of constructivism as it follows the maximum tenets of constructivist dimensions.

Principles of Constructivism:

Constructivism is a philosophical tenet of education or learning theory that is based on certain principles. Understanding these principles makes us comprehend constructivism in a better sense.

- **Knowledge is constructed, rather than innate, or passively absorbed:** The first and foremost principle of constructivism is that knowledge is constructed by the knower or learner. Here knowledge is not innate and the learner is not a passive entity. Rather learner is the center of focus and actively constructed his or her personal knowledge based on his/her personal experiences.
- **Learning is an active process:** Hence learning is an active process under the constructivist principle. Here experiences play the most important role because it is the prior experience of the learner which counts most. Learner constructs the knowledge via two processes assimilation and accommodation in which s/he uses his/her previous schema to build new ones.
- **Learning is a social activity:** Cognitive constructivism denies the existence of social and cultural presence in learning. But social and radical constructivism have accepted the social presence and even emphasized that learning cannot happen in a vacuum. It is a social activity and results only when cognition interacts with the environment.
- **All knowledge is personal:** When learning is constructed by the learner on his/her own with the help of his/her personal experience, then it is obvious that knowledge is only personal. There is no objectivity possible in reality or truth it can be subjective only.
- **Learning exists in the mind:** Learning exists in the mind of the learner only. It has not occurred outside the mind. It does not have to match any real-world reality. The process of equilibration lies only in the mind, i.e. assimilation and accommodation all occur in the mental processes of the learner.
- **Learning is contextual:** Experiences are contextual always, hence learning is also contextual. Hence the role of the teacher is to provide meaningful experiences to students so that learner can construct their meaningful learning.
- **Motivation is key to learning:** Intrinsic motivation is the key to learning. The learner must have an inner drive to act upon their experiences so that they can construct their new knowledge. Hence motivation is required because the learner has to take the initiative of their learning.

Essential Components to Constructivist Teaching

Constructivist classroom is totally different from a traditional classroom. There are some essential components to constructivist teaching, the presence of which makes learning possible in a constructivist classroom. These components are:

- **Elicit prior knowledge:** Learner uses or adapts previous experiences or mental structures (schema) to construct new knowledge. Or in another way, one can say that new knowledge is created in relation to the learner's previous knowledge. It is the most important component to constructivist teaching to make use of previous knowledge. Hence classroom teaching must be focused on the previous knowledge of the learner. Teacher training institutions also follow this pattern to train prospective teachers.

- **Create cognitive dissonance:** It is the duty of the constructivist teacher to createsuch novel problems before the students so that they found these problems challenging and take initiative to change their existing cognitive structures. This sort of cognitive dissonance is the key feature of constructivist teaching. Teachers must present such concepts before the students that can challenge their previous knowledge.
- **Apply knowledge with feedback:** A constructivist teacher must encourage his/her students to not only construct knowledge but also to evaluate new knowledge. This ongoing feedback is a must for revising existing schema in the learner's mind.
- **Reflect on learning:** Similarly it is a routine practice in constructivist classrooms to prepare students in such a way that they must reflect on what they learn. They must work on their schemas to accommodate new knowledge in the previous structure. Teachers can arrange group discussions in the classroom for such reflections.

Examples of Constructivist Classroom Activities

Constructivism has revolutionized the age-old teaching-learning practices in our classrooms. Constructivist teachers have an altogether different approach to teaching and engaging students. Some of the constructivist classroom activities are:

- **Reciprocal teaching:** This teaching is based on Vygotsky's notion that social interaction is the key to learning. Here in this method students try to comprehend the meaning of a provided text by role-playing. The teacher here tries to skill students in four areas namely: summarizing, questioning, clarifying, and predicting. Students use various techniques such as metacognition and thinking aloud. These are higher-order thinking processes and help in developing cognition in a better way. It is also a type of cooperative learning strategy and involves the principle of ZPD (Zone of Proximal Development) of Vygotsky.
- **Inquiry-based learning (IBL):** In contrast to a traditional classroom, the constructivist classroom is not dull and monotonous. Here learners are not merely swallowing the information provided by their instructors but they act upon the information and construct their reality on their own. The learner is in active mode here. Questions lie at the heart of inquiry (Murdoch, 2011). Questioning, exploring, and discussing are the central theme of inquiry-based learning as well as constructivist classrooms. Teachers present such situations before students that create cognitive dissonance, they try to solve this by working on their environment. Here the process of learning is shared between learner and teacher.
- **Problem-based learning (PBL):**Both problem-based and inquiry-based learning follows the constructivist philosophy that knowledge does not exist outside the mind of the learner rather it is created by the learner with the help of his/her subjective experiences. In this type of activity too, the teacher acts as a guide and engages students in active meaning-making in a tutor-guided activity. But there are differences too, PBL is a type of IBL, which means inquiry-based learning is a much broader concept, and in problem-based learning, students work upon authentic, real-world problems.
- **Co-operative Learning:** Cooperative learning sees the cooperation of peer groups in the learning process. In this way, it is called an offshoot of social constructivism. A constructivist teacher deliberately creates such a situation that students can utilize the social presence in their learning process. Constructivism emphasizes the students' personal experience in their meaning-making process while cooperative learning strategy goes one step beyond this and utilizes others' experiences too.

Constructivist Classroom

If we compare a traditional classroom and a constructivist classroom then there are striking differences in them. In a constructivist scenario, everything is changed whether it is the role of teacher and learner or teaching-learning strategies or seating plan of the classroom. Each element of the constructivist class has emphasized the presence of social and cultural elements and their utilization in enriching the experience of the learner. The teacher here is not in the role of the information provider but guide and the facilitator of students' learning. S/he must take care that students are continuously engaged in the process of using their experience in the construction of reality. Constructivists deny the existence of objective reality and the transfer of the same knowledge to one person from another. Hence constructivist teachers present such a situation before their students so that they feel cognitive dissonance and try ways to find the equilibrium state by working on their cognitive structure. Similarly, the role of the learner is not the same in a constructivist classroom in comparison to a traditional behaviorist classroom. Learner here has taken the lead in his/her learning. He has become an active learner from an active knower in the constructivist setup. Learner not only grasps the information provided by the instructor but works upon the information in the

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capacity of the interaction with his cognition and environment and constructs his/her personal reality which is very much his/her own. The learner is a learner in its true sense in constructivism.

Conclusion

Now is the time to drop the concluding remark over this learning theory. It is truly a revolution in the field of teaching-learning which has overall changed the role of teacher and learner in the light of constructivism. This theory has included the role of society and culture in the learning of students. This has made teachers conscious about the role of personal experiences in the construction of reality or truth by the students. Learning is an active process here and the learner is actively involved in the meaning-making process. This is truly a paradigm shift in the teaching-learning scenario. Before this learning process is a monologue but constructivist philosophy makes it a dialogic process. Here students and teachers have an equal share in the learning process, both are co-learners here. The teacher becomes a friend, philosopher, and guide and the learner is the active member in the classroom.

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Crossover learning for formal and informal learning

Johnsi Priya, J.
Assistant Professor of Education, Meston College of Education (Autonomous), Royapettah, Chennai

Introduction

'Crossover learning' is one of ten innovations on the verge of having a significant impact on education, according to the 2015 Innovating Pedagogy study (Sharples et al., 2015). The phrase "crossover learning" refers to a broad definition of learning that includes both formal and informal learning situations. During the next 2-5 years, traditional learning environments (school, university, professional development) are expected to gradually assist learners in connecting various learning events that connect the classroom with informal and incidental learning: "These links work in both directions." Ordinary life experiences can help students learn more in schools and universities, and informal learning can be enhanced by adding classroom questions and information. These seemingly unrelated meetings excite my attention and inspire me to learn more." (Sharples et al., 2015). Curt Bonk expressed it this way: "Anyone can now learn anything from anyone at any time." (Bonk, 2009). A variety of variables such as e-learning, open courseware, web 2.0 tools, and knowledge sharing through online communities have drastically impacted the educational environment when compared to 10 or 20 years ago: Learning takes place in personal learning networks rather than in classrooms. As we connect, we gain knowledge. We learn in a number of ways because informal learning is such an important part of our education, such as through communities of practise, personal networks, and the completion of work-related tasks.

Crossover Learning

According to the "2015 Innovating Pedagogy Report," Crossover Learning is one of ten breakthroughs on the cusp of having a big impact on education (Sharples et al., 2015). By combining the capabilities of both formal and informal learning situations, crossover learning aims to provide students with the best of both worlds. This innovative method acknowledges what decades of pedagogical research have suggested: students must learn how to think rather than what to think. Furthermore, rather than focusing on students' performance, the technique focuses on equipping them with the knowledge and critical thinking skills they will need in today's society. These cross-pollination learning experiences take advantage of both settings' strengths to provide learners with authentic and engaging learning experiences. Because learning occurs across a lifetime and is based on experiences gained in a range of situations, there is a greater chance of assisting learners in recording, linking, recalling, and sharing their various learning experiences. "These links work in both directions," Sharples et al. remarked. Real-life experiences can boost learning in schools and colleges, and informal learning can be increased by incorporating questions and knowledge from the classroom. These seemingly unrelated events excite my interest and make me want to learn more" (2015).

Need for connecting the formal and informal learning environments

Formal learning environments include institutions of higher learning, workplace knowledge acquisition, and industry associations/affiliations. However, a learner's exposure to these formal learning opportunities is dwarfed by the ongoing barrage of informal information sources. Informal learning has become a vital component of our daily education. The most common informal learning venues include our personal networks of friends and family, groups we participate in, social media, and a favourite news source. In today's world, learning through work-related activities and professional network connections is commonplace. Siemens is a company based in Germany (Siemens, 2014). As a result, it is necessary to connect formal and informal learning situations in order to enhance and retain information for a longer period of time.

Why is Crossover learning good to implement?

The benefits are obvious. To begin with, incorporating crossover learning fosters learner autonomy. The majorities of youngsters wants and are capable of acquiring more control over their education. Students will have significantly more freedom in selecting informal learning activities than they do in class, where coursebooks and lesson plans already confine them. It also boosts your motivation. Outside of the classroom, teenagers will choose educational information that is relevant to their lives. They will not consider this form of learning to be yet another homework assignment, especially if it is authentic and exciting, as we tend to want to learn more about things that we are actually interested in. Third, crossover learning is a great way for students to combine their formal linguistic knowledge with real-world experience. Simultaneously, with the guidance of the teacher, informal learning can be fine-tuned.

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How to implement Crossover Learning?

A teacher's adoption of crossover learning, like any other innovation, will likely take time.

1. Using a flipped classroom approach is the first step toward crossover learning. Teachers can allow students to study select topic-related films on their own. In a flipped classroom, students learn new material at home before practising it in class. It allows students to take on greater responsibility and manage their time and effort.
2. General knowledge and internet research quizzes are another way to polish a number of skills, such as public speaking and digital literacy. Allow them to undertake research, take notes, and report their results to the class.
3. Language and Content Integrated Learning allows them to concentrate on the aspects of their future occupations that they are interested in. The teacher can ask students to do an experiment and make a short film about it if they are interested in Physics or Chemistry. Those with a strong interest in geography may want to organise short discussion groups on other countries and cultures. Making a decision is entirely up to you.
4. Schedule a visit to a museum, a movie, or a cooking lesson. You could begin by asking them questions or displaying KWL charts to them. They're visual organisers that can help youngsters organise their thoughts before, during, and after a visit. The acronym KWL stands for:

    K - What are your thoughts on the subject?

    W – What do you want to know?

    L - What exactly did you learn?

Students' learning will be enhanced by these visits, which will undoubtedly pique their curiosity and motivation. An excellent way for a teacher to apply this strategy is to pose a question or problem in the classroom and assign students the duty of researching that question during a museum visit or other field trip. They learn by collecting photos or notes as evidence and further discussing their findings in the classroom.

Crossover learning to motivate and spark interest in students

From a motivational aspect, crossover learning is an appealing teaching approach for teachers. It's a terrific way to ignite students' interest in learning by connecting instructional content to what they enjoy. Children learn more efficiently when some subjects are taught outside of the classroom. Many academic topics might be more fun if they were tied to something practical, as crossover learning suggests. There are daily contacts that can be considered learning opportunities in a crossover learning scenario. Visits to museums, theatres, and exhibitions are examples of field trips to nature. In each of these cases, children can apply what they learn in school to better comprehend everyday situations that are more fun to them.

Crossover learning and new technologies

In today's society, new technology has changed the way we teach and learn. In both formal and informal contexts, many different types of learning opportunities have been established and diversified. Both within and beyond the classroom, technology plays a vital role. Virtual worlds, teaching platforms, and online learning have all become critical tools for facilitating and increasing education. As a result, it makes significantly more sense for crossover learning to use current technology to offer a more comprehensive, sophisticated, and long-lasting education. In addition to conventional and institutionalised education, it necessitates both formal and informal learning. It also happens more naturally everywhere and at any moment. Furthermore, it is a more fun way of learning for many people. Informal learning, on the whole, is more closely tied to one's environment, experiences, and way of life. The majority of them cater to individual pupils' natural motivations, preferences, and needs. They're also linked to a number of other learning goals. In today's world, it is vital to use both formal and informal learning in schooling. True learning also encompasses both intellectual and practical knowledge.

Connectivism, Crossover learning and Digital Environment

The notion behind connectivism is that knowledge is extensively spread over a range of information networks and is digitally maintained in a variety of ways. In terms of learning theory, it accommodates digital learning situations and the usage of network structures for online interactions. In the modern digital world, true digital literacy, in which learners can search out current material and assess its feasibility as a source, is essential. When a learner needs information but doesn't know where to look, the ability to identify sources that satisfy specific criteria becomes essential. Because of the exponential development and evolution of knowledge, the capacity to locate information that is needed is more significant than what was obtained yesterday. George Siemens claims that "The pipe itself is more important than the material it contains. Our ability to learn what we will need in the future is more important than what we already know" (2014). There are numerous instances of these knowledge repositories that are currently operational in our environment. Using an online library, you can access a number of databases dedicated to current knowledge in a variety of industries and professions. These peer-

reviewed scholarly texts from EBSCO, Proquest, Ipswitch, and investment cover a wide range of topics. However, social media should be considered while looking for knowledge repositories that are ideal for casual learning circumstances. The main repositories of 360-degree films, interactive virtual reality tours, and games are Facebook, Google, and Oculus. They provide hundreds of experiences to enjoy, participate in, and learn from in a number of ways.

Conclusion

"Experience has long been thought to be the best teacher of knowledge. Because we can't experience everything, we rely on other people's experiences, and hence other people, to supplement our knowledge. The proverb "I store my knowledge in my friends" refers to amassing knowledge by accumulating people (Stephenson, K. undated). In the past, informal learning was limited to museums and in-class field trips where students may interact with educational topics that were meaningful to them. Virtual reality, smart phones, high-resolution cameras, and digital recording capabilities have made connecting learners to informal learning opportunities easier than ever before. The informal learning environment has improved to the point where the only limitation to where you may take your students is our ability to ask the right question. The notion of crossover learning will be discussed in this article, which refers to a comprehensive understanding of learning that includes both formal and informal learning situations.

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Research Papers

Effectiveness of online classes among B.Ed., students

Maria Ugin Joseph, C.
Principal, A.K.T. Memorial College of Education, Neelamangalam, Kallakuirhi – 606213

Rationale

The outbreak of COVID-19 brought tremendous changes and challenges in the sphere of human life. It is no exception in the field of education from pre-primary level to Ph.D level. Assessment and promotion of students from one level to the next became great hurdle for the teachers and stakeholders. There are a lot of confusions and misconceptions regarding the marks and grades of students. Examinations at graduate and post-graduate level have been conducted online and in disguise it is open-book method and in no way tests the students' achievement in subjects. Online classes are the trend of the day. School level, college level and university level online classes are being conducted. Many researchers and educationists have given the opinion that nothing can replace a teacher. Technology is only a means to enhance the learning and class room activities. In this pandemic situation technology plays the role of a teacher, content, text-book, methodology and the like.

The broad topic of the combined book "Emerging Trends of Psycho-Technological Approaches in Heutagogy" seems to be very relevant title as the whole world faces the pandemic period. Pandemic period paved the way, in disguise, the enhanced utility of technology from kids to aged. As the teacher of today needs to rather multi-disciplinarian than mono-disciplinarian, so the learning process needs to be redefined from 'pedagogy' to 'heutagogy'. As the knowledge is ubiquitous, so the students decide what they need to learn. Pedagogy means the institution and teacher decide what the students will learn and how they will learn it. Heutagogy means the students decide what to learn and how and is supported by outside resources including the teacher. Online classes too is one the techniques of self-directed learning as the students are free to attend or not at their end. The investigator in this paper made an attempt to indentify whether the online classes conducted for the B.Ed., students are effective or not.

Among the many levels of education being imparted online, the researcher focuses in this article the effectiveness of online classes being conducted for the prospective teachers. Teaching is a professional activity that needs a lot of hands-on training and practices. As a beginning teacher one needs to acquire a lot of skill and techniques to impart knowledge to the students most effectively. This brought a curiosity to the investigator to inquire into whether online classes are effective to the B.Ed., students or not. The detailed research study is being explained step by step in this article.

Review of Literature

Klein et.al., (2021) conducted Studying physics during the COVID-19 pandemic: Student assessments of learning achievement, perceived effectiveness of online recitations, and online laboratories. The COVID-19 pandemic has significantly affected the education system worldwide, which was forced to respond with a sudden shift to distance learning. Various physics courses, including lectures, tutorials, and laboratory courses, had to be transferred to online formats, resulting in a variety of simultaneous, asynchronous, and mixed activities. To investigate how physics students perceived the sudden shift to online learning, we developed a questionnaire and gathered data from N=578 physics students from five universities in Germany, Austria, and Croatia. The results are correlated with the students' self-efficacy ratings and other behavioral measures (such as self-regulated learning skills). This study is descriptive in nature, and a survey study design was implemented to examine the relationships among the variables. We found that good communication abilities ($r=0.48$, $p<0.001$) and self-organization skills ($r=0.63$, $p<0.001$) are positively correlated with perceived learning achievement. We draw conclusions and suggest implications for future online classes on the instructor and faculty level. Suggestions include (i) focusing on first-year courses with on-campus teaching when facing limited lecture hall capacities, (ii) offering special courses for promoting self-regulated learning skills, (iii) emphasizing the positive aspects of distance learning, and (iv) installing networking services for supporting student communication.

Darius, P.S.H., Gundabattini, E. & Solomon, D.G. (2021) opined that online teaching–learning methods have been followed by world-class universities for more than a decade to cater to the needs of students who stay far away from universities/colleges. But during the COVID-19 pandemic period, online teaching–learning helped almost all universities, colleges, and affiliated students. An attempt is made to find the effectiveness of online teaching–learning methods for university and college students by conducting an online survey. A questionnaire has been specially designed and deployed among university and college students. About 450 students from various universities, engineering colleges, medical colleges in South India have taken part in the survey and submitted responses. It was found that the following methods promote effective online learning: animations, digital collaborations with peers, video lectures delivered by faculty handling the subject, online quiz having multiple-choice questions, availability of

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student version software, a conducive environment at home, interactions by the faculty during lectures and online materials provided by the faculty. Moreover, online classes are more effective because they provide PPTs in front of every student, lectures are heard by all students at the sound level of their choice, and walking/travel to reach classes is eliminated.

Objectives of the Study

The study was undertaken having the following objectives in mind.

- To find out the effectiveness of online classes among B.Ed., students.
- To find out if there is any significant difference between
  - Male and Female students
  - Urban and rural students
  - Science and Arts stream students

Hypotheses of the Study

- Effectiveness of online classes among B.Ed., students is at moderate level.
- Male and female students do not differ significantly in effectiveness of online classes.
- Urban and rural students do not differ significantly in effectiveness of online classes.
- Science and Arts stream students do not differ significantly in effectiveness of online classes.

Method of Study

The study was conducted in Kallakurichi, an educational district of Tamil Nadu and survey method was deployed. The sample was divided into different categories on the basis of gender, locality and stream of study.

Sample of the Study

Covering the entire population is not possible for the present study. From among many B.Ed., colleges only two were selected and 100 samples were considered for the present study. These students are from the academic year 2019-2021 batch. Out of these 100, 63 were female and 37 were male students and they were selected by random sampling technique.

Tool used in the present study

In the present study to assess the effectiveness of online classes, the investigator used self-developed tool. It consists of 30 statements on three point scale. The responses were given as disagree, undecided, agree on three point scale. Maximum score for this tool is 90 and minimum is 30. Score 1-30 indicates less effective, 31-60 indicates moderately effective and 60-90 indicates high effective.

Reliability of the Tool

Reliability refers to the accuracy and consistency of a measuring tool. A measure is reliable when an individual remains nearly the same in repeated measurements. Reliability is measured by reliability coefficient and the estimation of reliability can be done statistically. It is based on the correlation between performances on initial test and retest after a distinct interval. That is, it involves repetition of the same test. Thus by using test and re-test method reliability of the tool was calculated and it was found to be 0.79 which is reliable.

Validity of the Tool

Content Validity is concerned with the sampling adequacy of the content area being measured. Content validity assessment also involves a more elaborate procedure by which items are developed, given to experts for judgment and determination of percentage of items for each category. Percentage of agreement between the judges is considered as the basis for inclusion or rejection of items. Thus the tool was given to experts in the field of education and thus content validity was established.

Statistical Techniques used in the Study

For analyzing data, mean, standard deviation and 't' test were used in the present study..

Analyses of Data

Table 1: Mean and SD of the whole group

Variable	Number	Mean	SD
Effectiveness of Online Class	100	73.09	10.032

The analysis of the score of whole group from table 1 reveals that B.Ed., students have high level of effectiveness of online classes. Hence, effectiveness of online classes among B.Ed., students is at moderate level is rejected.

Table 2: Mean, SD, t-value based on Gender

Gender	Number	Mean	SD	t-value	Significant Level
Female	63	70.87	11.244	2.57	Significant (0.05)
Male	37	76.24	7.701		

From the analysis of scores of Table-1, it is found that mean score of male students (76.24) with standard deviation of 7.701 is greater than female students. The calculated t-value 2.57 is significant at 0.05 level. Hence, male and female students differ significantly in effectiveness of online classes.

Table 3: Mean, SD, t-value based on Locality

Locality	Number	Mean	SD	t-value	Significant Level
Rural	62	72.74	10.878	0.144	Not Significant
Urban	38	73.05	9.622		

From the analysis of scores of Table-2, it is found that mean score of rural students is somewhat similar to that of urban students. The calculated t-value 0.144 is not significant at 0.05 level. Hence, urban and rural students do not differ significantly in effectiveness of online classes.

Table 4: Mean, SD, t-value based on Stream of Study

Stream of Study	Number	Mean	SD	t-value	Significant Level
Arts	48	71.81	11.183	0.97	Not Significant
Science	52	73.83	9.567		

From the analysis of scores of Table-3, it is found that mean score of Arts and Science Stream students is somewhat similar. The calculated t-value 0.97 is not significant at 0.05 level. Hence, Science and Arts stream students do not differ significantly in effectiveness of online classes.

Findings of the Study

- Effectiveness of online classes among B.Ed., students is high.
- Male and female students differ significantly in effectiveness of online classes.
- Urban and rural students do not differ significantly in effectiveness of online classes.
- Science and Arts stream students do not differ significantly in effectiveness of online classes.

Educational Implications of the Study

From chalk and talk method to digital mode enormously influenced students' learning. Self-directed learning needs fundamentally self-discipline, focus, goal orientation, aptitude, dedication, sincerity and so on. The investigator found in this study that B.Ed., students are able to adhere to all these qualities as mentioned. Further the study revealed that the effectiveness of online class is high. This means that today there must be a radical shift from traditional method of teaching to rather blended method to teaching. Of course none can replace a teacher.

Conclusion

Quantitative analysis with large number of samples will always bring out a better result and easy to generalize the findings. However, this study is short research with limited number of sample of hundred students. The investigator was curious to undertake this study as the B.Ed., students of 2019-2021 batch had almost throughout the academic year online classes and practical exam too. The findings of present study may be useful for the researchers, academicians and stakeholders.

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Effectiveness of blended learning strategies on learning biological concepts at higher secondary level

Sarala, A.
Ph.D Scholar (Part time), AUCE, Alagappa University, Karaikudi, Tamil Nadu

Merlin Sasikala, J. E.
Assistant Professor, AUCE, Alagappa University, Karaikudi, Tamil Nadu

Introduction

Blended learning is regarded as a combination of face-to-face learning and online learning and emphasizes the use of Internet-based technologies. The learning activities described by blended learning involve students, teachers, and learning resources. Blended learning is regarded as an important alternative method to overcome the different limitations of face-to-face learning and online learning because the blended learning method combines the advantages of both types of learning. In addition, blended learning is more effective than face-to-face or online learning in terms of student satisfaction and teacher response, flexibility in time and space, ease of use of resources, increased interaction, and effectiveness of peer interaction. In this era of technological advancement, blended learning is an important part of education. The awareness of blended learning is an important factor for higher secondary school teachers. It represents a lot of innovation and educational processes in the classroom.

Need for the study

In this investigation the researcher find out Higher Secondary Biology students very difficult to understand the concept of Functions of Eye. And students unable to understand the structure and functions of Eyes, working mechanism of Iris and how to control the amount of light entire into the pupil. And most of the students lack of knowledge in functions of retina by means how real and inverted image of an object formed. Moreover lack of knowledge to differentiate that is and HyperMetropia and Myophia by how image of distinct object are falls infront and behind the retina. So an educational task that involves directs experience and participation of students. So the researcher try to focus more attention in the concept through blended learning strategies as a learning strategies to enhance the learning achievement of the students. Hence the blended learning paves the way for the removal of rote memory prevailing among the students.

Statement of the problem

This present investigation has aimed to identify the level of student achievement in biological concepts through blended learning strategies among higher secondary students. Innovation in teaching and learning environment includes various methods of teaching, media and form of interactions. So teachers are encouraged to integrate technology in teaching and learning process for better achievement of students. Therefore the present research study is aimed to preparing blended learning strategies for learning biological concepts to enhance the academic achievement of students, so the study entitled as **"Effectiveness of Blended Learning strategies on Learning Biological concepts at Higher Secondary Level"**

Objectives of the study

1. To access the level of achievement in learning the concept functions of Eye among higher secondary Biology students.
2. To find out if any significant difference between pre test and post test for students to learning the concept functions of Eye.
3. To find out the effectiveness blended learning strategies to improve learning achievement in the concept of Functions of Eye
4. To find the attitudes towards blended learning among higher secondary students regard to gender and class.

Hypotheses of the study

- There is no significant difference between pre test and post test scores in learning the concept of functions of Eye among higher secondary Biology students.
- There is no significant difference between Male and female higher secondary Biology students with regard to learning achievements.

- To find the achievements towards blended learning among higher secondary Biology students with regard to class.
- To find the attitudes towards blended learning in learning the concepts higher secondary Biology students regard to gender.

Methods of the study

The present study is based on single group experimental design. The procedure in this design will be testing the group then treatment will be given after the pretest. In the present study the investigator will be adopted the blended learning as a strategies.

Sample of the study

The investigator has 100 students of male and female studying higher secondary biology students by using random sampling at Government Higher School of Thirupuvanam block in Sivagangai District were taken as sample for analysis.

Tools used

Teacher made achievement test tool was used. The same test tool was used for both Pretest and Post test. The investigator conducted pretest at the beginning of the study and a post test was conducted after providing a suitable teaching learning experience**.**

Data analysis and interpretation

In the present study, the blended learning as learning strategies to improving the level of learning capacity among higher secondary biology students were found with administration of the tool. The scores secured by the students were collected and computed for analysis. Mean and standard deviation and were used for computing analysis.

Null hypothesis 1:

There is no significant difference between pre test and post test scores in learning the concept of mechanism of respiration among higher secondary biology students.

Table 1 Significant difference between Pre test and Post test scores in learning achievements in biological concepts of higher secondary students

Test	N	Mean	SD	t test	Remarks
Pre test	100	23.32	2.32	4.10*	S
Post test	100	25.88	2.40		

The significant performance of the learners by the adoption of blended learning strategies to enhancing the concept functions of eye was proved by the test of significance 't' test was applied and it was tabulated . The above table shows that the obtained calculated 't' value 4.10 is greater than the table value of 't' at 1.96 level of significance. By conventional criteria, this difference is considered to be statistically significant in their achievement. This shows the teaching through the blended learning has increased the achievement of students in the concept of "Functions of Eye".

Null hypothesis 2:

There is no significant difference between Male and female students in learning the concept of functions of eye

Table-2 Significant difference between Male and female Higher Secondary biology students with regards to learning achievements

Locality	N	Mean	SD	't' test	Level of Significance
Male	45	20.02	4.07	0.74	NS
Female	55	16.12	3.10		

From the above table the mean score of male students 20.02 and mean scores of female students 16.12. The calculated t value 0.74 is less than the table value at 1.96 level. Hence the hypothesis is accepted. It is concluded that there is no significant difference between the male and female students with regards to learning achievements.

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Null hypothesis 3:

To find the Achievements towards blended learning strategies among higher secondary biology students with regard to class.

Table 3 Achievements towards blended learning strategies among higher secondary students with regard to class

S. No	Class	N	Mean	SD	Calculated 't' Value	Remark
1.	XI	50	25.35	2.38	0.51	NS
2.	XII	50	25.08	2.19		

It is concluded from the above table that the calculated 't' value 0.51 is less than the table value (1.96) at a 5% level of consequence. So, there is no significant between pre test and post test towards blended learning strategies in the concept of functions of eye among higher secondary students with regard to Class.

Null Hypothesis – 4

There is no significant difference between attitudes towards blended learning strategies among higher secondary students with regard to gender

Table 4

Attitudes towards blended learning strategies among higher secondary students with regard to gender

S. No	Gender	N	Mean	SD	Calculated 't' Value	Remark
1.	Male	45	24.62	2.32	3.18	S
2.	Female	55	25.88	2.10		

It is conditional from the overhead table that the calculated 't' values 3.18 are fewer than 5% level of significance. Henceforth the significant hypothesis is established. It's expressed that there is significant between attitudes towards blended learning among higher secondary students with regard to gender in the concept of functions of eye.

Data Collection and Analysis Method

The present study is based on single group experimental design. Teacher made achievement test tool was used. The same test tool was used for both pretest and post test. The investigator conducted pretest at the beginning of the study and a post test was conducted after providing a suitable teaching learning experience**.** In the present study the investigator adopted the blended learning as strategies.

Findings

The table 1 shows that the obtained calculated 't' value 4.38 is greater than the table value of 't' at 1.96 level of significance. So the difference is considered to be statistically significant in their achievement. This shows the teaching through the blended learning strategies has increased the achievement of students in the concept of "functions of Eye".

The table 2 shows concluded that the mean score of male students 20.02 and mean scores of female students 16. 2. The calculated t value 0.74 is less than the table value at 1.96 level. Hence the hypothesis is accepted. It is concluded that there is no significant difference between the male and female students,

The table 3 shows concluded that the calculated 't' value 0.51 is less than the table value (1.96) at a 5% level of consequence. So, there is no significant between pre test and post test towards blended learning strategies in the concept of function of eye among higher secondary biology students with regard to Class.

The table 4 shows concluded that that the calculated 't' values 3.18 are fewer than 5% level of significance. Henceforth the significant hypothesis is established. It's shows that there is significant between attitudes towards blended learning strategies among higher secondary biology students with regard to gender in the concept o functions of eye. So this difference is considered to be statistically significant in their achievement. This shows the teaching through the blended learning stratigies has increased the achievement of students in the learning concept in "Functions of Eye". So the learners understanding ability and level of academic achievement have been improved and enhanced by applying the blended learning strategies

Conclusion

The conclusion of this investigation revealed that the learners understanding ability and level of academic achievement have been improved and enhanced by applying the specially designed by blended learning technique. The present day traditional method of teaching has failed to achieve the expected learning out comes. Hence, conclude that the blended learning stratigieswould help to learn the biological concept effectively and would their academic achievement and meaningful learning.

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The effectiveness of management attitude on labour performance: a behavioral study on plantation workers in Idukki district, Kerala

Gireesh K. Hari
Ph.D. Research Scholar, Department of Economics, Periyar University, Salem

Vaithianathan, V.
Asst. Professor, Department of Economics, Periyar University, Salem

Introduction

Employees are the cornerstone of every organization. The success or failure an any kind of business depends on the commitment and performance of its labours. It was a classical believes that the productivity is subject to change with wage rate. But the productivity may affect by the commitment and attitude of the labours even if they are getting a better wage rate. The commitment and performances of the labours in all the business platform is affected by the employer's attitude. So, the new managerial economists give more importance to the relationship between employer and employee.

A dynamic organization desires a well enthused and contented employee. The workers should love to do their job without any reluctance. This would only lead to the success and progression of an organisation. The management approach has very much effect on the productive level. These are the innumerable types of management such as democratic, autocratic and free-rein are the some of the key style of management. These styles of management will result altered outcomes in the performance of workforces.

Nowadays many organisations are heartening introduction of new tendencies such as humanistic work environment. It will build a win-win atmosphere for both employer and employee, with the corporation of employees, the organisation can't attain their management goals. So, the organisation should always trace the performance of the employeesefficiently. The key component of better productivity in an organisation is giving enthusiasm to the labourers. Selecting the numerous styles of management and productivity it is an important premeditated decision. It might be advanced influence in an organisation on each aspect. There are both benefits and detriments for the management styles. Most of the studies advocatethat manager who are pleasant and good communicator with their employees are being accepted and respected. Freedom for doing job is an imperative aspect in working environment. So, for the management styles can lead good perfection in production, improved commitment level of employees, higher performance sinking the level of turnover ratio, etc.

Why management or employer attitude is important?

Now a day business environment is very indispensable to detect the various psychological and motivational futures which are impelling the employees for better performance. Most of the employer anticipates that providing training and development are key significantresponsibility of each organisation to enrich their proficiencies. The employees'prospect plays a vital role in the performance of the organisation.

Plantation Economy

The plantation crops and its business are the integral part of the agricultural economy. The plantation sector an important engine of growth and development of the agrarian economy of south Indian states. The crops like cardamom, coffee, tea, cashew, coconut etc. can be considered as plantation crops. Its business contributes a significant amount to the foreign exchange, generates and provides numerous employments directly or indirectly, thereby it makes overall development of the economy.

Plantation Sector– Kerala scenario

The plantation sector has a major role as they absorb nearly one quarter of the net cropped areas in the most productive and ecologically high-altitude regions in the state. There are 34 per cent the net cropped area in the state and 38 percent at the national level during 2018-29. On the other hand, 83.7 percent rubber productions, 60.7 percent of cardamom, 21.9 percent coffee, 5.3 percent tea in the country is also produced in Kerala alone (Directorate of Agriculture, Government of Kerala)

There is a fact that the output of the plantation is mostly produced for commercial purposes and not for domestic consumption. Kerala's plantation products are highly export oriented;therefore,these outputs are very important from the national point of view. There are a large number of labours depending on plantation sector for their livelihood and sustenance.

Review of literature

Akin Celik (2013) review that the human relation among laboures in the place of work. In this study they find that the culture of an employee and the educational background of an employee have an important role in the productivity level of an organisation. On the other hand, it finds that good matured and viable managers give vital for the productivity of an organization. Imran khan (2014) explored that there are many elements will mark the performance of the employee in an organisation. The foremostfinding he has found out that is attitude, commitment to job, job satisfaction, training and motivation, etc. Suresh et.al (2016) found that the demographical variables have a substantial relation on the satisfaction level. Demographic variables such as gender, income and education have avital role in the satisfaction level of employees. These will lead to the performance of employees. Habeeb Rahman (2017) studied that there are significant relationships between attitude on and performance. He also foundthat performance is becoming akeyphase for the existence of each organization. Adil Namiq (2018) perceived that choosing management style has been fundamental role in an organization for the productivity and performance. According to his researchall management and managers should have a proper prophecy andoperation about their aimand should have the facility to boost the employees of the organisation as well.

Significance of the study

The research seeks to find out the relationship between management or employer's attitude and employee's performances. For this purpose, it has decided to select the rural plantation sector. The production of plantation crops has identified as a well-organized commercial and business sector which is highly export oriented. The plantation sector requires large number of skilled and unskilled labourers to run the industry. Therefore, large number of migrant and domestic workers have employed in the production of plantation crops. The technological change, expansion of education in the rural areas, new skills, mind set of employees etc. are new challenges faced by the plantation economy. At these circumstances, the rural plantation sector has to measure the current labour performances, values, cultural changes etc. Therefore, one can study that the effectiveness of management attitude on labour performances.

Objectives of the study

- To understand the attitude of labourers towards working environment and its vibrancy.
- To measure the state of mind of Management on human resource practices. and
- To find out the factors of smooth relationship among worker, supervisor and others.

Research methodology

This study has used descriptive research design because here it attempts to describe the facts that exit at present. The cluster sampling technique has used for collecting the primary data. The Idukki district has divided into four regions or clusters based on the production of plantation crops, from each clusters production units are randomly identified and respondents are also selected through simple random method from each unit. The sample size has selected with the margin of 95 per cent confidence as 138.

Results and discussion:

Table: 1

Respondent based on their department

S. No	Particulars	No. of Respondents	Percentage
1	Mulching	9	6.5
2	weeding	10	7.2
3	Trashing	12	8.7
4	Shade Regulation	9	6.5
5	Earthing up	12	8.7
6	Plucking	34	24.6
7	Plant protector	33	23.9
8	Packing	11	8.0
9	Overall	8	5.8
	Total	**138**	**100**

Source: Primary Data

The table (1) shows that the respondents and their department. From this table it can understand that the respondents are classified into nine based on their work in the plantation field. The majority of the workers engaged in the plucking work that is about 24.6 percentages.

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Table: 2
Management practices

S. No	Management Practices	Min	Max	Mean	Standard Deviation	Mean Rank	Reliability
1.	Encourage among workers	1.00	4.00	2.3913	.66656	7.81	.693
2.	Utilize fullest potential	1.00	4.00	1.8913	.60030	6.18	
3.	Flow of work	1.00	4.00	1.8188	.61887	5.89	
4.	Improve the morale	1.00	5.00	1.6594	.72993	5.19	
5.	Treating all workers equally	1.00	4.00	1.6087	.69864	5.00	
6.	Decision making	1.00	4.00	1.6304	.71558	5.01	
7.	Required Communication	1.00	5.00	1.5942	.73134	4.91	
8.	Culture	1.00	4.00	1.7754	.77382	5.61	
9.	Grievance Handling	1.00	4.00	1.6812	.79217	5.21	
10.	Retain the workers	1.00	4.00	1.4130	.68058	4.20	

Source: Primary Data

The table (2)shows that the highest mean rank is 7.81among ten factors, it is obtained by "Encourage among workers" and the lowest mean rank is 4.20 obtained by "Retain the workers". The reliability is found as 0.693.

Table: 3
Attitudes towards working environment

S. No	Attitude – Working Environment	Min	Max	Mean	Standard Deviation	Mean Rank	Reliability
1.	Workplace challenges	1.00	5.00	4.0870	.93182	9.27	.686
2.	Development	1.00	5.00	2.9565	.82718	7.43	
3.	Effective Supervision	1.00	4.00	2.4565	.71603	6.29	
4.	Workplace Interactions	1.00	5.00	2.0000	.83710	4.99	
5.	Workplace Performance	1.00	5.00	2.6232	1.3080	6.12	
6.	Personal Experience	1.00	5.00	2.0797	.98944	4.90	
7.	Workplace Influences	1.00	5.00	1.6884	.82657	3.91	
8.	Workplace is dull	1.00	5.00	2.2464	1.3002	4.99	
9.	Responsibilities	1.00	4.00	1.4855	.64203	3.43	
10.	Succeed in workplace	1.00	3.00	1.5580	.63955	3.67	

Source: Primary Data

The table (3)explores that the highest mean rank is 9.27 among 10 factors. This is obtained by "Workplace challenges". Thelowest mean rank found as 3.43, it is obtained by "Responsibilities of employees". The reliability is estimated as 0.686.

Table: 4
Ranking on human resource policy that encourages performance of employees

S. No	Factors	Percentage Position	Table Value	Garrett Value	Total	Total Score	Mean Score	Rank
1	Motivate workers	100(1-0.5)/10	4.92	82	138	6990	50.65	5
2	Duties fairly	100(2-0.5)/10	14.25	71	138	6753	48.93	6
3	Struggling workers	100(3-0.5)/10	23.88	64	138	5763	41.76	10
4	Workers meeting	100(4-0.5)/10	34.25	58	138	5905	42.78	9
5	Taking decision	100(5-0.5)/10	43.97	53	138	6172	44.72	8
6	Personal difficulties	100(6-0.5)/10	54.03	48	138	6722	48.71	7
7	Required Training	100(7-0.5)/10	63.85	43	138	9283	67.26	1

8	Workers Issues	100(8-0.5)/10	74.52	37	138	7679	55.64	2
9	Workers Feedback	100(9-0.5)/10	84.56	30	138	7370	53.40	3
10	Respect to workers	100(10-0.5)/10	94.49	19	138	7303	52.92	4

Source: Primary Data

The table above(4)stresses that respondents are given much more importance towards "Required Training" in workplace. Therefore, from this exploration, it establishes that the labours should be proficient before beginning the work is an important factor compared to other factors. Thus, it accomplishes that the Required Training is more important than the other factors in a workplace.

Conclusion

There are many researchers have tried to explore the benefits of fostering the productivity and performances in the production field. Many of the employers have given attention for the happiness of the employees, their commitments, loyalty and trust towards their performances in the production process; thereby the employers will get financial benefits as well as the reputation of the organization. There will be a win-win situation for both employers and labours through forming such an environment in the production center. From the analysis of the data, the study found that the attitude of the employer is directly affecting the performances of the labours. This can bring integrity, honesty, confidence, inner commitments and self-discipline etc. in the working environment, no matter whether it is agricultural or industrial sector, because the production and marketing of the plantation crops can be considered as a business.

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Impact of mobile usage on decision making among higher secondary students

Arnold Robinson, D.
Assistant Professor, Department of Biological Science, Meston College of Education (Autonomous), Chennai, TamilNadu, India

Rama, S.
Assistant Professor, Department of Mathematics, Lady Willingdon Institute of Advanced Study in Education (Autonomous), Chennai, Tamil Nadu, India

Introduction

Education is a developmental process which takes place on an individual life. Adolescence period is a time of change in physical, cognitive, social, and emotional aspects. The media, television, radio, movies, music videos are part of the social environment in which today's young people grow up, and form new social norms. Exposure to various fields, interaction with people and other stimuli in an environment make a person competitive and achiever. Text books, other study materials, documentary films, useful audio programmes and mobile phones are efficient teaching devices and make students' academic life easier. During interaction with these devices thought process of students are emerging like a wave in sea shore and help a learner to make some right decision in various academic situations. In the 21stcentury due to development in technology everything is in the palm of our hands, it has reached its peak and it's still developing to a new every day. In this aspect owning mobile phone is also gradually increasing, and has impact in the behaviour. New generation uses the mobile phones more and it act as both a curse and a boon. These phones when being used for education and entertainment purposes lot of inconvenience arise. Shoukat (2019) says that adolescent's mental health and physical health is associated with cell phone addiction. But while owning mobiles, students should take self-regulatory effort in usage of them (monitoring and limiting use) which significantly impacted by mental focus and personal goal setting. This research will clarify the importance of decision making and usage of mobile in the adolescent life.

Related works

Many researchers have analyzed research on the concepts of decision making. Few of them are given here. Junancy Shiny (2012) carried out a study on decision making of high school students in relation to intelligence and home environment. Results also pointed out a significant relationship between decision making and home environment of high school students. Tang, Zixuan et al (2017) explored the decision control of smartphone high users in a sample of 125 college students and their findings demonstrated that smartphone overuse was associated with problematic decision-making, a pattern similar to that seen in persons affected by a variety of addictions. Another research was conducted by Schoeni, A. et.al (2015) on mobile phone usage among 439 students, aged 12-17 from Central Switzerland and concluded that mobile phone usage during night hours was common among youngsters.

Decision making

Decision making comprises systematic thinking, valuation of a situation and its possible consequences. The decision making process is explained clearly by Beyth- Marom et. al. (1991) that combining of all 'appropriate choices', 'potential consequences of each choice, 'practicability of the choice' made and the significance of all the choices to decide which choice is most appealing". According to Ranjithkumar, T and Selvaraju, R (2014) Decision making has five dimensions. They are,

1. Righteous means acting in accordance with clear, moral law or free from guilt. Making morally right, truthful, genuine or justifiable decisions in any situation.
2. Unbiased: People are constantly making decisions from various options, free from bias or injustice selection of decision is considered as unbiased one.
3. Acceptability: Many decisions are accepted by most of the people with the fact of being approved of and considered normal and effective.
4. Instinctive: These decisions are made intuitively, without deliberate conscious thought. Such decisions prompted by instinct and framed naturally by any individual. Relying purely on intuition may happen during the urgency of the decision.
5. Efficiency: This is the pattern of making a conclusion without wasting materials, energy, efforts, money, time and other resources in producing a desired decision. Based on these five dimensions, decision making of higher secondary students is assessed.

Statement of the problem:

The topic, "Impact of Mobile Usage on Decision Making Among Higher Secondary Students" was chosen for the study.

Operational Definition

Decision making is defined as taking a right and clear choice when a person meets a challenging situation in their life to make it successful.

Objective of the study

To find out whether there is any significant difference in the decision making of higher secondary students based on gender, owning mobile and Duration of Mobile phone usage.

Hypothesis of the study

There is no significant difference in the decision making of higher secondary students based on gender, owning mobile and Duration of Mobile phone usage.

Tool used

Decision making of the adolescent students was measured by using a Decision-Making Scale prepared by Ranjith Kumar.T and Selvaraju R (2014). This scale has five dimensions (Nature of persons) namely, righteous, unbiased, acceptability, instinctive and efficient. 5- point scale (Strongly Agree - 5, Agree - 4, Undecided - 3, Disagree - 2, and Strongly Disagree - 1) was used to assess the students. In this scale there were no negative items. The scores obtained from the scale were distributed from 36 (Minimum) to 180 (Maximum).

Sample of the study

A convenient random sampling technique was adapted for the selection of sample. 1269 students who are in XI standard of higher secondary schools of Chennai city were chosen as the sample.

Analysis and interpretation of the data

The collected data were subjected to statistical analysis by using SPSS package. The mean, standard deviation and 't 'tests were computed for the entire sample. The following are the results and inferences of the research.

Hypothesis 1: Gender has no impact on the factors of Decision Making among higher secondary students.

Table 1: Differentiation of different factors of Decision Making among boys and girls

Factors of Decision Making	Gender				'CR' value
	Boys (634)		Girls (635)		
	Mean	SD	Mean	SD	
Righteousness	33.11	4.65	30.08	5.48	10.669**
Unbiased	28.13	4.43	24.39	4.10	15.847**
Acceptability	25.43	4.50	28.07	4.57	10.560**
Instinctive	28.72	4.43	25.47	4.96	12.50**
Efficiency	27.73	4.89	23.98	4.46	14.423**
Overall Decision Making	143.12	19.39	132.99	19.10	9.379**

** = P < 0.01

From the table no.1, it is clear that the calculated CR values are significantly ($p<0.01$ for Righteousness, Unbiased, Acceptability, Instinctive, Efficiency factors and Overall Decision Making) greater than that of table CR values. Hence, the hypothesis is rejected and proved that gender has an impact on the factors Righteousness, Unbiased, Acceptability, Instinctive, Efficiency factors and Overall Decision Making.

Boys have higher mean score in the Righteousness, Unbiased, Instinctive, Efficiency factors and Overall Decision Making than the girls. But girls have higher mean score in the Acceptability factor of Decision making than the boys. This finding go along with the work of Cenkseven-Önder, F. (2012), who identified some gender differences regarding satisfaction with various life domains and decision-making styles among early adolescents who were students at a school in a city in southern Turkey. Here in this research, except acceptability factor boys have high decision making than girls.

Boys' decision generally invites high potential for arguments. That often because boys tend to short change the different vital decision making step and they usually rush for the finish line. That might be the reason why Righteousness, Unbiased, Instinctive, Efficiency factors of decision making are more in the case of boys than the case of girls (Susan Heitler, 2014).

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Hypothesis 2: Owning Mobile Phone has no impact on the factors of Decision Making among higher secondary students.

From the table no. 2, it is clear that the calculated CR value is significantly ($p<0.01$ for Unbiased) greater than that of table CR value. Hence, the hypothesis is rejected and proved that Owning Mobile Phone has impact on the factor, Unbiased of Decision Making among higher secondary students. In the cases of Righteousness, Acceptability, Instinctive, Efficiency factors and Overall Decision Making the calculated CR values are lesser than that of table CR Values. Hence, the hypothesis is accepted that Owning Mobile Phone has no impact on the factors, Righteousness, Acceptability, Instinctive, Efficiency factors and Overall Decision Making among higher secondary students.Mobile phone plays a vital role in our lives, this study also reveals that students who are owning mobile have high impact on the factor, Unbiased of Decision Making. Unbiased nature is defined as not affected or influenced by someone's beliefs or opinions, here students use their mobile phones and take unbiased decisions which seems right in their views boldly.

Table 2: Differentiation of different factors of Decision Making among students' Owning Mobile Phone

Factors of Decision Making	Owning Mobile Phone				'CR' value
	Yes (516)		No (753)		
	Mean	SD	Mean	SD	
Righteousness	29.90	4.62	30.22	5.52	1.088^{NS}
Unbiased	25.06	4.34	24.41	4.18	2.680**
Acceptability	25.47	4.66	25.04	4.47	1.674^{NS}
Instinctive	25.81	4.67	25.40	4.81	1.528^{NS}
Efficiency	24.23	4.77	24.31	4.57	0.316^{NS}
Overall Decision Making	130.48	18.67	129.38	19.62	0.995^{NS}

NS = Not Significant ($p > 0.05$) ** = $P < 0.01$

Table 3: Differentiation of different factors of Decision Making among higher secondary students based on their Duration of Mobile Phone Usage

Factors of Decision Making	Usage of Mobile Phone						F ratio	Groups Differed
	(1) No Usage (414)		(2) Less than One Hour (501)		(3) More than One Hour (354)			
	Mean	SD	Mean	SD	Mean	SD		
Righteousness	29.92	6.15	30.56	4.73	29.64	4.43	3.640*	**(1,2) (2,3)**
Unbiased	24.57	4.37	24.93	4.45	24.45	3.77	1.569^{NS}	**None**
Acceptability	25.46	4.69	25.18	4.52	24.97	4.41	1.163^{NS}	**None**
Instinctive	25.30	5.11	25.88	4.60	25.43	4.52	1.859^{NS}	**None**
Efficiency	24.56	4.83	24.33	4.46	23.87	4.68	2.125^{NS}	**None**
Overall Decision Making	129.81	21.73	130.88	18.67	128.36	16.69	1.788^{NS}	**None**

NS = Not Significant ($p > 0.05$) * = $P < 0.05$

Hypothesis 3: Duration of mobile phone usage has no impact on the factors of Decision Making among higher secondary students.

The table 3 shows that the calculated F value is significantly ($p< 0.05$ for Righteousness) greater than that of table value. Hence the hypothesis is rejected that duration of mobile phone usage has impact on the Righteousness factor of Decision Making among higher secondary students.Moreover, the test result from the above table indicates that the mean scores of students who are using mobile phones less than one hour (30.56) are having better impact on the factor, Righteousness of Decision Making than the students who are not at all using mobile phones and using more than one hour. Usage of mobile phones makes individuals' life easier, but on the other hand, it ties everyone. Students spend their time more likely on social media, academic search, finding answers to questions, finish their assignment and playing games.Few researchers revealed that adolescents who spend more hours on their gadgets, specifically mobile phones are affected highly in the risk of negative, suicidal thoughts.Rosen LD, et.al.(2013) found out that excessive use of mobile phone paired with negative attitude and feeling of anxiety.Tang Z, et.al. (2017) findings demonstrate that smartphone overuse was associated with problematic decision-making. Hence less and limited usage of mobile phone is good for proper decision making.

Major findings of the study

After analysis of tabulated data, the investigator found out the following major findings

1. Boys are higher in the Righteousness, Unbiased, Instinctive, Efficiency factors and Overall Decision Making than the girls. But girls are higher in the Acceptability factor of Decision making than the boys.
2. Owning Mobile Phone has impact on the factor, Unbiased of Decision Making among higher secondary students.
3. Students who are using mobile phones less than one hour are having better impact on the factor, Righteousness of Decision Making.

Conclusion

Mobile and recent devices are good for learning purposes but severe overuse of mobile as a form of addiction affect students' life. Shaffer (1996) defined an addiction behavior which brings pleasure and relieves pain and stress and individuals cannot control even if it causes some harmful consequences. Hence parents should restrict their ward'smobile screen time to have higher righteous decision making. Parents must not allow their children to watch more than one hour continuouslyas it pulls down their decision making ability.Schools should encourage girl students to decide boldly in various activities, which enhance their problem solving skills.Teachers and parents are also responsible to bring the changes in the effective decision making process.Excessive amounts of something can have negative effects.In the same way people used to tell that "Too much of anything is good for nothing", so let us make younger generation in the positive and useful track.In the 21st century, devices are like third hand of a person, they are inevitable, so let us train our future generation in the right way to flourish in taking good decisions.

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Effectiveness of WhatsApp assisted learning (WAL) in learning psychological concepts among B.Ed., student teachers

Revathi, B.
Assistant Professor, Vellalar College of Education, Erode, TamilNadu

Senthilkumaran, M.
Assistant Professor, Department of Educational Technology, TNTEU, Chennai

Introduction

In this digital era, technological development is touching all the aspects of human life in the society. World is gradually changing as a techno-based society. Modern technology reshapes the human interaction and interactive methods. Today people are spending more time in social interactions through different social Medias. People can share their own experiences, information, views, feelings, interest, activities, events etc through different social networks like WhatsApp, facebook, Twitter, Youtube, Blogs etc. Among these, the influence of WhatsApp is very vast than others. WhatsApp is the largest communication medium with the huge number of audience compared to other social networks. WhatApp users are increasing day by day in the globe.

Need for the study

Knowledge transferring is one of the primary objectives of our educational system. In a classroom, a teacher should transfer the concept successfully into the students mind. In general, several teaching methods are practiced in school education to transfer the ideas, principles and concepts. But conventional method alone vastly used in higher education system. Teacher education is one of the important sub divisions of higher education. Here, most of the student teachers follow the conventional learning alone to gain the knowledge. Lecturing is one of the oldest methods of teaching, and it is currently the most accepted educational technique. In conventional learning, students are passively receiving information. It is a transactional period, lot of changes in teacher education curriculum according to the NCTE 2014 regulations. So learning also should be changed from conventional method to technology based learning.

Objectives of the study

The objective of this research study was to study and compare the effectiveness of conventional learning and WhatsApp assisted learning in learning psychological concepts among the student teachers.

Statement of the problem

The successful student – teacher relationship makes the learning joyful one. If the professor gives the subject matter or instruction in a desirable manner of the students, they perceive faster. Nowadays, most of the college students are using their leisure time in social networks, particularly in WhatsApp. It mingles with college students' life. While majority of the college students interact on WhatsApp, why don't use WhatsApp as a medium for knowledge transferring. So only, the investigators adopted the WhatsApp learning method for this study. The problem entitled as, *"A study on the effectiveness of WhatsApp assisted learning in learning psychological concepts among the B.Ed., student teachers."*

Operational definitions

- ***Effectiveness*** refers to the result of independent variable introduced in the study.
- ***WhatsApp assisted learning:*** WhatsApp is a social media which is used by most number of people in the world. Users can share audios, pictures, videos, documents and texts through WhatsApp. Using the WhatsApp medium in teaching learning process is considered as WhatsApp assisted learning (WAL). It is a part of M- Learning.
- ***Psychological concepts:*** In Tamilnadu Teachers Education University B.Ed., curriculum, there are some topics based on psychological principles and ideas. Among the following concepts are considered as psychological concepts in this research study - Behavioral theories of learning & Cognitive theories of learning
- ***Student teachers:*** Students those who are studying bachelor of education (B.Ed) course in Indian educational system are called as student teachers.

Hypotheses of the study

Phase 1

H_0 1: There is no significant difference in the post test mean scores of control group and experimental group student teachers.

H_0 2: There is no significant difference in the post test mean scores of control group and experimental group students based on student teachers' locality.

Phase 2

H_0 1: There is no significant difference in the post test mean scores of control group and experimental group student teachers.

H_0 2: There is no significant difference in the post test mean scores of control group and experimental group students based on student teachers' locality.

Method of the study

An experimental design to the researcher is what a blueprint is to an architect. It provides the researcher an opportunity for comparisons required by the hypotheses of the experiment and enables him to make a meaningful interpretation of the results of the study with the help of statistical analysis of the data. The design selected for the present study is post test only rotational group design.

Sample for the study

The present study consists of 80 student teachers those who are studying in B.Ed. Colleges. The sample was selected by using cluster sampling technique. In phase I, among 80 student teachers, 40 student teachers are selected from Nandha College of Education (control group) and remaining 40 students are selected from Vellalar College of Education (experimental group). In phase II, the samples are vice versa.

Administration procedure

During the experimental process, the control group was taught by conventional method alone. But, in experimental group, the psychological content was taught by conventional method and also the content related pictures, videos sent through WhatsApp media at the end of the academic day. Student teachers went through that content videos and share their views, doubts in the next academic day class.

Tool used for the study

Investigator's self made achievement tests were used as a tool for the study. Validity of the tools was established by the opinion of the juries. Reliability of the tools was established by the parallel form method.

Research Design			
Method		Post test only rotational group design	
Phase 1			
Group	**Sample**	**Sample size**	**Treatment variable**
Control	Nandha Collge of Education	40	Conventional learning method
Experimental	Vellalar college of Education	40	WhatsApp assisted learning
Phase 2			
Group	**Sample**	**Sample size**	**Treatment variable**
Control	Vellalar college of Education	40	Conventional learning method
Experimental	Nandha Collge of Education	40	WhatsApp assisted learning
Dependent variables		Phase 1 Phase 2	Academic Achievement of student teachers

Data analysis

Phase 1

H_0 1: There is no significant difference in the post test mean scores of control group and experimental group student teachers.

Table 1

Difference between control and experimental group in phase 1

Group	N	Mean	S.D.	't' Value	Result
Control	40	11.3	1.47	13.57	Significant*
Experimental	40	15.93	1.58		

(* at 5% level of significance the table value of 't' is 1.98)

It is evident from Table1 that there is a significant difference between control and experimental group students in their mean scores at phase 1. The experimental group is better than the control group in their

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mean scores. Hence, the WhatsApp assisted learning is effective for learning psychological concepts in B.Ed. Curriculum.

H_0 2: There is no significant difference in the post test mean scores of control group and experimental group students based on student teachers' locality.

Table 2

Difference between control and experimental group based on locality in Phase 1

Variable	Sub Variable	Group	N	M	S.D.	't' Value	Result
Locality	Rural	Control	26	11.12	1.53	17.24	Significant*
		Experimental	22	17.05	0.79		
	Urban	Control	14	11.64	1.34	6.50	Significant**
		Experimental	18	14.56	1.15		

(* at 5% level of significance the table value of't' is 2.00) (** at 5% level of significance the table value of't' is 2.04)

It is evident from Table 2 that there is a significant difference between control and experimental group students in their mean scores based on student teachers' locality at phase 1. The experimental group is better than the control group in their mean scores both rural and urban area. Hence, the WhatsApp assisted learning is effective for learning psychological concepts in B.Ed. Curriculum based on locality.

Phase 2

H_0 1: There is no significant difference in the post test mean scores of control group and experimental group students.

Table 3

Difference between control and experimental group in phase 2

Group	N	Mean	S.D.	't' value	result
Control	40	11.03	1.42	11.87	Significant*
Experimental	40	15.55	1.95		

(*at 5% level of significance the table value of't' is 1.98)

Table 3 reveals that there is a significant difference between control and experimental group students in their mean scores at phase 2. The experimental group is better than the control group in their mean scores. Hence, the WhatsApp assisted learning is effective for learning psychological concepts in B.Ed. Curriculum.

H_0 2: There is no significant difference in the post test mean scores of control group and experimental group students based on student teachers' locality.

Table 4

Difference between control and experimental group based on locality in Phase 2

Variable	Sub Variable	Group	N	M	S.D.	't' Value	Result
Locality	Rural	Control	22	11.05	1.53	7.78	Significant*
		Experimental	26	15.19	2.15		
	Urban	Control	18	11	1.33	11.09	Significant**
		Experimental	14	16.21	1.31		

(* at 5% level of significance the table value of 't' is 2.00) (** at 5% level of significance the table value of 't' is 2.04)

It is evident from Table 4 that there is a significant difference between control and experimental group students in their mean scores based on student teachers' locality at phase 2. The experimental group is better than the control group in their mean scores of both rural and urban area. Hence, the WhatsApp assisted learning is effective for learning psychological concepts in B.Ed., Curriculum based on locality.

Major findings

From Phase 1 and Phase 2, Student teachers those who are learned through WhatsApp assisted learning showed better performance than the student teachers learned by conventional method.

Conclusion

The high effectiveness of the WhatsApp method in learning psychological concepts has been tested and found true by conducting the experiment. The student teachers who underwent training in this mode exhibited higher grasp of the concepts revealed by comparison with the performance of the control group. The observation and inference can logically be extended for other subjects, especially sociology topics in B.Ed., Curriculum.

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Non-communicable diseases: Prevalence and prevention programmes

Sona, K. V.
PhD. Research Scholar, ICSSR Fellow, Periyar University, Salem

Vaithianathan, V.
Assistant Professor, Department of Economics, Periyar University, Salem

Introduction

The World Health Organization (WHO) recognizes the growing evidence that health promotion and preventive health approaches are effective in improving overall health and well-being, lowering the burden of chronic disease and injury, addressing health inequities, facilitating better resource use, and increasing economic productivity. 'Health for All' is a valued aim shared by all governments across the world. India is no exception, and in fact, is one of the pioneering countries that have introduced 'Universal Health Care' that entitles every citizen access to publicly provided health service. A disease is a particular abnormal condition, a disorder of a structure or function, affects a part or all of an organism. A non-communicable disease is a non-transmissible medical condition or disease.Noncommunicable ailments can't be passed from one individual to another. Human noncommunicable ailments incorporate coronary illness and malignant growth. Persistent ailments are among the most continuous and costly wellbeing concerns, yet they are likewise among the most avoidable. To be best, ongoing sickness anticipation should happen across different areas and across a singular's entire life cycle.

Non-communicable Diseases

NCDs, which include cardiovascular diseases (CVDs), chronic respiratory illnesses, diabetes, and cancer, pose a significant danger to human health, economic growth, and national development. India, a developing economy and population giant, confronts a human and economic challenge from NCDs. NCDs are key factors to the country's high morbidity and death rates. Tobacco and alcohol use, lack of physical exercise, bad food, obesity, stress, and environmental factors all contribute to the high disease burden of NCDs. These risk factors are changeable and may be addressed to minimise the incidence of NCDs and improve outcomes for individuals who have them. Because therapy is long-term and expensive, the costs sustained by afflicted people and families may be catastrophic. NCDs have major economic, physical, and societal consequences, motivating investment in NCD prevention and management as well as well-established risk factors. Smoking, drinking, and eating unhealthy diets (high in salt, sugar, and fats and low in vegetables and fruits) are also reported to be widespread among the poor socioeconomic category. To guarantee long-term sustainability of initiatives, the programmes would be designed within the current public sector health system and, where possible, public-private partnership models would be used.

Statement of the Problem

Better wellbeing is fundamental for joy and prosperity in people. It likewise contributes fundamentally to monetary headway since better populaces live longer, are more useful, and save more. Numerous factors sway individuals' wellbeing and a country's ability to offer compelling medical services. As a rule, medical care conveyance frameworks in immature countries are less designed for managing constant NCDs than they are with irresistible sicknesses. One of the significant hindrances to planning public strategies for a viable reaction to NCDs is a deficiency of great wellbeing data. There is a need to avoidance and control of NCDs for motivations behind arranging neighborhood, public and worldwide reactions to changing examples of infection weight, and observing the effect of these reactions on sickness trouble. This study expects to examine the weight of NCDs and avoidance and control of NCDs in India.

Objectives

- To examine the status and burdens of NCDs in India.
- To study on risk factors and prevention of NCDs programmes.

Research Methodology

The study is based on secondary data collected from various reports and statistics.

Review of Literature

Pati et al. (2020) underlined the significance of a coordinated extensive methodology of NCD care, especially at the essential medical care level, intending to the rising weight of these sicknesses. This

investigation is very pertinent and supportive in arranging NCD care in Indian and equivalent LMIC setting. Nethan et al. (2017) identified India's reaction to NCD risk factor surveillance has been significantly delayed, and information on the subject is intermittent and insufficient. Standard WHO NCD risk factors questions must be added into ongoing surveys to promote information comprehensiveness. India should also plan for a low-cost, time-efficient NCD surveillance system.Asaria et al. (2007)the costs of implementing NCD preventive and control programmes have been evaluated, and population interventions like as tobacco control and dietary salt reduction appear to be economical for nearly all low- and middle-income nations.

NCDs in Global

NCDs are the greatest reason for mortality in the South-East Asia region, as per Global NCDs. NCDs guarantee an expected 7.9 million lives each year, representing 55% of all fatalities. In South-east Asia district, the extent of NCD passings happening among individuals younger than 60 was 34%, contrasted with 23% in the remainder of the world. The main source of NCD mortality is cardiovascular sickness, trailed by ongoing respiratory diseases, malignancies, and diabetes. Ongoing illnesses kill individuals at financially and socially useful ages: low-and center pay countries represent 80% of persistent illness mortality, reflecting both the size of these populaces and the epidemiologic change from irresistible to constant sicknesses. A big part of cardiovascular illness passings happen among individuals 30-69 years old, which are at least 10 years more youthful than in more evolved locales. Ongoing worldwide and provincial infection trouble gauges demonstrate that noncommunicable sicknesses currently represent about portion of the illness trouble in low-and center pay nations, a 10% increment beginning around 1990.

The 2008–2013 Action Plan was developed by WHO and Member States to translate the Global Strategy for the Prevention and Control of NCDs into concrete action. NCDs have the potential to have major socioeconomic implications by increasing individual and family poverty and impeding social and economic growth.

Table 1: Cause of death, by NCDs & CVDs (in thousands)

Years	NCD	CVD	Percent Share of CVD in NCD
2000	31391125	14424607	45.95
2005	33606210	15388435	45.79
2010	36405327	16623701	45.66
2015	39544157	17689163	44.73

Source: www.who.nit

This table explores that the Causes of death, by NCDs & CVDs. NCDs death rate 31391125 to 39544157 increased by 2000 to 2015 periods. CVD caused death rate also increased by 14424607 to 17689163 during 2000. During 2000 to 2015 periods 8153032 were died in NCDs and 3264556 were died with CVDs. And this difference shows that the out of NCDs 40.04 percent deaths due to CVDs. The percent share of CVDs in NCDs shows that the out of NCDs about 46 percent death caused CVDs. The overall table shows that the NCD & CVD are the leading causes of death in worldwide & India also. So, the Government takes precautions to tackle this problem & controls this problem.

Burden of NCDs in India

In India, the prevalence of noncommunicable diseases (NCDs) is high. Noncommunicable diseases (NCDs) kill roughly half of all people in India. Cardiovascular Diseases (CVD) account for 52% of NCD mortality, followed by Chronic Obstructive Pulmonary Disease (COPD), Cancer, Diabetes, and Injuries. Projection projections imply that unless interventions are implemented, the burden of NCDs would skyrocket. NCDs account for 43% of all DALYs. The number of potentially productive years of life lost (PPYLL) owing to CVDs in the 35-64 age group was 9.2 million in 2000, and it is anticipated to increase to 17.9 million by 2030. When compared to other countries, there is a large loss of life during productive years since the majority of fatalities are avoidable.Heart disease, stroke, and diabetes are all anticipated to worsen, costing India $237 billion between 2005 and 2015.

NCDs represent in excess of 62% of the age-normalized weight of inability changed life years (DALYs) in India. As indicated by a functioning gathering research introduced to India's Planning Commission for the twelfth Five-Year Plan (2012-2017), cardiovascular sickness is the top reason for mortality in both metropolitan (poor and non-poor) and rustic India (52% of all NCDs). Somewhere in the range of 2012 and 2030, India is expected to burn through $4.58 trillion on NCDs and psychological well-being issues. CVDs ($2.17 trillion) and psychological well-being issues ($1.03 trillion) will represent most of the economic loss.

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Table 2: Causes of death, by NCDs (% of total)

Years	India	World
2000	46.1	60.11
2005	50	62.87
2010	55.7	66.8
2015	60.8	69.97

Source: W.H.O: Global Statistical Report

The above Table shows that there is an expanding pattern in NCDs - world savvy and India moreover. In 2000 60.112% people groups are kicked the bucket by NCDs and step by step demonstrated an expanding pattern, during 2015 this prompts 69.974.

By and large, counteraction and control of NCDs require a wellbeing framework to address a singular's issues at different phases of life and conditions of wellbeing by giving promotive, wellbeing upkeep, and preventive intercessions for the whole populace, as well as infection the board capacity tending to the last part of populace wellbeing circulation. Essential anticipation targets avoidance of infection and incapacity at the level of the local area, while higher request preventive endeavors at the auxiliary or tertiary level spotlight favoring the person. Fitting demonstrative abilities, upheld by proof-based medicine conveyance and follow-up to guarantee consistence, is basic for precise infection the executives and fruitful helpful treatments.

Following will be significant parts of NCD programs

Primary Health Care, Strengthening District Hospitals for finding and the board of NCDs including restoration and palliative consideration, Tertiary Care for cutting edge administration of muddled cases including radiotherapy for malignant growth, cardiovascular crisis including heart medical procedure, neurosurgery, organ transplantation and so forth, Emergency clinical consideration and fast reference framework, Health Promotion and Prevention. NCDs are the essential drivers of mortality around the world, killing a larger number of individuals than any remaining causes joined every year. Practically 80% of NCD fatalities happen in poor and center pay countries.

NCD Prevention and Control in India

Prevention and Control of Noncommunicable Diseases in India NCD prevention and control are desirable areas in which India should concentrate its resources. Collaboration across the governmental, business, and civil society sectors to address NCDs will be a vital component of this approach. In the Indian context, primary prevention of NCDs, based on robust early screening and a strong healthcare infrastructure, is a viable approach for reaping favourable returns on investment.

Interventions that focus on screening (in the case of hypertension), vaccination (in the case of human papilloma virus [HPV]) and reduced tobacco use were assessed as promising in terms of feasibility of achieving a 15% ROI. A collaborative stepped care strategy to enhance care for depression and anxiety disorders that uses an existing healthcare infrastructure and employs lay health counsellors to give care is also a potential way to tackling prevalent mental health issues in India.

Government plans for monitoring

NCDs Following will be significant parts of NCD programs: Primary Health Care, Strengthening District Hospitals for determination and the executives of NCDs including recovery and palliative consideration, Tertiary Care for cutting edge administration of muddled cases including radiotherapy for disease, heart crisis including cardiovascular medical procedure, neurosurgery, organ transplantation and so forth, Emergency clinical consideration and fast reference framework, Health Promotion and Prevention.

Since 2010, the Indian government has facilitated NCD counteraction and control endeavors under the National Program for the Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS). The NPCDCS program is presently being carried out in 100 regions and will be progressively eased in to all regions around the country during the twelfth Five-Year Plan (2012-2017). The program's administrations are facilitated under the National Health Mission (NHM), which has separate provincial and metropolitan plans.

NPCDCS program parts include: foundation/fortifying of wellbeing framework; early finding and treatment; human asset advancement; wellbeing advancement; and checking, observation, and examination. Designated intercessions incorporate tobacco control, CVD, diabetes inconveniences, disease, and oral wellbeing, as well as broad measures, for example, advancing actual work in schools and all through society; limiting the promoting and accessibility of food items high in salt, sugar, and undesirable fats; and zeroing in on early identification and conclusion of NCD utilizing minimal expense innovations. Satisfactory information sources and observing systems will be expected to push these activities ahead.

Risk Factors for Noncommunicable Diseases

Tobacco use, bad food, insufficient physical exercise, and the hazardous use of alcohol are four behavioural risk factors that are prevalent components of economic transformation, fast urbanisation, and 21st-century lives. These gamble factors largestly affect low-and center pay countries, as well as less fortunate individuals in all nations, repeating the fundamental financial determinants. In the domain of NCDs, four significant normal gamble factors-tobacco use, terrible food, actual idleness, and risky liquor utilization are the most significant. Openness to natural and word related risks, for example, indoor and outside air contamination, strong fuel exhaust, ozone, airborne residue, and allergens can prompt constant respiratory ailment, and some air contamination sources, for example, strong fuel vapor, can prompt cellular breakdown in the lungs. Indoor and open air contamination, heat waves, and relentless pressure from work or joblessness have all been connected to cardiovascular infection. Openness to cancer-causing agents in the living and workplace, for example, asbestos, diesel fumes gases, and ionizing and UV radiation, can raise the gamble of malignant growth. Essentially, unpredictable utilization of agrochemicals in farming and dangerous item release from uncontrolled compound organizations might bring about malignant growth and other NCDs like renal sickness. Since these openings have the best potential to influence NCDs right off the bat throughout everyday life, additional consideration should be taken to stay away from openness during pregnancy and early stages.

Conclusion

Health 2020 positions health as an essential resource and asset for economic and social development- economic performance is linked to people's health along the life-course. NCDs need to be more firmly anchored in national development agendas and health plans across the Region.

In conclusion, actually forestalling and controlling NCDs requires drawing in entertainers and accomplices from different areas who hold various plans and arrive at various populaces and networks. Four principle shared hazard factors-tobacco use, unfortunate eating regimen, actual idleness and unsafe utilization of liquor are the most significant in the circle of NDCs. To sum up, India is a different nation, and answers for the NCD emergency should be adjusted to neighborhood circumstances. To put India on the way to additionally staying away from and overseeing persistent sicknesses, numerous partners should convey a far-reaching set of cures. One more fruitful methodology for limiting the weight of NCDs is further developed medical services, early recognizable proof, and ideal therapy. Wellbeing frameworks should be built up further to give a successful, sensible, and reasonable bundle of treatments and administrations for people living with NCDs.

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Working memory Intervention 'Brain Omatics' for Dyscalculia: A single case study

Anu Joy Singh
Ph.D. Scholar, Union Christian College, Aluva, affiliated to M.G University, Kerala

Introduction

The early number learning skills should be acquired by the child gradually by 6 years of age but the inability to acquire these skills within the expected time may pave the way to suspect Dyscalculia. Dyscalculia is defined as "The Specific disorder of arithmetical skills' involving 'a specific impairment in mathematical skills that is not solely explicable based on general mental retardation or of inadequate schooling. The deficit concerns the mastery of basic computational skills of addition, subtraction, multiplication and, division rather than of more abstract mathematical skills involved in algebra, trigonometry, geometry, or calculus" (WHO, 2010). Children with Dyscalculia display certain characteristics, though each child is unique in the difficulties they encounter, some characteristics common for Dyscalculia are information processing difficulties, language and reading difficulties, and Maths Anxiety.

Mathematical achievement is related to general cognitive abilities such as intelligence, working memory, semantic memory, processing speed, attention, language abilities, executive functions, spatial ability, and phonological awareness. When performing a mathematical task, working memory and executive functions work simultaneously, process and store the incoming mathematical information and block the unwanted irrelevant information from entering the working memory, and shift the attention from one method or operation to another (Andersson, 2008).Many cognitive studies conducted on Working Memory and Mathematics have used the working memory model of Baddley and Hitch (2000) as a framework for understanding the relationship between both constructs. According to Baddeley and Hitch (1974) Multicomponent model of working memory, there are three aspects of working memory: "Phonological loop, Visuospatial sketchpad, and Central executive" each of these components have a significant role in learning Mathematics.

The visual-spatial sketchpad is studied less compared to the verbal component, it has a passive "visual-temporary memory store" and an active "visual-rehearsal process". The information gradually declines from this sketchpad, depending upon the complexity of the stimuli and the duration they are active within the visual modality. Retrieving the visual information depends upon the rate of eye movement, image manipulation, and visual mnemonic used by the individual (Baddeley,1986). Children up to 10 years of age usually store the visual information as visual materials without recoding it into speech-based form. Generation, manipulation, and retention of visual images and the construction of spatial models are supported by a visual-spatial sketchpad. Maintenance of mental images is highly demanding for visual-spatial components and thus central executive takes up the role, especially for visual images that are generated internally and consciously (Pearson, Loggie, & Gilhooly,1999).

Need and significance

The body of research conducted in the field of Learning Disability figures out that, far less research has been conducted in the area of Mathematical Difficulty compared to Reading Difficulty. In, a developing country like India where the literacy rate is low, little effort has been taken to identify and remediate children with Mathematical Difficulty. Considering the prevalence rate of Mathematical Difficulty in other countries and India, there is a high need for extensive research and intervention for Mathematical Difficulty. Many researchers studied the cognitive profile of children with Mathematical Difficulty and concluded that poor mathematical achievement depends upon deficits in several cognitive factors such as intelligence, processing speed, attention, spatial abilities, executive functions, and working memory. According to Domain General Cognitive hypothesis among the several cognitive factors, deficit in working memory and its components plays a significant role in contributing to Mathematical Difficulty. The current research is an effort towards understanding the effect of the working memory game intervention program 'BrainOmatics' on Dyscalculia. For that purpose, a Dyscalculiachild at the primary school level was considered and the Working Memory processes were assessed with standardized tests at the pre test level. A computer-manual-based working memory game intervention program, 'BrainOmatics' was developed by the researcher, and the effectiveness of the 'BrainOmatics'intervention on the Working Memory processes of the child with Dyscalculia was assessed at a post-test level.

Objectives

To determine the effectiveness of the computer-based intervention program 'BrainOmatics' on the visuospatial aspects of working memory.

Hypothesis

There is no significant difference in visuospatial scores of working memory for a Dyscalculia child at pretest and post-test levels.

Methods

Research Design

The research design used in this particular study is a single-subject pre-test and post-experimental design. The intervention program, 'BrainOmatics' is considered as the independent variable and to find the effectiveness of the intervention program on the visual-spatial component of working memory for a child diagnosed with Dyscalculia is the main objective of the study. The researcher adopted a Quasi-experimental pre-test and post-test design.

Tools

1. General DataSheet
2. Raven's Colored Progressive Matrices (Ravens,2008)
3. Diagnostic Arthimetic test (Kapuret al.,1992)
4. Diagnostic Test of learning disability (Swarup & Mehta,2011)
5. Working Memory Tests (NIMHANS Neuropsychological Battery For Children (Karetal., 2004)
    - VisuoSpatial working memory span Task
    - Visuospatial 1n Back and 2n Back task:

Procedure for data collection

An 8-year-old male from Grade 3, diagnosed with Dyscalculia, was assessed on the visuospatial working memory tests at the pretest level. Further,the child had taken the 15 days computer-based sessions with 'BrainOmatics' and after a time gap of two weeks, he was post-testedto know the effectiveness of the BrainOmatics Intervention on the Visuospatial aspects of working memory.

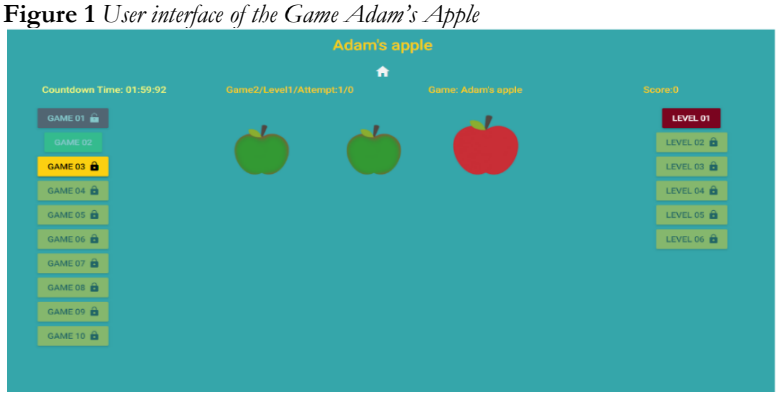
Game intervention program 'BrainOmatics'

"Working memory is a cognitive system with a limited capacity that is responsible for temporarily holding information available for processing". The model of working memory by Baddeley and Hitch(1964), is composed of three main components; the central executive, the phonological loop, and the visuospatial sketchpad. The Baddley Hitch model is the theoretical base for the development of this game intervention program.

The 'BrainOmatics'working memory game interventionwas developed by the researcher which consists of Workingmemory game activities. However, basedon the rationale of thisstudy, the games 'Adams Apple' 'Knock the cupboard' 'Tring Tring'were used to stimulate the visual-spatial sketchpad of working memory. Each game was played by the child for 15 minutes for 5 days, on the 6th day a new game is introduced, the three games are covered by a period of 15 days. The game score was recorded for the first day(baseline score) and final day through a game history download option.

Game 1: Adam's Apple

Figure 1 *User interface of the Game Adam's Apple*



Aim: This game activity trains the participants to respond more accurately to visuospatial stimuli presented in the sensory modality.

Rationale: This game stimulates the visual-spatial components of working memory.

Method of presentation: Desktop computers

Duration: 15 minutes

Game 2: Knock the Cupboard

Figure 2 *User interface of the Game Knock the cupboard*

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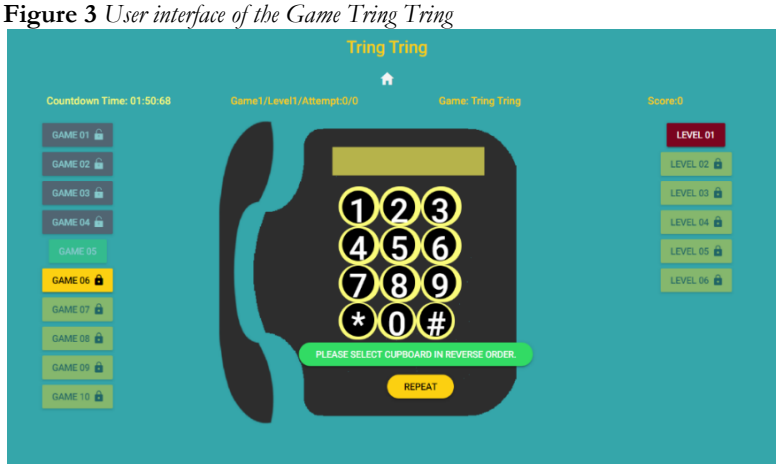
Aim: This game activity trains the participants to respond more accurately to visuospatial stimuli presented in the sensory modality.
Rationale: This game stimulates the "visual-spatial components of working memory".
Method of presentation: Desktop computers
Game Activity: 8 closed shelves numbered 1-8, now each cupboard opens (only half the way) in a random sequence and close. The child is required to repeat the sequence in the reverseorder of the cupboards opened and closed, by clicking on the cupboard after the sequence of presentation.

Game 3: Tring Tring

Figure 3 *User interface of the Game Tring Tring*



Aim: This game activity trains the participants to respond more accurately to visuospatial stimuli presented in the sensory modality.
Rationale: This game stimulates the "visuospatial sketchpad of working memory".
Method of presentation: Desktop computers

Result and Discussion

Table 1

The results of the Pre-test and Post-test raw score of a single subject on the measures of visuospatial component of working memory

Visuospatial Working memory	Pre test(i)Post test(j)	Gain score(i-j)	
Tapping Task	5	9	4
Visuospatial 1n back	7	9	2
Visuospatial 2n back	3	5	2

Figure 4

Graphical representation of Pretest and Post-test scores of visuospatial component of working memory for a single subject

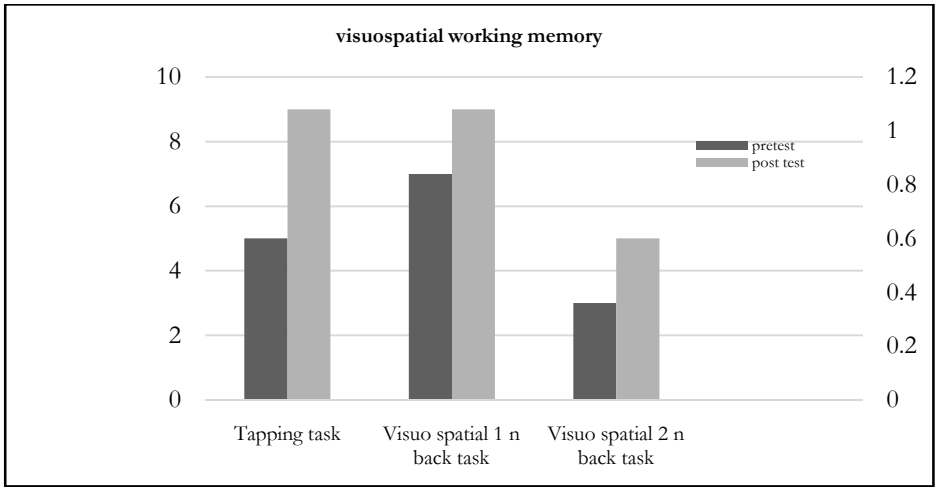


Table 1 represents the pretest and post-test scores for measures of visuospatial component of working memory for a single subject. Results indicate that there is a significant improvement in score after the 'BrainOmatics' intervention. Based on the gain scores the improvement rate is high on tapping tasks followed by Visuospatial N back tasks. Figure 1 graphically represents the working memory pretest and post-test scores for the subject. From the graph, it can be inferred that the intervention has a significant positive effect on the visuospatial component of working memory.

The results are consistent with the findings of Holmes and Gathercole(2014),they used *Cogmed* Working memory software training program to know the effect of working memory on children with low academic performance. The training was administered by teachers of the concerned school through two different trials. In trial 1 there were 22 participants of age 8 to 9yrs and in trial 2 there were 50 participants aged 9-11 yrs, matched with 50 participants who were not trained. The 20 sessions with *Cogmed* software were given to the children, results indicated that there was a significant improvement for children on both trials for trained and untrained working memory tasks.

Dahlin(2013) found that *Cogmed* training on children with academic poor performance can substantially improve their maths and reading performance after the continuous 20 days sessions with the software.Witt(2011) conducted a preliminary investigation to know the effect of school-based working memory training programs on the mathematical performance of children. After the 6-week training sessions, he found that the children who received "working memory training" programs showed significantly greater post-test gains both in trained "working memory tasks" and untrained visuospatial measures than their control group. Although preliminary investigation, the school-based working memory training has significant improvement on Maths performance.

Table 2

Distribution of 'BrainOmatics' game scores for a Participant on Day 1 and Day 5

Game	Day 1(First Day)	Day 5(Last Day)	Gain Score(Day 5-Day1)
Adam's Apple	15	24	9
Knock the Cupboard	14	19	5
Tring Tring	15	21	6

Table 2 represents the game score based on the game history downloaded from the game application, for Day 1(first day) and Day 5(final day). There is a high improvement in the game score on the final day compared to the baseline score of the subject. The gain score obtained for the three games are positive with the high gain score for Adam's apple' game followed by the other two games. The gain score obtained by the subject is significant in understanding the improvement at the post-test level. Thus, the BrainOmatics intervention has a significant impact on the visuospatial working memory functioning of the subject. The hypothesis there is no significant difference in visuospatial scores of working memory for a Dyscalculia child at pretest and post-test levelsis rejected.

Conclusion

It can be concluded that the 'BrainOmatics' working memory game intervention program, developed and validated by the investigator has a significant effect on improving the visuospatial component of working memory for Dyscalculia. The professionals and teachers from educational settings are recommended to identify Dyscalculia in the early years of school and provide computer-based

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interventions for remediation, such interventions are more efficient and easy to use among students than traditional training methods.

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Effectiveness of blended learning strategy on teaching electric circuits among biological science teachers

Vijayalakmi Shankar, S. V.
Senior Lecturer, DIET, Uthamacholapuram, Salem

Introduction

The National Achievement Survey (NAS) is the largest ever national assessment survey in the country and is among the biggest in India, becoming conducted at some point in India today. Union HRD Minister Shri Prakash Javadekar said that the NAS is a transparent and credible workout accomplished below third-party verification. It become carried out for Classes 3, 5, and 8 in Government and Government-Aided schools. The survey tools used multiple test booklets with 45 questions in Classes III and V related to language, Math and 60 questions in Class VIII in Math, Language, Science, and Social Science. The competency-based test questions evolvedthink about the Learning Outcomes developed by the NCERT which were recently incorporated which were these days incorporated withinthe Right to Education Act (RTE) by the Government of India. Along with the test items, questionnaires about students, teachers, and schools were also used.

The district-wise studying progress cards might be prepared primarily based on a software program specially designed for this. Sooner or later, analytical reports might be organized. The evaluation will reflect the disaggregated and detailed learning levels. The entire technique will begin without delay and might be completed within 3-5 months. The inferences may be used to layout Classroom interventions filtered to all the schools in the districts for execution. The findings of the survey can even help in expertise the performance of the education system. NAS effects will help guide education policy, planning, and implementation at national, state, district, and classroom levels for improving getting to know degrees of children and bringing about qualitative enhancements.

Blended Learning reflects a more aware and more intentional approach in designing the most suitable preparation or gaining knowledge of environments following the method of blending components while the blended character of traditional instructional contexts is largely the result of habit (culture), comport, or happenstance (Rossett& Frazee, 2006). A superficial understanding of blended learning is that it provides non-face-to-face elements into the traditional path structure. But this most customarily results in a dysfunctional phenomenon as known as the "direction-and-a-half" (Educause, 2010). Schools may be especiallyat risk of this lure if the introduced online factors are virtually based totally on the present-day generation technology, which can give a false impression of true innovation.which can provide a misconception of genuine innovation.

The key assumptions of a blended learning design given by Garrison and Vaughan (2008) are:

- Thoughtfully integrating face-to-face and online gaining knowledge of
- Essentially rethinking the design layout to optimize student engagement.
- Restructuring and changing conventional class touch hours.

Blended learning is an academic formation that integrates onlinegetting-to-know techniques consisting of online shipping of materials through web pages, dialogue forums, and/or email with the conventional coaching technique. The pedagogy of blended learning assumes that it is based on the idea that there are inherent blessings in face-to-face interaction in addition to the understanding that there are benefits in using online strategies.(Clark & Patrick, 2007). Blended learning is used to explain learning that combines various event-primarily based sports, inclusive of face-to-face classrooms, staye-gaining knowledge of, and self-paced mastering (Valiathan, 2002). supplying numerous online alternatives in addition to traditional classroom education multiplied what college students discovered. (Dean, Stahl, Sylvester & Pearson, 2001; Graham & Allen, 2005). Blended Learning, the teaching practice thatmixes coaching strategies from both face-to-face and online gaining knowledge of, is a longtime, rapidly growing instructional model this is proving highly powerful in supporting faculties and districts cope with the challenges of student achievement, limited resources, and the expectancies of twenty-first-century freshmen (Eduviews, 2009).

Literature review

The models utilized in teaching and gaining knowledge of approximately DC circuits have been reviewed and associated with the historical improvement of textbooks on the problem. in the end (1996), the same authors additionally compared the models utilized by beginners with those utilized by specialists. bobbing up from these analyses, macro-micro relationships emerge as essential attention, partially because they help link electrostatics with electrodynamics – something this is traditionally overlooked out and which, Eylon and Ganiel suggest, "may additionally explain why college students cannot conceptualize the

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electrical circuit as a system". Borghi, Ambrosius, and M,ascheretti have described in detail a coaching and studying collection geared toward establishing this hyperlink.

Aside from the talk on how fine to teach the topic, there's a pressing need to increase techniques for correcting what has already gone incorrect. sensible activities have regularly been embodied within an expect-have a look at-give an explanation for strategy as proposed by using Gunstone and White and Liew and Treagust. each Zacharia and Jaakkola, Nurmi, and Veermans have pronounced the efficacy of realistic sports in this regard and discovered confined benefits. but, when provided in parallel with computer simulations there are certainly substantial blessings.

The research effects of Li & Singh (2016) additionally revealed that there are misconceptions that scholars have towards electric powered circuit, especially in figuring out the brightness of the bulbs in the circuit, specifically (1) the scholars anticipate that more strength is continually brighter whether or not it's far arranged in collection or parallel; (2) fail to apprehend the correlation among the resistors at the bulbs and strength dissipation; (3) take into account that more strength for a steady voltage supply can have a primary resistors; (four) fail in understanding the simple of a parallel and series circuit; (five) within the series lighting fixtures, college students count on that within the first bulb that is close to the larger voltage source than the second bulb, due to the fact the electrical cutting-edge flowing to the first bulb will cause a voltage drop in order that the voltage inside the next bulbs is reduced; (6) fail to remember the fact that it is the strength dissipation which determines the brightness of the bulb; and (7) the confusion in the idea of resistors, electric powered modern-day, and voltage.

Need for the study

To satisfy curricular expectations at the secondary stage, the curriculum is largely organized around the seven themes— Food; Material; The World of the Living; How Things Work; Moving Things, People, and Ideas; and Natural Phenomena and Natural Resources. Based on the seven themes 38 learning outcomes are defined along with the pedagogical process for secondary level (classes 9 &10).

National Achievement Survey - NAS (Survey of Learning Outcomes) was conducted by the National Council Of Educational Research And Training (NCERT), the year 2017. NAS State-wise and district-wise analyses were released. Based on the analysis, Salem District Report Card (DRC) of secondary Science subject showed that the Lowest Performing Learning Outcomes (LOs)wasSCI 1010: handles tools and laboratory apparatus properly; measures physical quantities using appropriate apparatus, instruments, and devices, SCI 1013: derives formulae, equations, and laws and SCI 1008: calculates using the data given. From District Report Card (DRC) Only 18 % of students solved the application-based question asked from Electric circuit contents. Therefore, this action research aimed to enhance the Class Room Transactional Technique in Electrical Circuits among Science Teachers working in High Schools.

Rationale

The District Report Card (DRC) presents the academic fulfillment of secondary school students at the district level along with the participation rate of students and schools in the National Achievement Survey (NAS). In Tamilnadu, NAS was conducted in 80 schools and 2764 students have participated. Average Findings of the NAS for class X -cycle 2 report in DRC science subject (33.69 %) is barely more than SRC (33.54 %). In Salem district for science subject, 64.16 % of students (lies 0-35 % bandwidth) are at risk,31.72% of students (lies 36-50% of bandwidth) want improvement and 4.12 % of students lies (51 - 75 % of bandwidth) average level.

Research design

The practitioner decided to focus on the thirty secondary school science teachers. In the tenth standard science textbook out of 12 chapters, one of the chapters is Electricity. According to the NAS report, the poor performance Learning outcome was SCI 1010: handles tools and laboratory apparatus properly; measures physical quantities using appropriate apparatus, instruments, and devices, SCI 1013: derives formulae, equations, and laws and SCI 1008: calculates using the data given. From District Report Card (DRC) Simplest 18 % of students solved the application-based question asked from Electric circuit contents. The practitioner designed and administered a questionnaire on Electric Circuits in advance of the start of the intervention, to identify the teacher's understanding of Electric Circuits concepts. In this way, the practitioner hoped to identify actions that could be taken almost at once within the interventions and practicals that were to follow. Anticipating that the practitioner would find misconceptions among the teachers, the practitioner planned to use the practice as an important context in which to address these. In particular, it seemed likely that the practitioner might adopt a Didactic Material (Learning Equipment) Gathering material, Experimentation, Observing the reality, Analyzing and substituting, Inferring results, and implementing the techniques in their classroom using simple hands-on experiments.

Objectives of the study

- To understand the nature of the teacher's knowledge when teaching electric circuits through blended teaching.
- To explain how the instructional strategies are used to shapes classroom interaction and discourse through blended teaching.
- To draw and build series and parallel circuits online as well as in offline mode
- To measure voltage and current in series and parallel circuits
- To analyze the components and characteristics of series and parallel circuits
- To reflect on their understanding of series and parallel circuits offline mode.

Hypothesis

- Problem identified and Questions were prepared.
- Based on problem materials are prepared for teachers as e-books to utilize in the class.

Methodology

1.*Sample*: 9th and 10th handling B.T science Teachers (Biology as their main qualification)
2.*Research Tool:*

- The Practitioner identified the problem through zoom meetings and discussion with teachers.
- 10 open-ended questionnaires are prepared for conducting Pre and Post-test based on teaching techniques in Electric circuit and their applications

1. Strategy Adopted:

Online -Google form	Conducting Pre-test
Through google meet	Orientation of NAS-SRC Report-DRC Report
Through google meet	Finding the low-performance learning outcome in a science subject.
Through google meet	Identified low-performance LO
Orientation through workshop	Preparation of Didactic Material Gathering materials, Experimentation, Observing the reality Analyzing and substituting Inferring results
Offline	Post-test
offline	Implementing the techniques in their classroom.
Online -google meet and WhatsApp	Students prepared didactic materials in innovative methods & Presenting the Experimentation
On line -google form	Evaluation
Photos	Performance report

2. Intervention Given:

Sample Plan: 1. simple electric circuit Didactic Material		
1.	Gathering materials,	• three 1,5 V cells • insulated copper conducting wires with crocodile clips • ammeter • voltmeter • resistor / light bulb

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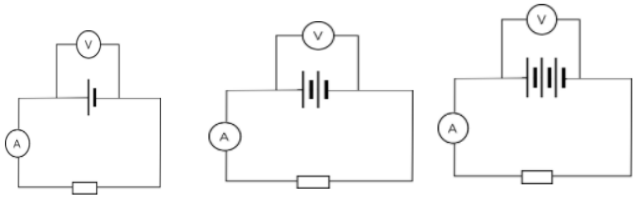
<table>
<tr><td>2.</td><td>Experimentation</td><td>

Construct a series circuit with 1 cell, a resistor, and the ammeter in series.
Connect the voltmeter in parallel with the cell as shown in the following circuit diagram.
Record the readings on the ammeter and voltmeter in the table below.
Add a second cell in series with the first cell.
Record the new readings on the ammeter and voltmeter in the table below.
Add the third cell in series with the other two cells.
Record the new readings on the ammeter and voltmeter in the table below.
Draw a graph of our results.

Fig 1 Fig 2 Fig 3


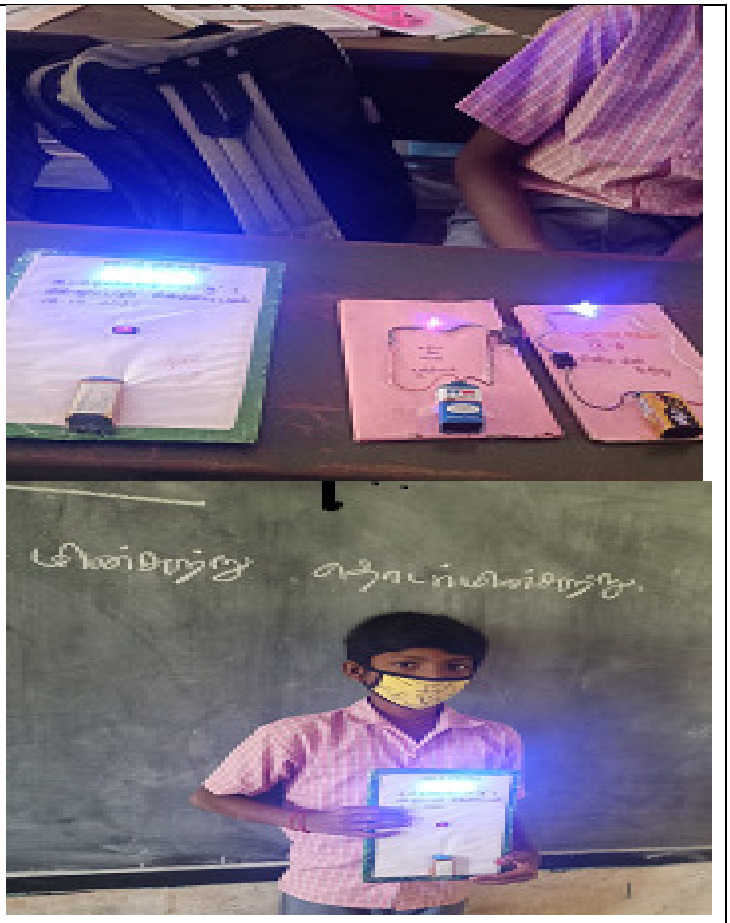
</td></tr>
<tr><td>3.</td><td>Observing the reality</td><td>
<table>
<tr><td>Number of the cell (1.5 V)</td><td>Ammeter reading(A)</td><td>Voltmeter reading(V)</td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>4.</td><td>Analyzing and substituting</td><td>

Adding one or more cells in the circuits, observe the value of current and voltmeter reading.
Similar experiments can be done including a single bulb in the circuit.
Observe the brightness of the bulb and then by adding one or more cells, check the brightness.
The experiment can be done in another way that instead of adding cells add the number of bulbs in the circuit and observe the brightness of each bulb.

</td></tr>
<tr><td>5.</td><td>Inferring results</td><td>

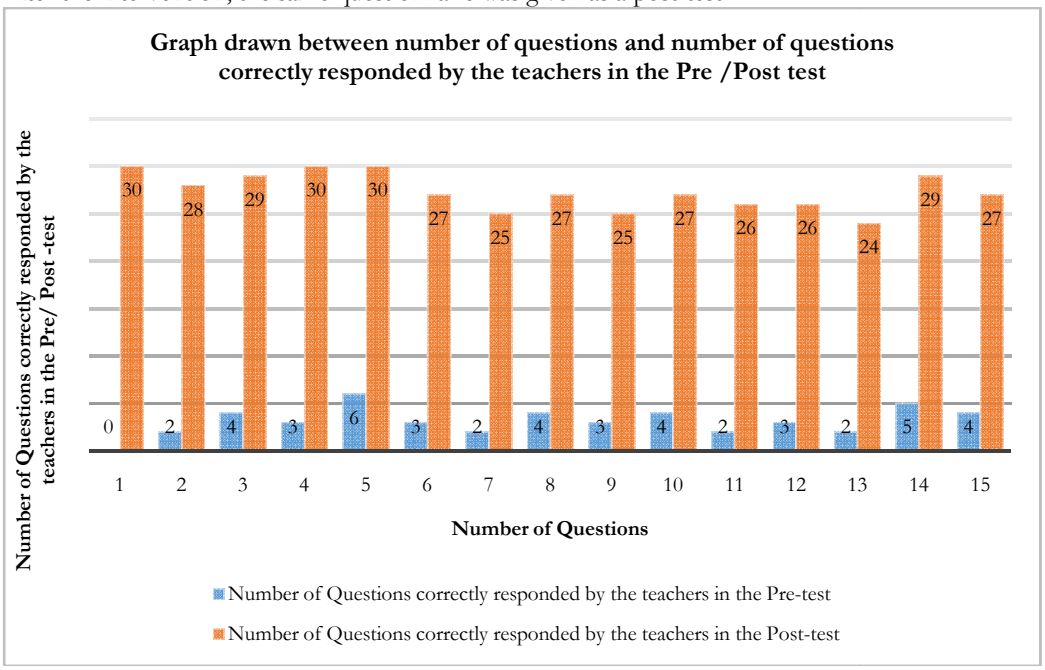
Draw a conclusion based on the addition of cells.
Draw a conclusion based on the addition of bulbs.
there is a larger current, adding more batteries increases the current in every element in the loop.
Brightness decreases due to the addition of bulbs because of voltage shares.

</td></tr>
<tr><td>6</td><td>Implementing the techniques in their classroom.</td><td>  </td></tr>
</table>

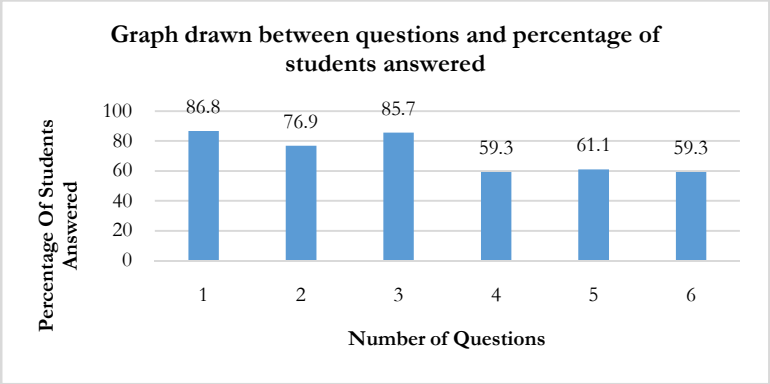


Analysis

The practitioner gave a one-day orientation training program to 30 BT Biological Science Teachers working at Tharamangalam and Veerapondi block, Salem District. The questionnaire was given to the teachers to identify the issues among the students while teaching Electric Circuits concepts. Out of thirty schools, the Practitioner observed a few schools teaching techniques used in classroom teaching. After the intervention, the same questionnaire was given as a post-test.



After the training program teachers implemented the GEOAI² Technique while teaching the Electric Circuit concepts in classroom teaching. Teachers adopted this GEOAI2 technique for teaching simple circuits, Ohms law, Series circuits, and Parallel Circuits in the classroom. Finally, students' achievements are tested with the questionnaire and analyzed.



Findings

- The Biology teachers (BT-Biology) are very terrible in a pre-test in use ofcircuit symbols to Construct Schematic Diagrams A single cell, light bulb, and switch are placed together in a circuit such that the switch can be opened and closed to turn the light bulb on and achieved in post-test scoring of 100%.
- Out of 30 teachers, only 2 teachers are answered for pre-test in solving a combination of resistance in parallel and series circuits, and the same 24 teachers are scored in post-test.
- In the classroom teaching-learning process, 90 students scored have been acquired through google quizzes. out of six questions, they can attempt any five questions. They scored above 80% in simple circuits problems and combination-based resistance in series and parallel circuits, scoring less than 60%.

Conclusion

In this study, we present as an alternative to overcome these difficulties the use of experimental activities. Preparation of Didactic Material (Learning Equipment) Gathering materials, Experimentation, Observing the reality, Analyzing and substituting, inferring results, and implementing the techniques in their classroom. We concluded that blended learning is more effective than the conventional method in enhancing science teaching among secondary school students. It implies a greater scope for adopting a blended learning strategy to optimize science learning at the secondary level. by pointing out that by using experimental activities in the teaching of electric circuits we are not proposing them as a replacement for learning by doing classes, but we accept we are increasing the range of possibilities for helping students to overcome their learning difficulties.

Recommendations

Through blended learning (online and face to face mode)

- Comprehensive recommendations to reduce students' difficulties in Class Room Transactional Technique in Electrical Circuits.
- Arranging or organizing tutorial and small group Class Room Transactional Technique in Electrical Circuits periods whereby students can learn to solve circuit-based problems.
- Using individual hands-on learning methods this skill can be enhanced among students.
- Providing enough home assignments and practicing past examination question papers.

Educational Implication of the Action Research

Teachers deliver practice to students skillfully solving and connecting the circuits such as bulb, key, cell, resistance, ammeter, and voltmeter and Students are actively involved in preparing circuits and self-learning circuits with the help of waste materials. These learning experiences developed students' presentation skills, thinking skills, and creativity.

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SLM for inclusive classes

Mrunalini, V.

Assistant Professor(SG), Dept of Special Education, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

Introduction

All the children deserve quality education as education is man making. The primary education lays foundation for the rest of the lives of the future citizens. Education is Nation Building; it cultivates; creates social change and imparts citizenship training. A child, who loses his chance at primary level, does not go up in his academic career. It is an important phase where the children are taught to read and write; mingle with others; appreciate differences and accommodate to the changes in the environment. Thus all the children irrespective of their abilities and limitations should be given an opportunity to access education. All the mainstream schools are expected to include all the children and not discriminate in the name of disability and thus are expected to equip itself to satisfy the needs of them. An attempt was made to study the accessibility of the children with visual impairment and hearing impairment in the primary schools. At the time of study, the 'Simplified Activity Based Learning' which is a self directed learning methodology was in practice. The investigator evaluated the accessibility of the Math SABL Cards for the children with visual impairment and the children with hearing impairment, adapted the cards that were inaccessible and studied the efficacy of the adaptation.

Objectives of the Study

1. To explore the Math SABL cards & identify the range and the extent of usage by CWVI & HI.
2. To adapt Math SABL cards for CWVI & HI separately.
3. To compare the academic achievement of the CWVI&HI before and after the introduction of the adapted SABL cards.

Need for the Study

When the children with disabilities are included in the system, it has to be empowered to accommodate the highly individualistic needs of this special population to achieve academic inclusion. The population of the children with disability is highly scattered. The regular teachers are usually inexperienced to take up the challenge of accommodating the CWSN in their instruction. Therefore it is imperative to know the difficulties the children with hearing /visual impairment face and construct remedies to support the teachers by preparation of adapted ABL cards. This can provide learning opportunities to these children.

The ABL cards are attractive in nature with colourful pictures and drawings. The instructions are given in simple language. This is good for the children with hearing impairment. If the early intervention has happened and the children are able to read to a certain extent, they shall easily cope up with majority of the cards. But if the child's language development lags behind seriously, then it is difficult for the child to cope up. Most of the cards contain attractive pictures and communicate the concepts visually. But in some of the cards the sentences are lengthy and there is no or not much picture support. Children with hearing impairment also struggle to pick up key words. The teachers do not use sign language in inclusive set ups. This prevents the child from attaining his fullest possible development. Judicial use of sign language may be encouraged. The teachers are given short term training to handle these children. But they lack hands on experience.

As far as the children with low vision are concerned, the cards are not stuffed with too many information, each card is clear with picture and simple language with enough spacing and in bigger fonts than that of the books.

But in the case of the totally blind, they are completely deprived of all the experiences the ABL cards provide as they are print disabled.

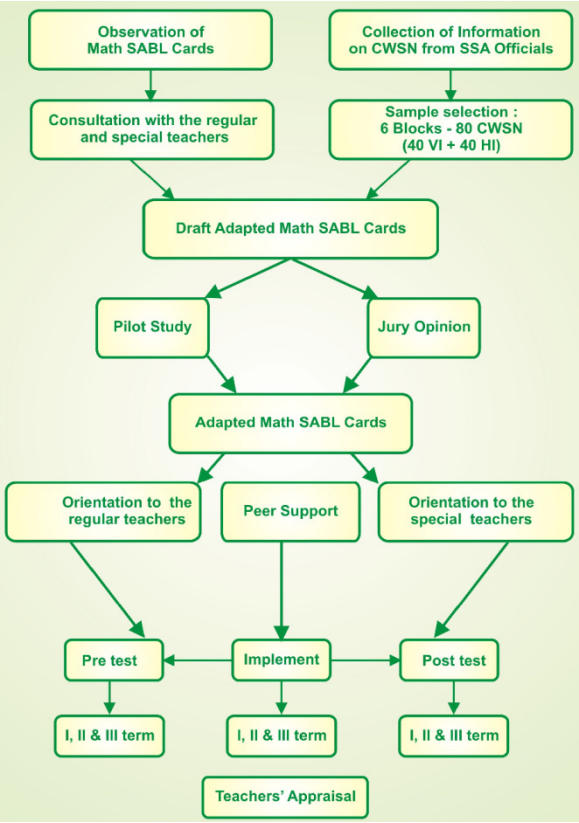
Methodology

Pre-post test Design Study without a Control Group

A pre-post test design requires collection of data on study CWHI & VI level of performance before the intervention took place (pre-), collection of the same data after the intervention took place (post-). This study design only looks at one group of individuals who receive the intervention, which is called the treatment group. The pre post test design allows making inferences on the effect of intervention by looking at the difference in the pre test and post test results. This gives the best evidence of whether or not the intervention had the intended causal effect.

Phases of the Study

The different phases of the study are diagrammatically depicted in the following flow chart.



Flow Chart showing the Phases of the Study

The various adaptations carried out for each disability are detailed below:

a) CWTB

- Print content were duplicated in braille.
- Pictures were modified into tactile forms without changing the content (sample cards and list of cards adapted are given in Appendix IV and IV a respectively).
- Complex or abstract pictures were substituted to get near normal experiences supported with oral explanation.

b) CWLV

- Preparation of large print and enlarged diagram based on visual acuity level.
- Modification done in presenting a picture with contrast background
- Some of the pictures were substituted with verbal instructions/ narrations.
- Use of assistive devices -magnifiers and reading slits. When the content of the card are too small to read they were large printed. If the card has enough space between the lines/words, the uses of magnifiers were recommended.
- The individual visual activity and magnification needs were considered for adaptations. Apart from these adaptations, the teachers were advised to write the key words in large print whenever necessary.

c) CWHI

Most of the math SABL cards were visually attractive. The cards that require adaptations were explored and adapted math SABL cards were prepared for both the CWHOH and CWD since they had the similar needs for adaptations. Hence the investigator prepared and used the same adapted SABL cards for CWHOH and CWD. The adaptations carried out were:

1. The cards were adapted using a lot of picture support
2. Sign language cards for the key word were prepared using the sign language dictionary (2000) prepared by International Human Resource Development Centre, Sri Ramakrishna Mission Vidhyalaya, Coimbatore to support the existing SABL cards
3. Sign songs were prepared and taught to the children with the assistance of the class teachers

After the adaptations were carried out, the jury opinion and pilot study were taken up to refine and redefine the adaptations. The adapted Math SABL cards were ready as described above and given in the following table 1 with details of the number of cards adapted for each category of disability.

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Results and Discussion

The collected data were statistically tested and discussed here under:

Table - 1

Pre Post Test Analysis for CWVI for all Grades - Term wise

CWVI - All Grades		Pre test FA(a+b)1 (out of 20)		Post test FA(a+b)4 (out of 20)		t value
		M	SD	M	SD	
Term I	TB (19)	10.26	0.45	13.95	0.91	15.93*
	LV(21)	10.24	0.44	13.62	0.50	23.50*
Term II	TB(19)	10.74	0.45	15.21	0.63	25.25*
	LV(21)	10.67	0.48	15.48	1.12	18.08*
Term III	TB(19)	14.47	1.17	19.79	0.42	18.67*
	LV(21)	14.67	1.24	18.57	0.98	11.30*

** - Significant at 5 per cent level*

The investigator felt the need for adaptation of the existing Math SABL cards for the children with visual impairment. A total of 40 samples were drawn consisting of CWLV& CWTB from the grades I, II, III & IV. On the whole, all the children could greatly benefit from the adaptations carried out. The results further reveal that even with the level of difficulty increasing from term to term, the children could withstand the academic pressure with the support of the adapted SABL cards and progress. Looking at the pre & post test means, we shall conclude that the Math achievement of the CWVI was improving significantly.

The pre post test analysis is carried out for each term in the table above to find out the efficacy of the usage of the adapted Math SABL cards for the CWVI. In all the three terms the performance of the CWVI have progressed considerably with a statistical significance of 95% confidence levels. This pronounces the efficacy of the adapted Math SABL cards for the CWVI.

Hence the null hypothesis stated as "there is no significant difference between the achievement in Math of CWVI before and after the introduction of adapted Math SABL cards" is rejected denoting that the adapted Math SABL cards had an impact on Math achievement of the sample.

Table - 2

Pre Post Test Analysis for CWHI

CWHI - All Grades		Pre test FA(a+b)1 (out of 20)		Post test FA(a+b)4 (out of 20)		t value
		M	SD	M	SD	
Term I	HOH (23)	10.09	0.29	12.91	0.79	16.11*
	CWD (17)	10	0	12.82	0.88	13.18*
Term II	HOH (23)	10.52	0.51	15.13	1.18	17.20*
	CWD (17)	10.53	0.51	15.76	1.09	17.91*
Term III	HOH (23)	15.17	1.27	18.39	0.89	9.97*
	CWD (17)	14.65	1.84	18.59	0.62	8.37*

** - Significant at 5 per cent level*

Most of the Math SABL cards were supported with pictures. Hence most of the Math SABL cards were HI friendly. Only a few cards were in need of adaptation in terms of picture support and fragmentation of sentences. The mental math and life math sums were to be supported with the step construction. Apart from these, the linguistic limitations due to loss of hearing were preventing them from acquiring the mathematical concepts even with the help of the materials provided with the SABL system.

Therefore, the investigator prepared a list of key words supporting the concept attainment for the CWHI from grade Ito IV. This list was transferred to sign language cards. These cards were containing signs for the specific key word with the relevant English and Tamil captions. The key words were provided in Tamil and the explanations on making the signs were in English, only to support the teachers to facilitate the children with proper instruction and usage of the cards. Both CWHOH &CWD were given same adaptations, but their performances were analysed separately since their amount of loss varied greatly. Irrespective of the amount of loss, all the children could progress well from the pre test to the post test and the difference were of statistically significant.

Hence the null hypothesis stated as "there is no significant difference between the achievement in Math of CWHI before and after the introduction of adapted Math SABL cards" is rejected denoting that the adapted Math SABL cards had an impact on Math achievement of the sample.

This result concludes with a report by Mani,M.N.G (2007) that the use of Activity Based Learning materials such as picture cards, are boon to children with hearing impairment. The gap in the existing system is thus bridged through the preparation of picture cards for word problems to foster fullest possible achievement in Math through inclusive classrooms.

Recommendations

The following recommendations are given based on the experience in dealing with CWVI and CWHI.

For the Policy Makers

- The policy makers should plan for equipping the school system and TLM adequately to ensure proper academic inclusion
- Enough care must be taken to provide individualistic support to compensate the hearing/ vision loss
- The children are to be supported by all the latest technological developments to tap up their fullest potential
- A national level call center with toll free number shall be set up to support, refer and provide guidance and counseling to the parents and teachers of the CWSN
- Special legal provisions to take up the advocacy issues shall be set up to strengthen service delievery to the CWSN

To the Government

- The government shall appoint more special education staff to give better care to these children
- More courses shall be introduced to help the children at grass root level with varied specializations
- Small monetary benefit shall be given to promote voluntary efforts
- Incentives shall be given to teachers who work hard towards inclusion
- The regular teachers who take up courses to support CWSN and show academic progress in them shall be given awards

To the Resource Teachers

- Tap parental support
- Bring volunteers
- Develop positive spirit among children with special needs

To the Regular Teachers

- Shall modify instructional strategies to accommodate CWSN within classes
- Maintain a non discriminatory classroom environment
- Ensure provisions of equal educational oppurtunities and equal participation
- Provide parity in learning for CWSN
- Equip on the techniques of special education

To the TLM Developers

- ensure accessibility of TLM to all CWSN, with due adaptation and supplements
- flexibility in the usage to make it multipurpose
- provide guidance on modifying/ using the TLM for the CWSN
- guidance on the use of local resources be mentioned in TLM's

To the NGO's

- Shall encourage voluntary support
- Conduct awareness camps
- Tap local resources
- Develop monetary resources
- Networking

To the Parents

- Shall boost the confidence of the children
- Neither overprotect nor neglect
- Treat equally
- Equip yourself to technical issues
- Network and advocate the needs of your children

To the Teacher Training Institutes

- Teacher training institutes shall encourage the students to take up mini projects in the area of special education
- The teacher institutes shall create awareness to the community on the education of CWSN
- The teacher training shall conduct inservice training on the education of CWSN
- The teacher training institutes shall conduct camps , put up exhibitions to help the teachers to know the educational difficulties faced by the CWSN

- The teacher training institutes shall prepare the list of gadgets available for the educational use of children with special needs and spread the information

To the Resource teachers

- Shall maintain good relationship with the regular teachers and tap their support for the CWSN
- Shall encourage the disabled peers to support the CWSN

To the Administrators

- The administrators shall foster network among special and regular teachers
- They shall communicate with the technocrats and arrange for gadgets free of cost or at subsidized rates for the use of CWSN
- The administrators shall tap community support to help the CWSN
- The administrators shall tap community support to help CWSN
- The administrators shall conduct awareness to the community on the importance of educating CWSN. They shall include such programmes on annual day and on days of national importance
- The administrators should encourage the teachers who work for CWSN.

Conclusion

The journey to becoming an Inclusive School may be long and challenging at times, but ultimately this journey can strengthen a school community and benefit all children. "Inclusion" does not simply mean the placement of students with disabilities in general education classes. This process must incorporate fundamental change in the way a school community supports and addresses the individual needs of each child. As such, effective models of inclusive education not only benefit students with disabilities, but also create an environment in which every student, including those who do not have disabilities, has the opportunity to flourish. Some ways in which inclusive educational practices build a school's capacity to educate all learners effectively are Differentiated instruction increases student engagement; Academic supports help each student access the full curriculum; Behavioral supports help maintain a positive learning environment for everyone; Respect for diversity creates a welcoming environment for all; Inclusive practices make effective use of a school's resources.

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Collaborative learning for successful inclusion of children with special needs

Revathi, D.

Lecturer (sr) in Special Education, National Institute for Empowerment of Persons with Multiple Disabilities, Kovalam Post, Kancheepuram district, Tamilnadu

Introduction

Children with Special needs are studying in a regular school together along with non-disabled children. Through SSA, it was implemented in 2000 to provide admission for all children regardless of age, sex, disabilities, and discrimination. The purpose of placing children with special needs or disabilities in inclusion is to bring change in the education system and state that education is right for all. Inclusion has more benefits most importantly equitable process. Equality of educational opportunities is existing where teachers deliver instruction for students with and without educational disabilities. MHRD (2013-2014) stated that 25 lakh children were enrolled in schools due to commitment towards free for children of standard I to VIII as given in the RTE Act, 2009. There is a practice in all the schools following a traditional instructional paradigm but less scope for the opportunity to be active. An approach that represents a learning paradigm is collaborative learning. It has the prime goal to make learners to actively participate in the society where we are interconnected (Lehtinen, Hakkarinen, Lipponen, Rahikainen and Muukkonen, 1999).

Collaborative learning is taking place naturally in a classroom due to fact that humans are concerned and cooperative if something happens in front of them. There is an example child with locomotor impairment always gets help from non–disabled peers to access the toilet and others in the environment. To reduce the burden, barrier-free environment is stressed upon school buildings and other backgrounds. The government has made such a ramp and accessible toilets in the newly constructed school buildings.

Collaborative learning is defined for that purpose when there is group learning between the learners focuses on the meaningful learning interaction (Goren-Bar &Koubek, 2001). Zurita and Nussbaum (2004) demand that Collaborative learning is stimulating learning as well as social interaction among members of a group. Group learning in inclusive schools is essentially one of the types of cooperative learning or peer tutoring. It differs in the engagement of the children in a school classroom (Foot, Morgan, & Shute, 1990; Damon & Phelps, 1989). Hence it was stated by Slavin (1989) that collaborative learning must ensure that there is something learned by the members of every group.

Furthermore, it is effective for children with special needs in terms of academic, social, and psychological benefits. Collaborative learning Studies were implemented to find the effectiveness, on the other side for improvement of social skills. A literature review helped to identify the gap and that all about is the implementation of truly collaborative learning for enhancing the academic and social aspects in inclusive education programmes where children with Visually Impaired, Hearing Impaired, movement impaired and intellectual disability getting the education. It was planned to create a mixed group of learners and enable them to learn from each other promoting Cohesiveness among the group. With the support of a teacher who is taking major responsibility to address all children in delivering the lesson content. And that Teacher must foster collaboration in many ways to create a conducive learning environment.

The objectives of the study were to:

1. Study the Academic Performance of students before and after the intervention on Collaborative Learning.
2. Analyze the effect of Collaborative Learning on the Social Skill development of students

Method

The Research study was conducted in inclusive schools at Coimbatore, Tamilnadu state. A Total Sample of 60 children with special needs using the purposive technique of sampling. The inclusion criteria are the four categories of children with special needs and non-disabled peers since it is collaborative learning with a group. Academic performance and social skills are the dependent variables in the study. Pre and posttest on Achievement were conducted and social skill rating was done with the participants as suggested by Coie and colleagues, 1982). A pilot study was done with one grade with some intervention sessions. This helped to further for reliability and validity of the tool. The Cronbach's alpha coefficient was used in the study and it was found 0.83 as the reliability and validated with subject experts in the field. Limitations of the present study are the sample size of children with special needs due to paucity of time and comparison of an experimental and control group for different grades and subjects.

Analysis of data and interpretation

Comparison of Academic Performance and social skill development of all students

The analysis was made to compare the relationship of academic performance and social skill development of students using the "Pearson correlation coefficient".

Table 1.1: Correlation Coefficient of Academic performance and social skill development of students

Learning Outcomes	Academic Performance (Posttest)	Social Skills
Academic Performance (Posttest)	1	0.03 Ns
		(.590)
Social skills		1

Ns-Not Significant

The correlation coefficient between Academic Performance and Social Skill development of all Students is 0.03 which is not significant. It indicates the Academic Performance is retained at the same level. Therefore it is concluded that Academic Performance does not correlate with Social Skill development.

Comparison of Academic Performance and Social Skill development of Non-Disabled Peers

The analysis was made to compare the relationship of academic performance and social skill development of Non-Disabled Peers using "Pearson correlation coefficient".

Table 1.2: Correlation Coefficient of Academic Performance and Social Skill development of Non Disabled Peers

Learning Outcomes	Social Skill development	Academic Performance (Posttest)
Social Skill development	1	0.22**
		0.002
Academic Performance (Posttest)		1

***.Significant at 0.01 level Ns -Not Significant*

The correlation coefficient between Academic Performance and Social skills of Non-disabled peers is 0.22 indicating statistically significant. It is said that Collaborative Learning enhances Academic Performance which is correlated with Social skill development. Hence it is concluded that Academic Performance is positively correlated with the Social skill development of non-disabled peers.

Comparison of Academic Performance and Social Skill development of Student with Special Needs

The analysis was made to compare the relationship of academic performance and social skill development of Students with Special Needs using the "Pearson correlation coefficient".

Table 1.3: Correlation Coefficient of Academic performance and social skill development of Student with Special Needs

Learning Outcomes	Academic Performance (Posttest)	Social Skill development
Academic Performance (Posttest)	1	0.19 Ns
		0.20
Social Skill development		1

Ns-Not Significant

The correlation coefficient between Academic Performance and Social Skill development of Students with Special Needs is 0.19 which is not significant. Therefore it is concluded that Academic Performance does not correlate with Social Skill development.

Comparison of Academic Performance and social skill development of Student with Cognitive Impairment

The analysis was made to compare the relationship of academic performance and social skill development of Students with Cognitive Impairment using the "Pearson correlation coefficient".

Table 1.4: Correlation Coefficient of Academic performance and social skill development of Student with Cognitive Impairment

Learning Outcomes	Academic Performance (Posttest)	Social Skill development
Academic Performance	1	0.21 Ns

(Posttest)		0.43
Social Skill development		1

***.Significant at 0.01 level Ns-Not Significant*

The correlation coefficient between Academic Performance and Social Skill development of Students with Cognitive Impaired is 0.21 which is not significant. Therefore it is concluded that Academic Performance does not correlate with the Social Skill development.

Findings and discussion

The major findings of the study were that Collaborative Learning helped Non-disabled peers and children with special needs to some extent and their academic performance has correlated with Social skill development. The findings were in line with Johnson et al (1989) discussed that it works with children with intellectual disabilities and in another study by Johnson, Johnson (1985) found the result that collaborative learning among students with impairments for academic achievement than learning individually because of the interaction happening during the learning in a classroom within the members of the group. No doubt in finding the results concerning social skills among the diverse learners through collaborative learning as pointed by Romonov & Nevgi (2006 and Schmidt (2000).

Concluding remarks

Collaborative learning has been established as a piece of comprehensive evidence to practice in inclusive schools where disabled and non-disabled together in a classroom can undergo this group learning for success in terms of academic and social skills as well. Many schemes and policies that would bring a societal change should take this as an important consideration for national growth and development. The recommendation for stakeholders' of course, a teacher to learn the strategy and to put it into practice as it claims the effectiveness not just the way doing it.

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Effect of learning management system based training on action research skills of teachers

Ramesh Kumar Kandasamy
District Institute of Education and Training, Salem, Tamil Nadu, India

Maanhvizhi Emayavaramban
District Educational Officer, Ariyalur, Tamil Nadu, India

Selvam Muthusamy
Principal, District Institute of Education and Training, Salem, Tamil Nadu

Introduction

Learning is a life-long process. There are more and more advancements that are taking place in each and every field. Updating of the contents and methodology is foremost important task of a teacher. The teacher should determine not to teach unless he or she has decided to learn, as an ideal teacher is a learner throughout his/her life. In-service training is most essential component for the professional development of teachers.

To help the teachers develop the content knowledge and sufficient knowledge in methodology, the teachers are provided with in-service training programme by the School Education Department in Tamil Nadu through SCERT at the State level and DIETs in the District level. These in-service trainings are designed as per the need of the teachers based on the need analysis and the hard-spots identified by the educationists.

In-service Teacher Education Programme

In-service teacher education is defined in various ways by Educationists. According to Buch (1968), "In-service education is a programme of activities aiming at the continuing growth of teachers and educational personnel in-service." Siddiqui (1991) defined In-service Teacher Education as "all those activities and courses which aim at enhancing and strengthening the professional knowledge, interest and skills of serving teachers."

Learning Management System (LMS)

LMS is a software application that automates the administration of learning events and manages a wide range of functions in the delivery process. LMS includes functions like management of course materials session-wise, assignments, feedback collection etc. It may range from a simple system for managing training & record keeping to complex ones where all kinds of course related activities are monitored online. Corporates use LMS for online training and record maintenance activities (Davey 2011). It needs to take care of assessment of learner's competence and knowledge. It will also enable mentoring and personalization and use of discussion fora. Though LMS does not involve in content creation, it eases the job of the teachers by providing necessary tools and additional functionalities like assistance in collaboration with remotely located peers during content creation.

Need and Significance of the Study

Teachers face a lot of challenges in their classroom. To find solution to all the problems faced the teacher can find individualized solutions by conducting action research. Hence it was decided to provide teacher professional development through Moodle platform. When the content is given through Moodle platform the teachers would learn in self pacing manner without any disturbance in their quality teaching and learning time. Hence this study was designed to find the effectiveness of Moodle platform in training the teachers on action research skills**.**

Materials and Methods

Ethical consideration

This study was approved by the District Research Approval Committee (2020-2021) constituted by the District Institute of Education Research and Training (DIET), Salem, Tamil Nadu State, India. Participants were given a talk about the objectives of the research and a declaration of the investigators stating that the information collected would be treated confidentially.

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Study design and setting

Sample Technique and Sample

For the present study, the investigator selected the sample using one of the restricted sampling procedures namely **'Purposive Sampling'**.

Sampling procedure

To obtain the sample for the study the investigators conducted a discussion with Principal and with his guidance a coordination meeting was organized by the investigator and the co-investigator, in which the idea of research project was discussed and was planned to obtain a list for the study by circulating a google form in the social media, samples who are willing to take up the course was obtained and the samples was fixed.

The sample of the study consists of 72 learners who are teachers by profession and they belong to all levels right from primary school teachers to university professors.

Research Method

The effectiveness of the Learning Management System based Training on Action Research Skills of the Teachers are studied using *Mixed Research*method. The effectiveness of Moodle platform was conducted by quantitative method, the attainment of action research skill was conducted by qualitative method. Since the study tries to bring up the effectiveness and also the attainment of action research skill this Mixed method was found to be an ideal one.

Instrumentation

The investigators planned to conduct this study with the help of a Pre-Test/ Post- Test questionnaire for assessing action research attainment skill of the teachers. Every unit was followed by assessments to check the progress of the study. A pilot study was conducted for 10 samples from different parts of the state. After conducting the pilot study, the investigators found that this research work can be conducted with Pre-Test/ Post- Test questionnaire along with non-participatory observation by the investigators. An interview schedule was designed for the teachers and the parents.

Standardisation of the questionnaire

The prepared tool was validated with content and face validity(Sax, 1980). As both content validity and face validity are based on judgmental process, the toolwas presented to 8 experts, four educators, and four teachers. All the juries carefully read each item of the Pre-test/ post-test questionnaire and gave comments and suggestions after which the tool was finalized.

Data Analysis

Data was collected from samples. The Participant were observed and interviewed by the investigator and the co-investigator through non participatory observation method. The collected data was analyzed qualitatively. The quantitative part of the study was analyzed with the help of SPSS package, version 11. The data of the study involving 72 teachers belonging to different schools have been subjected to 1. Descriptive Analysis, 2. Differential Analysis and 3. Percentage Analysis

Summary of Findings

Findings based on the Mean Scores

These findings reveal the sample's knowledge of the using the learning management system

Female teachers have more knowledge in using online learning management than male teachers. Post graduate teachers have more knowledge in using learning management system. Teachers working in Institutions located in urban areas have more knowledge in using learning management system. Teachers residing in urban areas have slightly more knowledge in using learning management system. Teachers handling secondary classes have more knowledge in using learning management system. Teachers working in different types of schools have same knowledge in using learning management system.

Teachers working in private schools have more knowledge in using learning management system. Teachers with 1-5 years of experience have more knowledge in using learning management system. Teachers who have attended 4 and more trainings have added knowledge in using learning management system. Teachers who have received National awards have more knowledge in using learning management system.

Teachers who have participated in NSS have more knowledge in using learning management system. Teachers who have coordinated RRC and Science club activities have more knowledge in learning management system. With regard to the teachers who use ICT in their classroom, all the teachers have same knowledge in using learning management system. There is no difference between teachers based on the occupation of their spouse in using Learning Management System.

Findings based on the Achievement scores

These findings reveal the achievement scores of the samples based on the post test

There is no significant difference in the achievement levels between male and female teachers in enhancing the knowledge using learning management system in the Post-test.There is no significant difference in the achievement of teachers in enhancing the knowledge using learning management system based on their designation.

There is no significant difference in the achievement of teachers in enhancing the knowledge using online learning management system with regard to the locality of the institution in which they are working. There is no significant difference in the achievement of the teachers in enhancing the knowledge using learning management system based on the locality of their residence.

There is no significant difference in the achievement of the teachers in enhancing the knowledge in using online learning management in the Post-test based on the classes handled by them.There is no significant difference in the achievement of the teachers in enhancing the knowledge using learning management system in the Post-test based on the subjects handled by them.

There is no significant difference in the achievement of the teachers in enhancing the knowledge using learning management system based on their educational qualification.There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on their educational qualification.

There is no significant difference in the achievement of the teachers in enhancing the knowledge using learning management system based on their Marital Status.There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management system based on the nature of institution in which they are working.

There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on the type of school. There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on their experience.

There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on the ICT trainings undertaken by them.There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on the levels of the awards received.

There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on the activities coordinating by the teachers like JRC, NCC, NSS, Scouts, etc.There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on the club activities organized by the teachers like Language club activities, Science club activities, social science activities, RRC etc.

There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on the usage of ICT in the classroom.There is no significant difference in the achievement of the teachers in enhancing the knowledge using online learning management in the Post-test based on the occupation of the spouse.

Findings based on the Percentage analysis

Findings based on the Grades obtained by the teachers

6.9% of the male teachers have acquired full grades where as 27.8% of the female teachers have scored full grades. 12.5% of male teachers and 27.8% of female teachers have secured grades between 40 to 50. 5.6% of male and 9.7% of female teachers have secured 30-40 grades. Both male and female who have secured 20-30 grades belong to 1.4%. There is no person who have got grades between 0-10 while 4.2% of women have secured grades between 0-10.

2.8% of Assistant Professors have secured grades 40-50, 9.7% of Secondary Grade Teachers have secured grade 50, 16.7% of teachers have secured 40-50, 5.6% of them have secured 30-40, 2.8% of teachers have got 20-30, 1.4% of them have secured 0-10%. With regard to the Bachelor Trained teachers 16.7% have secured 50, 13.9% have secured 40-50, 6.9% have secured 30-40, 1.4% has secured 10-20 and 0-10. 2.8% of Head Masters have secured 50, 4.2% of them have secured 40-50, 1.4% have secured 30-40, and 10-20. Post Graduate teachers who have secured 50 is 2.8%, 1.4% of lecturers have secured 50 and 0-10%. Primary School Headmaster have secured 1.4% with grades 50 and 30-40.

23.6% of teachers working in the rural area, 11.1% of teachers working in Urban locality have obtained grades 50. 33.3% of teachers working in the rural area, 5.6% of teachers working in Urban locality, 1.4% of teachers working in hilly locality have obtained grades between 40-50. 12.5% of teachers working in the rural area, 2.8 % of teachers working in Urban locality have obtained grades between 30-40. 1.4% each of rural teachers and urban teachers have obtained grades between 10-20% and 20-30%. 4.2% of teachers working in rural teachers have obtained scores between 0-10%

18.1% of teachers residing in rural areas and 16.7% of the teachers residing in Urban are have obtained full marks. 22.2% of rural teachers and 18.1% of teachers residing in the urban area have secured

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grades between 40-50. 9.7% of teachers residing in the rural area, 5.6% of the teachers residing in the urban area have secured grades between 30-40%. 1.4% of teachers in the rural area and urban area have secured 20-30%, 2.8% of teachers residing in rural area have secured 10-20. 1.4% of the teachers residing in the rural area and 2.8% of teachers residing in the urban area have secured grades between 0-10.

11.1% of teachers handling primary school, 13.9% of teachers handling Upper primary classes, 5.6% of teachers handling secondary classes, 4.2% of teachers handling higher secondary classes have secured full grades. 18.1% of teachers handling primary school, 11.1% of teachers handling Upper primary classes, 6.9% of teachers handling secondary classes, 4.2% of teachers handling higher secondary classes have secured grades between 40-50. 6.9% of teachers handling primary school, 6.9% of teachers handling Upper primary classes, 1.4% of teachers handling higher secondary classes have secured grades between 30-40. 2.8 % of teachers handling primary school have secured grades between 20-30. 1.4 % of teachers handling primary school Upper primary classeshave secured grades between 10-20. 2.8% of teachers handling primary school and 1.4% of teachers handling Upper primary classes have secured grades between 0-10.

4.2% of samples with D.T.Ed., as qualification, 23.6% of samples with B.Ed., as professional qualification, 1.4% of the sample with professional qualification of M.Ed., 5.6% of samples with M.Phil., as professional qualification have secured full grades. 13.9% of samples with D.T.Ed., as qualification, 18.1% of samples with B.Ed., as professional qualification, 2.8% of the sample with professional qualification of M.Ed., M.Phil., and P.hD., as professional qualification have secured grades between 40-50. 2.8% of samples with D.T.Ed., as qualification, 9.7% of samples with B.Ed., as professional qualification, 2.8% of the sample with professional qualification of M.Ed., have secured grades between 30-40. 2.8% of samples with D.T.Ed., as professional qualification, have secured grades between 20-30. 2.8% of samples with of samples with B.Ed., as professional qualification, have secured grades between 10-20. 1.4 % of samples in D.T.Ed., B.Ed., Ph.D., have secured grades between 0-10%.

33.3% of the samples who are married and 1.4% of the samples who are unmarried have secured full grades. 38.9% of the samples who are married and 1.4% of the samples have secured 40-50% grades. 15.3%, 2.8%, 2.8% of married samples have secured grades between 20-30%,10-20% and 0-10% respectively. 1.4% of unmarried samples have secured grades between 0-10%

1.4% of samples working in boys' school, 4.2% of samples in girls' school, 29.2% of the sample working in co-education schools have secured full grades. 5.6% of samples working in girls' school and 34.7% of samples working in co-education schools have obtained grades between 40-50. 1.4% of samples working in girls' school and 13.9% of samples working in co-education schools have obtained grades between 30-40. 2.8%, 2.8%, 4.2% of samples working in co-education have secured grades between 20-30%, 10-20%,0-10%.

4.2% of teachers having teaching experience between 1-5 years, 8.3% of teachers having teaching experience between 6-10years, 9.7% of teachers having teaching experience between 11-15years and 16-20 years and 2.8% of teachers having teaching experience of 21 years and above have secured grades fully. 5.6% of teachers having teaching experience between 1-5 years, 8.3% of teachers having teaching experience between 6-10years, 15.3% of teachers having teaching experience between 11-15years and 5.6% of teachers having teaching experience of 16-20years, 21 years and above have secured grades between 40-50. 1.4% of teachers having teaching experience between 1-5 years, 4.2% of teachers having teaching experience between 6-10years, 2.8% of teachers having teaching experience between 11-15years and 4.2% of teachers having teaching experience of 16-20years, 2.8% of teachers having experience of 21 years and above have secured grades between 30-40. 1.4% of teachers having teaching experience between 6-10years, and 16-20 years have obtained grades 20-30. 2.8% of teachers having teaching experience of 21 years and above have secured grades between 10-20. 2.8% of teachers having experience between 11-15 years and 1.4% of teachers having 16-20 years of experience have obtained grades between 0-10.

33.3% of the samples working in Government schools, 1.4% of the samples working in private schools have secured full grades. 30.6% of samples in government, 5.6% of samples in aided schools, 4.2% of samples in private schools have secured grades between 40-50%. 9.7% of samples in government, 4.2% of samples in aided schools, 1.4% of samples in private schools have secured grades between 30-40%. 2.8%, 2.8%, 4.2% of teachers in government school have completed the grades between by 20-30%, 10-20%,0-10%.

2.8% of teachers who have not attended any ICT related training, 5.6% of teachers who have attended 1 ICT related training, 9.7% of teachers who have attended 2 ICT training, 4.2% of teachers who have attended 3 ICT related trainings, 12.5% of teachers who have attended more than 5 ICT related trainings have obtained full grades. 9.7 % of teachers who have not attended any ICT related training, 5.6% of teachers who have attended 1 ICT related training, 1.4 % of teachers who have attended 2 ICT training, 11.1% of teachers who have attended 3 ICT related trainings, 1.4% of teachers who have attended more than 4 ICT related trainings, 1.4% of teachers who have attended 5 ICT related trainings 1.4% of teachers who have attended more than 5 ICT related trainings have obtained grades between 40-50. 2.8 % of teachers who have not attended any ICT related training, 4.2 % of teachers who have attended 2 ICT

training, 1.4% of teachers who have attended 3 ICT related trainings, 1.4% of teachers who have attended 5 ICT related trainings 5.6% of teachers who have attended more than 5 ICT related trainings have obtained grades between 30-40. 1.4% of teachers each with 2 and 3 ICT training have grades between 20-30. 2.8% of teachers who have attended more than 5 ICT trainings have obtained grade of 10-20. 1.4% of teachers who have not attended any ICT training and more than 5 ICT training have secured grades between 0-10.

6.9% of teachers who have awards and recognition at the district level, 5.6% of teachers who have received awards at other levels and 22.2% of teachers who have not received any award have obtained full grades. 5.6% of teachers who have got awards at district level and 1.4% of teachers who are have received awards at the state level and national level , 4.2% of teachers who have received awards at other levels, 27.8% of teachers who have not got any awards have got grades between 40-50, 1.4% of teachers with state level awards, 4.2% of teachers with awards at other levels, 9.7% of teachers who have not got any award have obtained grades 30-40. 1.4% of teachers who have got awards at the district level and 1.4% of teachers with no awards have obtained grades 20-30.

13.9% of teachers who have spouse with teaching as the profession, 12.5% of teachers with other profession, 8.3% of teachers who have spouse who are not working have obtained the grades fully. 16.7% of teachers who have spouse with teaching as the profession, 13.9% of teachers with other profession, 9.7% of teachers who have spouse who are not working have obtained the grades between 40-50. 2.8% of teachers who have spouse with teaching as the profession, 5.6% of teachers with other profession, 6.9% of teachers who have spouse who are not working have obtained the grades between 30-40. 1.4% of teachers who have spouse with other profession, 1.4% of teachers who have spouse who are not working have obtained the grades between 20-30. 1.4% of teachers who have spouse with teaching as the profession, 1.4% of teachers who have spouse who are not working have obtained the grades between 10-20. 2.8% of teachers who have spouse with teaching as the profession, 1.4 % of teachers with other profession, have obtained the grades between 0-10.

Findings based on the percentage of completion

12.5% of male and 44.4% of female have completed the contents of the Learning Management System fully. 11.1% of male and 16.7% of female have completed the contents between 80-100%. 4.2% of male and 6.9% of female have completed the contents between 80-60%. There is no male who have completed between 60% to 0. 1.4% of females have completed individually between 40-60%, 20-40% and 0-20%.

1.4% of Assistant Professors, 13.9% of Secondary Grade Teachers, 27.8% of Bachelor Trained Teachers, 6.9% of Head Masters, 2.8% of Post Graduate teachers, 1.4% of Lecturers, Head Masters, Head Masters of the primary school, Principals have completed fully. 1.4% of Assistant Professors, Head Masters, Head Masters of Primary school and Principals, 6.9% of have Bachelor Trained Teachers have completed the contents between 80-100%. 5.6% of secondary grade teachers, 4.2% of Bachelor Trained Teachers, 1.4% of Head Masters have completed between 60-80%. 1.4% of Secondary Grade Teachers have completed 20-40% and 1.4% of Bachelor Trained Teachers have completed 0-20%.

37.5% of teachers working in the rural area, 18.1% of teachers working in Urban locality and 1.4% of teachers working in hilly area have completed the course content fully. 27.8% of teachers working in the rural area have completed their course content between 80-100%. 6.9% of teachers working in the rural area, 4.2 % of teachers working in Urban locality have completed the course content between 60-80%. 1.4% each of rural teachers have completed the course content between 40-60%, 20-40% and 0-20%.

26.4% of teachers residing in rural areas and 30.6% of the teachers residing in Urban are have completed the course content fully. 20.8% of rural teachers and 6.9% of teachers residing in the urban area have completed the course content between 80-100%. 6.9% of teachers residing in the rural area, 4.2% of the teachers residing in the urban area have completed the course content between 60-80%. 1.4% of teachers in the urban area have completed 40-60%, 1.4% of teachers residing in urban area have completed 20-40%, 1.4% of the teachers residing in the Urban area have completed 0-20% of the course content.

8.3% of samples with D.T.Ed., as qualification, 36.1% of samples with B.Ed., as professional qualification, 2.8% of the sample with professional qualification of M.Ed., 6.9% of samples with M.Phil., as professional qualification and 2.8 % of samples with Ph.D., as professional qualification has completed full course content.

47.2% of the samples working in Government schools, 5.6% of the samples working in aided schools and 4.2% samples working in private schools have completed the course content fully. 23.6% of samples in government, 2.8% of samples in aided schools, 1.4% of samples in private schools have completed the course content between 80-100%. 8.3% of samples in government, 1.4% of samples in aided schools, 1.4% of samples in private schools have completed the course content between 60-80%. 1.4%, of teachers in government school each have completed the course content by 40-60%, 20-40%, 0-20%.

6.9 % of teachers who have not attended any ICT related training, 6.9% of teachers who have attended 1 ICT related training, 11.1% of teachers who have attended 2 ICT training, 11.1% of teachers who have attended 3 ICT related trainings, 1.4 % of teachers who have attended more than 5 ICT related trainings, 19.4 % of teachers who have attended more than 5 ICT related trainings have completed the course content fully. 6.9 % of teachers who have not attended any ICT related training, 4.2% of teachers who have attended 1 ICT related training, 1.4 % of teachers who have attended 2 ICT training, 5.6 % of teachers who have attended 3 ICT related trainings, 1.4 % of teachers who have attended 4 ICT related trainings, 1.4% of teachers who have attended 5 ICT related trainings 6.9% of teachers who have attended more than 5 ICT related trainings have completed the course between 60-80%. 1.4 % of teachers who have not attended any ICT related training have completed the course content by 40-60%. 1.4% of teachers each with more than 5 and 3 ICT training have completed the course content by 20-40% and 0-20%.

2.8% of teachers who are using ICT in every class, 8.3% of teachers who are using ICT very often, 12.5% of teachers who are using ICT often,9.7% of teachers who are using ICT occasionally in the class room, 1.4% of teachers who are not using ICT in the classroom have obtained full grades. 11.1% of teachers who are using ICT in every class, 6.9% of teachers who are using ICT very often, 12.5% of teachers who are using ICT often,4.2% of teachers who are using ICT occasionally in the class room, 5.6% of teachers who are not using ICT in the classroom have obtained grades between 40-50. 2.8% of teachers who are using ICT in every class, 2.8% of teachers who are using ICT very often, 4.2% of teachers who are using ICT often,2.8% of teachers who are using ICT occasionally in the class room, 2.8% of teachers who are not using ICT in the classroom have obtained grades between 30-40. 1.4% of teachers who are using ICT very often, 1.4% of teachers who are using ICT occasionally in the class room, have obtained grades between 20-30. 1.4% of teachers who are using ICT very often, occasionally, Using ICT in every class, using often, using very often, often, occasionally

Findings based on the Qualitative analysis

- Initially teachers found some difficulties in accessing the Moodle platform. When they were provided with a guide to handle the platform and oriented on the usage of the platform through online mode, they were able to utilize the course content was given in videos, audio, text and also interactive worksheets was also provided.
- The participants found the content interesting and had greater interest.Teachers were motivated with the motivation given in the form of emoji, smile faces, audio feed back and so on.
- At the end of the course teachers were also able to completed an action research report and submit it in the platform without any difficulty.The higher percentage of teachers who have completed the course content fully help us to interpret that they have utilized the Moodle platform effectively.

Recommendations

The DIETs may take up steps to utilize Moodle Platform for providing Teacher professional development. Moodle Platform becoming a gift or a curse depends upon the utilization of the teachers, administrators and policy makers. The quality teaching learning time of the teachers can be utilized properly when Moodle platform is utilized for the teachers in an effective manner. The designing of in-service trainings should cater to the overall development of the students with special emphasis on virtual training. DIETs can conduct trainings for the teachers to create Moodle Platform for their own students, peruse courses through Moodle Platform. Sensitization of the Moodle Platform courses can be disseminated to the teachers through local cable TV or new letters or newspapers.

Conclusion

Teachers who get trained through virtual mode are able to take the content of the training to the grass-root level. Democracy given in this sort of training has improved the performance of the teachers to a greater extend. In-service trainings and teacher professional development courses when given through online mode can improve the performance of the teachers which in turn would improve the teaching learning process and enhance the performance of the students.

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Influence of training courselet in developing online assessment skills among teachers

Kannaki, K.
Senior Lecturer, District Institute of Education and Training, Uthamacholapuram, Salem

Introduction

Using information and communication technologies (ICT) in teaching learning process becomes an inevitable one if the process would be more effective and makes permanent learning. Importantly, web-based in-service training allows all kind of teachers make acquaintance with skills envisioned to develop at their own pace. Instead it involves developing challenging and engaging online learning activities that complement. This learning mode aims to provide reinforcement to its legitimate teachers while maintaining the quality training elements. Incorporated with both traditional and distance learning methods, along with exploiting social media tools for increased comfort level and peer-to-peer collaboration.

ICT utilization in instruction in education these include: competence to make personal use of ICT in instruction, competence to master a range of educational paradigms that make use of ICT in instruction, sufficient competence to make use of ICTs as mind tools, competence to make use of ICT in instruction as a tool for teaching, competence in mastering a range of assessment paradigms which make use of ICT in instruction, competence in understanding the policy dimensions of ICT use in instruction for teaching and learning. The ICTs have the potentials not only in ensuring effectiveness and efficiency in these two areas of teaching and learning

Courselet

A courselet is a short, 10 to 15 minute, online training module that employees can take at their desk. It provides employees with just-in-time training without dedicating a large chunk of time to training. Since an employee can take a courselet from their desk in a short period of time, companies increase their flexibility to change business processes.

Google Forms

The Google Forms service has undergone several updates over the years. Features include, but are not limited to, menu search, shuffle of questions for randomized order, limiting responses to once per person, shorter URLs, custom themes, automatically generating answer suggestions hen creating forms, and an "Upload file" option for users answering questions that require them to share content or files from their computer or Google Drive.

Learning Apps

Learning Apps is a free, web-based authoring software and platform to support learning and teaching processes with small interactive, multimedia learning modules (e.g. multiple choice questions , assignment exercises, fill-in-the-blank and descriptive test). Learning modules can be integrated directly into learning content (e.g. wiki, blog, learning platform), but users can also create or change them online. Each application is made available via a QR code.

1) **Kahoot:** Kahoot is a game-based learning platform, used as educational technology in schools and other educational institutions. It's a learning games, "Kahoots", are user-generated multiple-choice quizzes that can be accessed via a web browser or the Kahoot app. Kahoot can be used to review students' knowledge, for formative assessment, or as a break from traditional classroom activities.
2) **Quizizz:** Quizizz uses the same educational technique as Kahoot, but it still has slight variances. Kahoot is only used for real-time formative evaluation, testing, questionnaires, and discussions in the classroom. Quizizz lists two different application modes. One is to form a formative evaluation in real-time in the classroom, and the other is to be arranged by the teacher to the student as an extracurricular assignment.
3) **H5P.org:** H5P.org is the community website where H5P libraries, applications and content types may be shared. H5P applications and content types work the same way in all H5P compatible websites. Currently four platform integrations exist, one for Drupal, Word Press., Tiki, and one for Moodle. The platform integrations include the generic H5P code as well as interface implementations and platform specific code needed to integrate H5P with the platforms. H5P has been designed to have a minimum of platform specific code and a minimum of backend code. Most of the code is JavaScript. The aim is to make it easy to integrate H5P with new platforms.

Statement of the problem

With the passage of time, teaching pedagogies have changed drastically thereby pushing for novel tools and techniques to be introduced especially for higher education. In this regard, numerous distance-based educational approaches have been proposed, and are already in practice. Training courselets for developing online assessment skills among teachers is a novel educational model that incorporates both the physical as well as the online learning system. Specifically, much wider application platforms for HL model are the degree programs that are offered at different universities. An important aspect of this model is that it is independent of the type of degree or institute, and can be equally applied at any institute by having the appropriate resources, and by following mandatory as well as the recommended set of rules.

Objectives of the study

- To design training package on developing online assessment skills among the teachers.
- To train the teachers through courselet in developing online assessment skills among the teachers.
- To evaluate the training package on developing online assessment skills among the teachers.
- To ascertain the training package on developing online assessment skills among the teachers through course let will be made positive impact in assessment skills of the teachers.
- To suggest legitimate training package on developing online assessment skills for further adoption.

Hypotheses:

- There is no significant difference between pre-test mean scores of control and experimental group teachers in using training courselets for developing online assessment skills.
- There is significant difference between post-test mean scores of control and experimental group teachers in using training courselets for developing online assessment skills.
- There is no significant difference between post-test mean scores of male and female teachers in experimental group teachers in using training courselets for developing online assessment skills.
- There is no significant difference between post-test mean scores of teachers of rural schools and teachers of urban schools in experimental group teachers using training courselets for developing online assessment skills.
- There is no significant difference between post-test mean scores of experimental group teachers in using training courselets for developing online assessment skills with regard to years of experience.
- There is no significant difference between post-test mean scores of teachers from primary schools and teachers from upper primary schools of experimental group in using training courselets in developing online assessment skills.

Research Design

The investigator has adopted a parallel group experimental design method.

Population & Sample of the study

In this study the population was the primary and upper primary teachers handling various subjects in Salem Educational District. The sample consisted of 80 upper primary school teachers, divided in to two groups as control group (40 teachers) and experimental group (40 teachers). In control group includes 21 female teachers and 19 male teachers and experimental group consists of 21 female teachers and 19 male teachers from various blocks of Salem district. Purposive sampling technique has been adopted for both quantitative and qualitative analysis.

Tools used for the study:

The tools are used in the prsent study included:

(i) An achievement questionnaire;
(ii) Observation schedule

Statistical Techniques to be used

Descriptive as well as inferential statistics has been used in data analysis. Under descriptive statistics Mean and S.D are used and inferential statistics t- test were used to analysis the data of the study.

Analysis and Interpretation of the Data

Hypothesis testing:

Hypothesis testing is an act in statistics whereby an analyst tests an assumption regarding a population parameter. The methodology employed by the analyst depends on the nature of the data used

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and the reason for the analysis. Hypothesis testing is used to assess the plausibility of a hypothesis by using sample data. Such data may come from a larger population, or from a data-generating process. The word "population" will be used for both of these cases in the following descriptions.

In hypothesis testing, an analyst tests a statistical sample, with the goal of providing evidence on the plausibility of the null hypothesis. Statistical analysts test a hypothesis by measuring and examining a random sample of the population being analyzed. All analysts use a random population sample to test two different hypotheses: the null hypothesis and the alternative hypothesis.

Hypotheses 1:

There is no significant difference between pre-test mean scores of control and experimental group teachers in using training courselets for developing online assessment skills.

Table 4.2 show the comparison of mean and standard deviation of the teachers in control and experimental group in pre-test

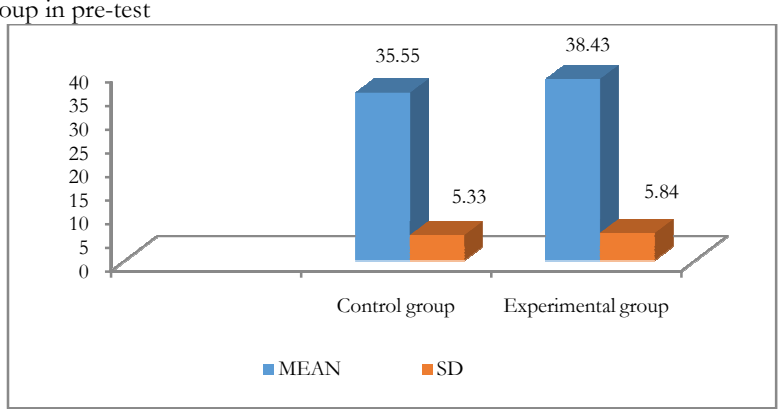
Group	N	Mean	SD	Calculated t value
Control group	40	35.55	5.33	0.59*
Experimental group	40	38.43	5.84	

*at the 0.01 level of significance

Findings

The table 4.2 shows the pre-test scores of control and experimental group using training courselets in developing online assessment skills. The calculated't' value is lower than the table value at 0.01 level of significance. So the hypotheses "There is no significant difference between pre-test mean scores of control and experimental group teachers in using training courselets for developing online assessment skills" is accepted. It is interpreted that the skill of teachers in using online assessment tools from control group and experimental group are same. The level of mean scores indicated that skill of using online assessment tools in academic practices among the teachers is low.

Figure 4.2 show the comparison of mean and standard deviation of the teachers in control and experimental group in pre-test



Hypotheses 2:

There is significant difference between post-test mean scores of control and experimental group teachers in using training courselets for developing online assessment skills. Table 4.3 show the comparison of mean and standard deviation of the teachers in control and experimental group in post-test

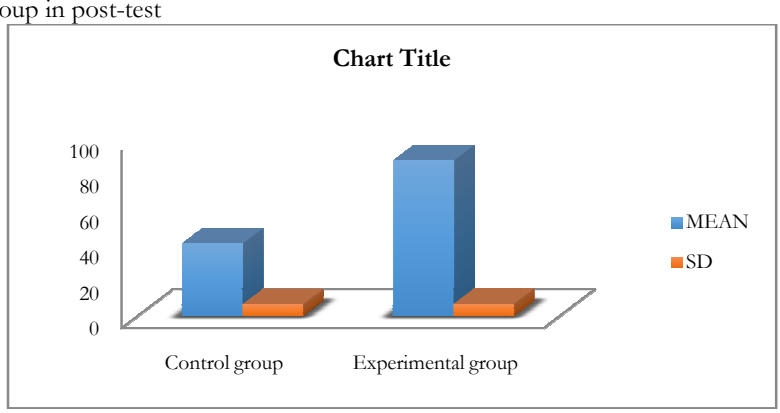
Group	N	Mean	SD	Calculated t value
Control group	40	41.32	6.88	2.89*
Experimental group	40	88.25	7.11	

*at the 0.05 level of significance

Findings

The table 4.3 shows the post-test scores of control and experimental group using training courselets in developing online assessment skills. The calculated't' value is lower than the table value at 0.05 level of significance. So the hypotheses "There is significant difference between post-test mean scores of control and experimental group teachers in using training courselets for developing online assessment skills." is accepted. It is interpreted that the skill of using online assessment tools by the teachers from control group and experimental group are significantly differed. The level of mean scores indicated that skill of using online assessment tools in academic practices among the teachers of experimental group is higher than the control group.

Figure 4.3 show the comparison of mean and standard deviation of the teachers in control and experimental group in post-test



Conclusion

The integration of ICT in classroom is getting more important as it help student in enhancing their collaborative learning skills as well as developing transversal skills that stimulates social skills, problem solving, self-reliance, responsibility and the capacity for reflection and initiative. To train the teachers, the training courselets are novel idea to be tested through present study. This chapter deals the pivot theme of the research, statement of the problem, objectives, research questions and limitations of the research. This will give the clear scheme of present research as the investigator envisioned.

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Developing Diksha's video embedded question (VEQ) framing skill among upper primary science teachers

Umamaheswari, M.
Lecturer, DIET, Namakkal, Namakkal District, Tamil Nadu

Introduction

We live in a world that values answers. We were taught in school to learn how to answer questions in exams, we were conditioned to go to work knowing that we need to have the answers and our society, by and large, focuses on finding the solutions rather than figuring out if we are asking the right questions .Questions and answers are by definition linked together but they are a very different skillset. Seeking answers is a process of elimination through research and experimentation, trying to piece together different information and narrow things down to a solution. But asking questions is a process of expansion through critical thinking and imagination. It is understandable why as a society we don't value the cost of asking the right questions because in some way the more questions we ask, the more work we need to do and the further away we are from finishing what we need to do. This creates a systemic problem that favours short term patches over long term solutions.

Questioning is a methodology that most teachers employ in most lessons, often as a means of recapitulating on previous lessons or as a means of gauging student understanding. Questioning skills are essential to good teaching. A question will normally begin with a brief amount of stimulus material. This may be in the form of a diagram, data or graph and videos. One of the commonly used questioning techniques is to employ the 5W and 1H questions: Who, What, Where, When, Why and How. While this questioning technique is useful to some extent, most of the 5W questions tend to be close ended and elicit factual responses. Although factual responses are necessary, as good teachers we need to promote higher level thinking skills as well. One way to address this would be to use Bloom's taxonomy of thinking skills as guidelines to ask questions and it includes remembering, understanding, applying, analysing, evaluating and creating.

Modern techno-rich education under DIKSHA has a dual role. On one hand, it develops skills and knowledge of its participants in general and students in particular. On the other hand, it encourages or stimulates technology. DIKSHA - National Digital Infrastructure for Teachers is also available in the form of mobile app. It is loaded with lesson plans, worksheets, videos and activities, to create enjoyable classroom experiences. For teachers the portal enables the teachers to strengthen their proficiency in teaching. This platform strengthens the hands of 'Our Teachers Our Heroes'.

For the upper primary classes, nearly 91 content enrich videos were in DIKSHAportal in biological science and which clearly explain the content in clear and catchy way. The teacher's review indicates that the teacher has knowledge of using DIKSHA portals in teaching and learning process. But the question was how effective the portals were utilized in teaching learning process. It makes an idea for the investigator to frame a title of research that, how far the videos help in teaching process as well as in understanding of concept among students (learning process). Questioning incorporating with DIKSHAportal videos help teachers to ensure that whether their students are attentive, engaged, in addition it helps to assess students' understanding too. For this, the skill of teachers on questioning is to be strengthened. So, that the researcher has chosen this topic and conduct an action research on it , in order to enhance the teachers question framing skill based on videos in DIKSHA app.

Need for the study

Biology, being a life science, differs significantly from the formal science (like mathematics and logic) in understanding the living organisms in their natural forms rather than through logical reasoning. A visual presentation is more often necessary to have a complete understanding of nature. Visual presentations can be in different ways such as a real life specimen, photographs and diagrams, videos etc. To develop a good knowledge of content in any topic, videos play a vital role on that. Questions help students to assess the ability to interpret concepts and provide depth in knowledge.

In order to assess the abilities and skills, types of question is necessary. To strengthen and assessing the understanding level of students, video embedded questioning in DIKSHAportal assist a lot. So the need of training upon such questioning skill incorporating with DIKSHA videos for teachers is necessary.

Objectives

1. To strengthen the skill of teachers in framing MCQ questions on biological science.
2. To develop the video embedded MCQ question framing skill of teachers.
3. To foster the teachers to be more proficiency in using DIKSHA portal videos.

4. To train the teachers to prepare the students to meet competitive exams such as NAS,NMMS.

Intervention Process

Sample: 15 Science handling upper primary teachers of Pudhuchathram block of Namakkal District was selected as a sample for this action research.

Tool:

- Self - structured questionnaire was prepared and used as a tool for this action research.
- Q - To test the video embedded questioning skill of teachers.
- Q1 -To test the knowledge of teachers on availability of science content in DIKSHA portal and questioning techniques.

Tool description & implement procedure:

- Questionnaire (Q1): comprises the prevalence status of DIKSHA portal bio-content videos of upper primary level and the questioning techniques.
- Teacher's knowledge on availability of science content videos in DIKSHA's portal was assessed by using questionnaire Q1. Teacher's responses in this tool without intervention were considered as before treatment score.
- Later, training was given to the selected sample teachers as an action research treatment.
- Teacher's responses in this (Q1) tool after intervention were considered as after treatment score.
- The obtained data in the before treatment and after treatment was tabulated in Table : 1
- Question Paper (Q): In addition, to test the multiple choice question framing skill of teachers, investigator asked the teachers to frame 5 questions based on KUAAS (Knowledge, Understanding, Application, Analysis, Synthesis) according to their desired science content area. Each question carries 5 marks and the sum total was 25. The obtained results were tabulated in the Table 2.

Methodology

- A Tool was prepared to assess the prior knowledge of teachers in using DIKSHA portal videos, and video embedded questioning techniques.
- Before treatment, the prepared questionnaire was used to assess the knowledge of teachers in DIKSHA's videos and on VEQ. Video embedded multiple choice question framing training was given to the teachers to develop video based questioning skill in upper primary bio-science content. After training, the impact of training was evaluated by an after treatment procedure of same constructed tool.
- Training module on framing video embedded questions (VEQ) was prepared and supplied to the teachers during training session for further better enhancement of training programme. The prepared module would guide the teachers as a source of reference in future teaching - learning need.
- From the obtained data, the mean score of before treatment and after treatment was calculated.

Instructional strategies

In order to develop the video embedded question framing skill among teachers, the investigator designed a training programme on framing video embedded questions in biological science subject using Diksha's portal and it was given to the upper primary science teachers of Pudhuchathram block in Namakkal district. Block Resource Centre, Pudhuchathram was selected as a training spot for comfortable accessibility of teachers.

During training, a detailed information on the importance of questioning skill for teachers, value of asking questions, Bloom's question starters , effective questioning techniques, question types, question matrix grid was explained and being considered as paramount for this training. The investigator allotted biological science content topics from Term 1 to Term 3 of class six to eight for each and every teacher and insisted them to go through the allotted content in DIKSHA portal videos in their mobile clearly. After viewing of content videos, the teachers were asked to frame video based questions which was trained in sessions earlier. The questions were presented, discussed and evaluated. A training follow up was carried over for week of time and the teachers were asked to post their framed questions in Science what's app group.

The framed question of teachers was reviewed by the investigator for further quality and the flawed questions were modified for better classroom operation. Subsequently, the trained teachers posted some of the questions in plant reproduction lesson to their students to assess their understanding on this lesson in DIKSHA's videos through what's app learning. In addition, the teachers were asked to upload their framed questions as a digital resource in TNTP by using their EMIS number for further teacher network usage.

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Data analysis and evaluation

The investigator insisted the teachers to open DIKSHA'S portal biological science content videos in their mobile. The biological science content of class six to eight of Term 1, 2 and 3 were separated and subjected to all the participants of training. The investigator gave training on questioning techniques earlier and later it was gradually incorporated with DIKSHA'S portal biological science content videos. The teachers were instructed to frame questions as per the Bloom's question starters, so that only variety of questions may arrive at almost all level. Hence, the teachers acquired a skill of questioning and at the same time they received thorough information about the status of uploaded biological science content videos in DIKSHA portal. During training, needful stationery material were dispensed to the participants for their convenience and was instructed as, that every one of the participant group is held responsible and accountable for participating.

A module on VEQ was supplied to the teachers as a supplementary resource for further reference. The purpose of this training was to help the teachers to assess their student's level of understanding when they exposed to DIKSHA portal content videos during teaching- learning process. Hence, to ensure that whether the students are attentive, engaged, and to assess students' understanding, questioning is necessary.For this, the training on the skill of teachers on video embedded questioning was planned and executed.

Interpretation of data

Table 1

Showing the teachers obtained average scores of before and after treatment in Q

Before treatment	After treatment
39.46	64.53

From the Table: 1, the before treatment total score was 592 and the mean was 39.46% which reveals that the teachers were not proficient in video embedded questioning and they were not well known about the availability of DIKSHA portal science videos. After treatment, total score was 968 and the mean was 64.53% which reveals that there is improvement in framing video embedded questions. The difference between the total score was 376. Through this training, the obtained gain mean score was 25.07. In addition, the teachers used their VEQ in their regular what's app group teaching and drawn their students feedback.

Fig. 1 Showing the teachers obtained average scores of before and after treatment in Q

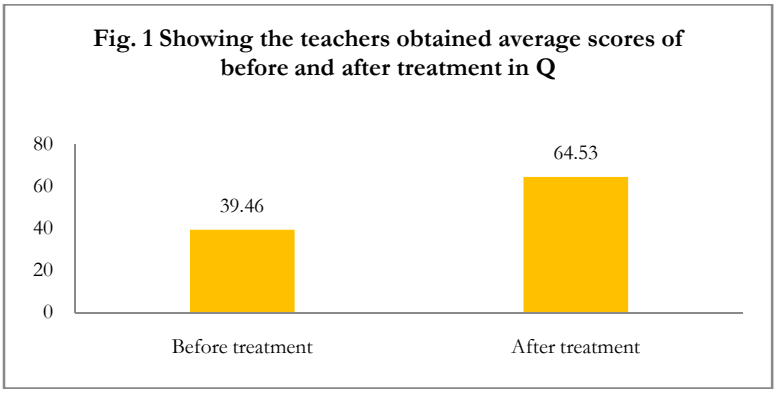

Table 2

Showing the teachers obtained average scores of before and after treatment in Q1

Before treatment	After treatment
34.64	74.4

From the Table: 2, the before treatment total score was 520 and the percentage of mean was 34.64 % which reveals that the teachers were not proficient in video embedded question framing skill and they were not well known about the various sort of questions. After treatment, total score was 1116 and the percentage of mean was 74.4% which reveals that there is improvement in framing video embedded questions among teachers. The difference between the total score was 596. Through this training, the obtained gain mean score was 39.76%.

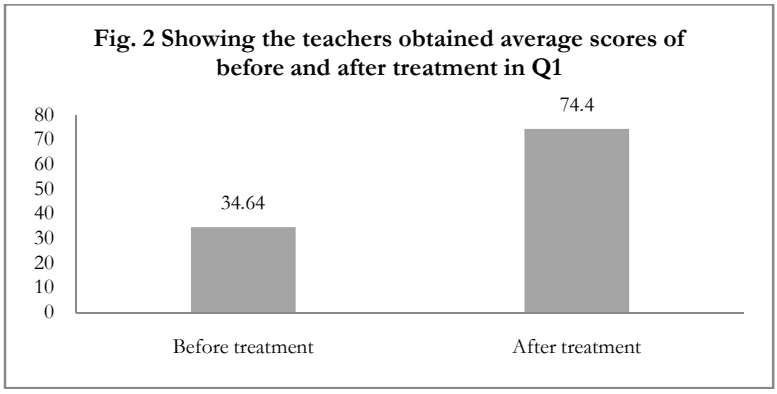

Fig. 2 Showing the teachers obtained average scores of before and after treatment in Q1

Table 3

Showing pre-test and post-test obtained scores of students.

Pre-test	Post-test
53.33	90.66

From the Table: 3, the student responses upon teachers VEQ pre-test mean score was 5.33 and the post-test mean score was 9.06. This shows there is an improvement in post –test. The obtained gain score was 3.73. Hence, the video embedded question strengthens students understanding and enhances deeper learning.

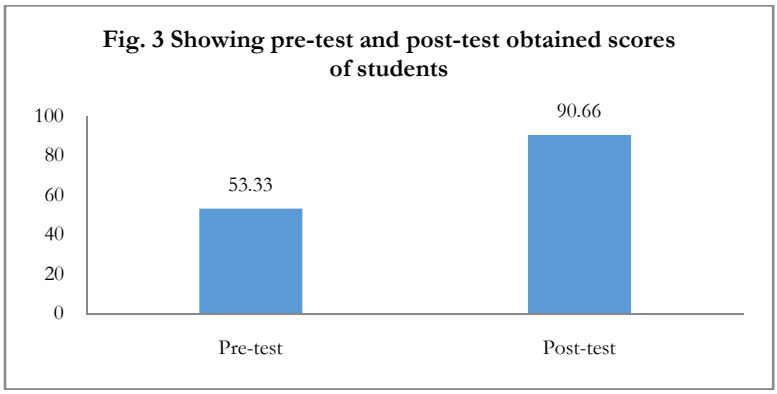

Fig. 3 Showing pre-test and post-test obtained scores of students

Table 4

Gain Scores	Q	Q1	SR
	39.76	25.07	37.33

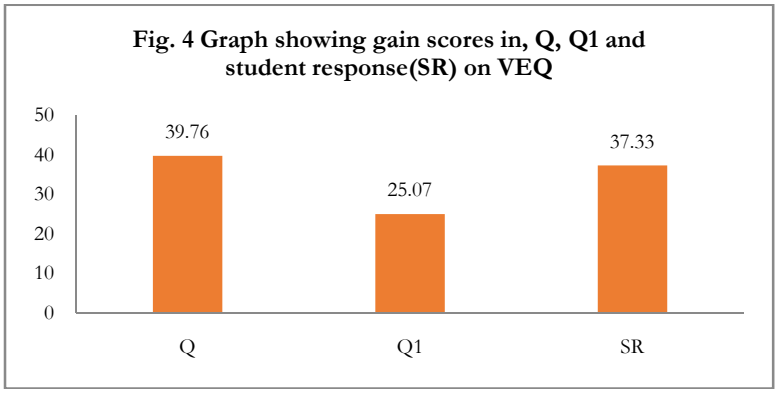

Fig. 4 Graph showing gain scores in, Q, Q1 and student response(SR) on VEQ

Findings

The mean percentage of teacher responses in Q1 before treatment was 39.46 and after treatment was 64.53.From the teachers responses (Q) of before treatment, the mean percentage was 34.64 and the questions seems only knowledge type, whereas, the mean percentage was 74.4 in after treatment (Q) and it was identified that their questions ranges from lower order to higher order thinking levels i.e., knowledge, understanding, application and analysis type. From the students score responses (obtained through what's

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app, due to corona lockdown period) the pre-test mean percentage was 53.33 and the mean percentage of post-test was 90.66. Finally, it was concluded that the video embedded questions uplifts their student understanding. Hence, it was sum up that; Diksha's VEQ enhances teaching and learning process.
The teachers reported that this VEQ development enhanced their teaching and helps them to identify the understanding level of students in a particular concept.

Conclusion

The video embedded question (VEQ) framing skill training helps teachers to frame questions based on videos and guide them to create a more engaging sensory experience for their students than using print materials alone. It provide a go-to resource that can be watched from anywhere with a Diksha app installation. VEQ strategy helps teachers in teaching and to increase knowledge, retention among students, checks their students understanding, encourages independent and critical thinking of pupil, reduces students mind wandering, identifies students fault understanding over concept. This action research helps the teachers to frame questions in the basis of knowledge, understanding, application, analysis etc. In addition, this action research indirectly helps to gauge their learner's progress where they are stronger and where they need support. VEQ assists teachers to be more proficiency in their subject.

Implications

- VEQ intensifies thinking levels of the teachers and students.
- It enriches teachers to be more proficient in their subject.
- It paves way to deeper understanding on concept.
- It draws the skill of framing variety of questions even from a single video.
- It stimulates creative and critical thoughts of teachers and active learning of students.
- It helps to assess students understanding level.

Improving the problem-solving skills in word problem through model diagram representation

Iyappan, D.
Lecturer in Mathematics, District Institute of Education and Training, Ranipet District, Tamil Nadu

Introduction

Problem solving requires creativity, intuition, knowledge, and skill. It also requires much more practice in solving word problems in mathematics. We want you to get a workout every day that strengthens your problem-solving ability in topics ranging from logic to algebra to some beautiful geometry. In general, problem-solving is one of the important strategies for solving word problem and each and every student has to aware of steps involved in problem solving and adopt the same to solve it.
In the classroom transaction, the Researcher observed that Diploma in Elementary Education (D.El.Ed), first year students were performed poor in solving word problem. The performance of first year students of D. El. Ed, DIET, Ranipet in the word problem solving skill was addressed in the Pretest conducted by Researcher, it leads the Researcher to peep into the problem-solving Strategies adopted among the D.El.Ed., first year students.

The Researcher observed and found that more than 60% of students were:

- Not able to understand all the words used in stating the problem
- Not able to think of a picture or diagram that might help you understand the problem
- Not able to identify appropriate problem-solving strategies can be used to solve the problem
- Not able to solve the problem
- Not able to verify that answer was correct for the question that was asked

Operational definition of key words

- **Problem Solving** refers to Studying the problem, translating into a mathematical statement, Answering the problem and Reviewing the solution. We call it as 'STAR' Technique in mathematics.
- **Word Problem**refers to a real-life problem consists of the numbers and situation. It differs from ordinary problem in mathematics.
- **Model DiagramRepresentation** refers to draw a diagram (Call it as 'Model Diagram')which is a useful problem-solving heuristic that can be translating the word problem into a diagram or representation that is easier to exploit for solving the problem.

Objectives of the study

Students able to

- To understand all the words used in stating the problem.
- To think of a picture or diagram that help him to understand the problem in better manner.
- To recognize that the given information is enough or not.
- To identify appropriate Problem-solving strategies can be used to solve the problem especially Model Diagram Representation.
- To verify that answer was correct for the question that was asked.

Hypothesis

- There is a difference between the pre-test and post-test average score in solving word problem by using Model Diagram Representation.

Delimitations of the study

- 35 first year D.El. Ed students from DIET, Ranipet, Vellore District, Tamil Nadu.

Research Design

Quantitative and experimental research approach has been used in this research. The written task on word problem solving was noted. In the pretest tool, the investigator identified 10 different kinds of word problems in day today life situations which is solved by Diagrammatical and brought out 10-word problems and short out. On the basis of the issues find in the pre-test, the investigator prepared worksheets sheets and utilized them properly in the classroom. Posttest tool was prepared with the same

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type of word problem with same objectives of pretest. As this research was importing the problem-solving skill in day today problem and helpful to aware of such strategies and used into other contextual problems.

Methodology Adaptation:

The following activities given by the Researcher in the classroom:

Activity 1: Basic Operation Skills were ensured by the Researcher through various problem and also ensured that the understanding of alternative terms used for addition, subtraction, multiplication and division like eliminating, joining, removing.

Activity 2: The Teacher prepared 5 cards with different set of problems like ordinary problem and also word problem and placed the card in an assorted manner on the table and instructed the students to take a card. The teacher asked the students to differentiate the problems having the cards with word problem and ordinary problems and also students were practiced to form word problem.

For Example,

Ordinary Problem: Add 5 and 6

Word Problem: Raju has 5 apples. Madan gave 6 apples to Raju then how many apples Raju should have?

Activity 3: Recognition of Steps in Problem solving

Placed the card with different steps involved in problem solving before the students and instructed them to take a card and arranged sequentially.

Activity 4: Investigator discussed briefly about how to solve the given word problem by using 'Model Drawing Approach or Symbolic approach'.

Modeling and analysis

There are many problem-solving strategies helping us to solve word problem easily and quickly. In this point of view, the following important strategies explained by the Researcher in the classroom.

1. Draw a Picture / Draw Table
2. Look for a at the Pattern
3. Guess and Check
4. Systematic Listing
5. Work Backward
6. Logical Reasoning

Model Drawing Approach

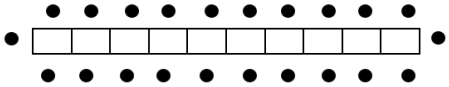
From the above strategies, the investigator decided to select one of the crucial strategies "Draw a picture" or "Draw a Model" or "Model Drawing" for his study. This Drawing help the students convert the information provided in the problem into concrete visual images. It enables the students to comprehend and convert into relevant mathematical structures. These mathematical structures consist of diagrammatic representation and mathematical manipulation of equations.

The students were asked to solve the problem in which a partial diagram was provided or explicitly asked to draw a diagram. Moreover, we find that students who drew a productive diagram performed better than those who did not draw a productive diagram even if they primarily used a mathematical approach. It is also called Model Drawing Approach.

Model Drawing Approach or Symbolic approach: Here the researcherdiscussed two sample test items with required Model Drawing Approachexpected answers from the students.

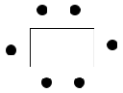
Test Item 1: In a hotel, arranged the dining tables in rectangles with sitting capacity 6 persons (See in the figure). If a family with 22 persons want to sit and eat with a table then how many dining tables are required to arranged this?

Answer:

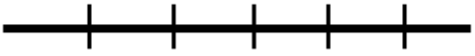


Test Item 2: Anbarasan wants to get 6 pieces from a thread. How many cuts he will do it?

Answer:

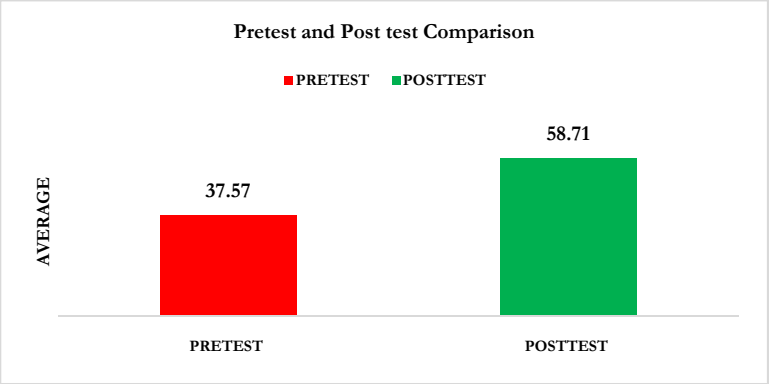


Activity 5: Students were practiced through worksheets using the strategies.



Results and discussion

a) Students Performance in before and after intervention



The Diploma in Elementary Education first year students' performance in Pre-test and Post-test average score are 37.57 and 58.71.It shows that there is a difference between Pretest and Posttest score (21.14).

b) Pretest and Posttest Item wise Average Score Analysis

Item No	1	2	3	4	5	6	7	8	9	10
pre-test average	86	38	50	68	20	14	31	12	30	24
Post-test average	90	33	94	46	40	70	23	100	58	33

Based on the above item analysis, the questions in the pretest 5, 6, 8, 9 and 10 (Distance Problem, Sharing Problem, Hand shaking problem, Venn diagram problem, Height based problem) were found to be difficult by the students. More focus was given to read the word problem, recognize the key words in the problem, find the adequate information provided or not, find the appropriate strategies help us to solve word problem, and also it can be used consistently used or not. After that treatment, there is an improvement which is shown in the table.

Conclusion

From the analysis, the Average Score of Pre-test and Post-test average score in problem solving skills is 37.57 and 58.71. There is difference between the Average Score of Pre-test and Post-test score (21.14) by Diagrammatic Approach. Some Students faced some difficulties in solving word problems by Diagrammatic Approach. The students involved in this study having awareness about various approaches by diagrammatically and adopted it. The D.El.Ed Students were explored and practiced various types of problem solving strategies in the practicing sessions and also developed the problem solving skill in solving word problem through other strategies.

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Enhancing the awareness on digital assessment among upper primary teachers

Kumar, C.
Lecturer, DIET, Ranipet

Introduction

The development of the Digital Learning Framework will provide clarity for teachers in terms of how they can effectively embed digital technologies into their practice. It will also guide school teachers and education providers in creating a shared vision for how technology can best meet the needs of all learners. A working group, representative of the Department and its inspectorate and its support service (Professional Development Service for Teachers), will establish for these purposes and will support by 1external expertise. This new Framework provides a common reference with descriptors of digital competence for teachers and school teachers promoting innovative pedagogical approaches which embed the use of digital technologies. The developed Framework holds that improving the quality of students' learning should be the main driver of teacher learning. Underpinned by constructivist principles, the Framework will support high-quality education mediated by digital technologies promoting active learner participation and engagement in a wide range of learning activities.

Experience a digitally based assessment by watching the tutorials that are given to students before taking an assessment. In addition, view the sample questions and student responses from previous assessments, explore interactive tasks, and download the survey questionnaires that are given to participants of student's assessments. The 2021-2022 academic year special year because Covid -19 after school completely school closed. Our Tamil Nadu Government takes necessary action to be taken for education. All the government schools standards and all subjects Tamil Medium and English Medium Text lesson Converted Video Lesson. Lesson telecast Kalvi Television and some other channels. Local Administration officers and School Heads created Whatsapp groups class-wise. Almost the K.V Kuppam block Primary and Upper Primary Schools Headmaster and Class teacher created the class-wise WhatsApp group. A class teacher instructed them through WhatsApp group text or voice message classwork and tests based on the Kalvi TV. The class teacher and subject teachers are to see the JPG image only. After Training the teachers can how to make digital assessments and corrections on JPG images.

Need and signification of the study

During covid 19 schools were not open. The teaching-learning process is not done in the classroom. Digital teaching is going on nowadays at the same time digital classwork as well as homework going on. But all the activities are one-way communication. After sending the classwork and home students may do any mistakes and how to correct carry class work and home students may be done any mistake and how to correctly carry out the teachers.

Statement of the problem

Enhancing the awareness of digital assessment among upper primary Teachers

Objectives of the study

Teachers able

- To Know the digital assessment tool in WhatsApp
- To Practice evaluating for assignment
- To aware the of various apps likes, Hot Potato backpack app, class flow app, go class apps

Hypotheses of the study

- There is a significant difference between Pre and Post-test performance related to digital assessment.
- There is no significant difference between Genders in digital assessment.

Research Methodology:

Stage 1: Tool Preparation
Stage 2: Pre Test
Stage 3: Assessment training
Stage 3.1: Digitalized Correction Homework & Classwork
Stage 4: Post Test
Stage 5: Comparison of pre-test and post-test

Research design
Method: Questioner schedule
Sample: 12 PUMS and 1 ADW Schools (6-8) Class handling 34 Teachers and 13 HM Also
Tool: Questionnaire
Analysis: Mean. t-test

Limitation of the problem

Panchyat Union Middle schools and ADW Schools K V Kuppam block Upper primary handling teachers Whats app (Document correction, save Correction Documents Forward or share the documents, and File Mange.

Research Methodology
Tool Preparation

A one-day workshop was organized which a rating scale with a 4 point scale was prepared. The ratings were from 1. Yes, 2. Sometimes 3.No in a Linker scale. Questionnaire schedule for Digital assessment based WhatsApp related, 20 multiple choice Question Questionnaire schedule prepared.
The statements were prepared in bilingual namely Tamil for the benefit of the user. The tool meant for the teachers also enquired the details of digital assessment about the teachers. Questionnaire schedule attached annexure).

Pre Test

Vellore District K.V.Kuppam Block PUM Schools Heads and B.T Asst Teachers Involved in the pre-test program conducted

Assessment Training

The training was attended by 34 graduate teachers and 13 headteachers from a middle school in KV Kuppam Union. The training started at 10 am and the first complete explanation about the Digital assistants like aware of various apps likes, Hot Potato backpack app, class flow app, go class apps was given. Due to the acquisition of covid-19, the Government of Tamil Nadu has made a huge revolution in the field of education and is currently broadcasting class-wise and syllabus programs on Kalvi TV to enable all students to study at home.
Kalvi Tholaikachi channel is a way for learning to find out how students understand the concepts of the subject. Class-wise WhatsApp groups were set up to track students' learning status. When parents of students come home in the evening or morning, parents hand over the cell phone to the children and find out the Homework and classwork assigned by the teacher. The one-day training was given day on how to properly evaluate and validate sent course ideas.

Digitalized Correction Homework & Classwork

The training was given on how to correct after the lunch break. First, the students were photographed from the textbook, and then the teachers were trained on how to correct it.
First, select the photo (JPG) sent by the students in the gallery
Edit will continue
Touch the doodle and then the pencil. Tick if it is correct and circle it if it is incorrect and then type or write the correct words accordingly, then save it and forward it to WhatsApp to the saved students. Thus trained to try again and again. The doubts of the teachers were clearly explained. Thus the correction thus obtained from the students should be done and sent. Students are allowed to correct learning and teaching mistakes thus improving the academic performance of the students.
Select image Edit Mark up Select Pencil Tick mark save sent

Pretest and post-test performance
Pre-test and post-test average score analysis

Test	Average
Pre-test	52.56
Pos-test	89.07

Pre-test and Post-test Pre-test and Post-test average scores are 52.56 and 89.07. There is a difference between Pretest and Posttest scores (37).

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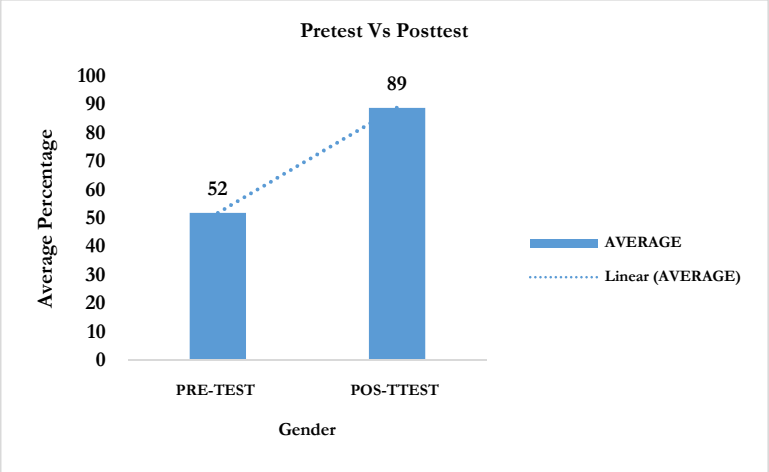

Results

The following results are arrived based on the analysis:

- The Average Score of pre-test and post-test performance in Knowing the digital assessment tool in WhatsApp is 52 and 89. There is a difference between the Average score of pre-test and post-test performance (37) in Knowing the digital assessment tool in WhatsApp.
- Male and females differed only 0.84%in pre-test average score Knowing the digital assessment tool in WhatsApp.
- Male and females differed only 1.2%in post-test average score Knowing the digital assessment tool in WhatsApp.
- Most of the teachers welcomed that it was an essential area for us to assess the students' performance digitally.
- Before the intervention, the investigator found that most of the teachers were aware of the digital assessment but not up to our expected level.
- The teachers were participated in learning digital assessment through WhatsApp.

Implications

This Research has motivated the teachers to aware of the availability of digital assessment and utilize and use those tools for assessing students' performance regularly in the covid period. The teachers were participated and boosted their performance through the training session conducted by us and also the teachers assessed the digital contents lively and they became very happy to practice and come over the issues in the digital assessment.

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Enhancing the basic math skills through hybrid pedagogy among foundational stage children in Madurai district

Packiam, D.
Lecturer, District Institute of Education, T.Kallupatti, Madurai, TamilNadu

Maruthavanan, M.
Assistant Professor, Thiagaraja College of Preceptors, Madurai, TamilNadu

Arthy, R.
Assistant Professor, Thiagaraja College of Preceptors, Madurai, TamilNadu

Introduction

Quality primary education not only increases the progress and achievement of children in schools, it also lays the foundation for future growth, learning and development, and develops positive attitudes and the desire to learn. Therefore, it becomes imperative to provide quality primary school experiences to children. Children's interests, physical skills, linguistic capacity, and ability for abstract thinking and generalization develop over the span of schooling, from the pre-school period through higher secondary school. This is a period of intensive growth and development, and also of fundamental shifts and changes in interests and capabilities. Children entering school for the first time have already begun constructing knowledge of the world.

The new school structure by NEP 2020 includes the newly added *Foundational Stage* for the first five years of the school life i.e. ages three to five years. This subsumes the first two years of the erstwhile primary stage. Therefore, the Foundational Stage comprises of three years of pre-primary (Nursery, KG and Upper KG) and two years of primary (Classes I & II). This provision aims to curb the detrimental trend of the downward extension of primary curriculum to pre-primary classes that was resulting in over-load of teaching-learning content causing extreme stress and overwork to the early learners who were expected to master reading, writing, and numbers operations at pre-primary stage. At the early stage of learning, from pre-school to the primary school years, an important place must be given to language and mathematics in all activities across the curriculum. The early childhood stage, until the age of 6–8 years, is the most critical period when the foundations are laid for life-long development and the realization of full potential; research shows that there are 'critical periods' at this stage for full development of the brain's potentialNCF 2005).

Rationale of the study

The National Curriculum Framework (NCF2005) describes that, majority of children have sense of fear and failure regarding Mathematics. Mathematical learning opportunities are needed which are challenging, appropriate and adaptive to the heterogeneous needs of young children. Hybrid learning is a way of combining transitional classroom experiences, experiential learning objectives, and digital course delivery that emphasizes using the best option for each learning objective. The Pandemic poses an excellent opportunity to change the way we teach Mathematics in schools. Because of the pandemic Education has had to migrate to the online environment. This change has impacted not only schools and their faculty but also families by allowing parents to be more involved with their children's education. The investigator is carefully watching the teachers' digital and video lessons of Mathematics sending to students through online and also the students' mathematics assignment submitting process. Teachers are facing so many problems to prepare the maths activities for online teaching and students are facing problems to learn Mathematics through online. As a teacher educator, I am giving suggestion to improve the online activities and face to face acitvities. Most of the poor children have no facility to attend the online classes. In the pandemic context, we are in need to enhance the children's basic math skills through Hybrid Pedagogy. It is with such considerations the present study has been undertaken.

What do previous studies say?

De Jong et al. (2017) found that: "PBL in a blended learning format is perceived to be an effective and feasible educational strategy. The four key learning principles of PBL (stimulating constructive, self-directed, collaborative, and contextual) can also be unified in PBL with a blended learning format, although the extent to which each principle can be implemented can differ depending on the structure of the educational program and the student population. Educators should carefully consider the role of distance learning in PBL education and consider several factors, including, "getting-to know-

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activities at the start of education", "lectures that are suitable for distance learning purposes", "guidelines for behaviour in online sessions", and "the importance of visibility and feedback during education"

Liming zhang & JuanliJiao (2013) conducted a study on "A study on effective hybrid math teaching strategies". During the computer supported hybrid teaching, teachers face a big challenge to find the suitable teaching strategies for a specific content. In this study, three experiments were conducted to explore the different math teaching strategies for different contents and different characteristics of the students in hybrid learning environment. The results indicated that traditional teaching was more suitable for the algebra related topics. Computer supported hybrid teaching was more effective for the graph related topics. Towards different students' characteristics, medium and low performance students benefited more from the computer supported hybrid teaching. The traditional teaching was more suitable for the high performance students. The student-centred hybrid learning requested significant more teaching hours to facilitate effective learning results.

Hybrid pedagogy

The need of the hour is to build a learner centric hybrid pedagogy. With the changes brought about by the pandemic and the launch of the National Educational Policy 2020, the teaching landscape in India is at the cusp of a change. Blended learning describes a process or practice; hybrid pedagogy is a methodological approach that helps define a series of varied processes and practices. (Blended learning is tactical, whereas hybrid pedagogy is strategic.)So, besides the computer supported learning environments, hybrid pedagogy emphasises the effective combination of different modes of delivery, models of teaching and styles of learning. In particular, hybrid spaces in primary school classrooms offer opportunities for encouraging interactivity, deeper student engagement and emphasis on student-centered learning.

Objectives

- To identify the level of basic math skills through Hybrid pedagogy among foundational stage children.
- To evolve the Hybrid pedagogy in enhancing the learning outcomes of basic math skills among foundational stage children.
- To implement the Hybrid play-pedagogy in enhancing the learning outcomes of basic math skills among foundational stage children
- To find out the significant difference between the mean scores of pre-test, progressive test1,progressive test 2 and post-test in basic math skills among foundational stage children
- To find out the significant difference between the mean scores of pre-test, progressive test1, progressive test 2 and post-test in basic math skills among foundational stage children
- To find out the significant correlation between the mean scores of pre-test, progressive test and post-test in basic math skills through Hybrid pedagogy among foundational stage children.

Research Questions

1. Which factor can best predict the basic math skills of foundational children?
2. Is there any relationship between hybrid pedagogy and foundational stage children's achievement in basic skills?
3. How can I help these children to improve their basic math skills?

Methodology of the study

Experimental Method adopted in this study. The investigator constructed a questionnaires. One for pre-test, and other one for post-test. The mean and standard deviation for the entire sample computed. F-test and the test of significance ('t'- test) used. Population consists of foundational stage children studying primary school in Madurai District. The sample will be selected from II std foundational stage children from Primary schools in Madurai District. Hybrid Pedagogy, is about the intersections of :Physical Learning space/Virtual Learning Space, Academic Space/Extra academic Space, On ground classroom/online classrooms, Permanent Faculty/Contingent Faculty, Institutional Education/Informal

Education, Analogue Pedagogy/Digital Pedagogy, Use of Tools/critical engagement with tools and Machine -like interaction/Human Interaction, Passive Learning/Experiential Learning.

Findings of the study

- The level of Foundational Stage children's Basic Math skill is in average (90%) after the intervention given through Hybrid Pedagogy
- From the findings, that there is a significant relationship between the mean scores of pre-test and mean scores of progressive test 1 . The Comparison of Pre -test Mean scores(5.17) and Progressive test 1 Mean scores(6.13) show that the obtained 't' value (4.397) is greater than the table value 2.756 at 0.01 level. Hence, statistically there is a significant difference between pre-test and progressive test 1 mean scores of the foundational stage children's basic math skills
- From the findings that there is a significant relationship between the mean scores of progressive test 1 and mean scores of progressive test2. The Comparison of progressive test 1 Mean scores(6.13) and Progressive test 2 Mean scores(6.50) show that the obtained 't' value (1.072) is less than the table value 2.756 at 0.01 level. Hence, statistically there is no significant difference between progressive test 1 and progressive test 2 mean scores of the foundational stage children's basic math skills.
- From the findings that there is a significant relationship between the mean scores of progressive test 2 and mean scores of post-test . The Comparison of progressive test 2 Mean scores (6.5) and Post- test Mean scores (10.17) show that the obtained 't' value (1.000) is less than the table value 2.756 at 0.01 level. Hence, statistically there is no significant difference between progressive test 2 and post- test mean scores of the foundational stage children's basic math skills.
- From the following table that there is a significant relationship between the mean scores of pre-test and Post-test Mean scores in basic math skill. The Comparison of Pre -test Mean scores (5.17) and Post -test Mean scores (10.17) show that the obtained 't' value (5.426) is greater than the table value 2.756 at 0.01 level. Hence, there is a significant difference between pre-test and post test scores of the foundational stage children's basic math skill.

Test	N	M	S.D	"t"	LOS
Pre-test	30	5.17	0.379	5.426	Significant
Post-test	30	10.17	0.592		

- From the following figure shows that, the foundational children's basic math skills mean score 5.17 in pre-test,10.17 in post- test , so that gain score is 5.0. Gain score mean showed that the difference between pre and post- test of foundational children's basic math skills increased through the hybrid pedagogy intervention given by the investigator.

Educational implications

This study on enhancing the foundational stage children learning basic math skills thorough hybrid way during covid-19 outbreak. The results of the study enabled the teachers, students, parents and researcher to find out the challenges towards learning basic maths through Hybrid pedagogy. The main purpose of the study is to promote the love towards learning basic math through Hybrid pedagogy. Also, the teachers benefited and gathered the experience to implement the Hybrid pedagogy from this study.

Recommendations

The research study proved the effectiveness of Hybrid Pedagogy in enhancing the basic math skills of II std foundational stage children. Curricula of in-service teacher training program at primary level should include Hybrid pedagogy for teaching learning process. Such efforts will be helpful in snowballing awareness among teachers to use Hybrid pedagogy and kindle the foundational stage children to learn basic math skills in the pandemic context.. Educators can create new paths to learning standards by providing more learning options for children

Conclusion

Basic math skill must for all the human beings. That is why it is imperative to develop basic math skills to children. Drill work is not a corrective remedial measure to get arithmetic knowledge. Teachers may try various strategies and techniques to help their children get rid of the fear for learning mathematics and inculcate good basic math skills in them. . The findings of the study strengthen the case of those who advocate adopting the Hybrid Pedagogy in teaching basic math skills in schools. One of the most important objectives of school education i.e., basic math skills of primary school children can be realized by exposing the children to Hybrid Pedagogy because it is extremely helpful in enhancing basic math skills of primary children.

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Effect of counselling interventions in changing the sociopathic behaviour in offenders

Saranya T. Jaikumar
Educational Psychologist, Westminster Healthcare, Chennai, India
Member, State Commission for Protection of Child Rights, Tamilnadu

Balakrishnan Velaiah IPS
IG - Central Zone, Tamilnadu, India

Introduction

Incarceration in prison, fines, probation, and the death penalty are all possible penalties for committing a crime. The severity of the offence, the accused person's criminal history, the purpose, and the way in which it was committed are all factors that go into determining the punishment. Restitution, deterrence, retribution, rehabilitation, and incapacitation are some of the most common conceptions of punishment. At least one of these categories applies to all forms of punishment. In India, crimes are divided into two categories: grave and non-grave. Grave crimes are those that are either horrific in nature, such as murder, rape, robbery, and dacoity, or involve a significant amount of property, such as burglary and theft. POCSO cases have been added to the GC category in recent years (GC). Crimes are also classed at a higher degree based on the court's procedure. The nature of the offence in summons cases is minor, and the trial is short, whereas the nature of the offence in warrant cases is significant, and the punishment is over two years. In warrant cases, a lengthy trial procedure is used. Summons cases are usually compoundable with a fine, whereas warrant cases are not, due to the severity of the sentence. Deterrence, rehabilitation, incapacitation, retribution, and restitution are the five primary ideas of punishment used in criminal law.

When a judge imposes a specific sentence with the goal of deterring future criminal behaviour, this is known as deterrence. When the court uses general deterrence, it warns the public that they could face the same punishment as the criminal if they commit a crime. When the court prevents a particular defendant from committing another crime by threatening the same or worse punishment, this is known as specific deterrence. The court may determine that the offender has rehabilitation potential, which means that he or she has the ability to become a contributing member of society. Probation, educational and career-focused programmes, rehabilitative programmes, and counselling are the most typical forms of punishment for criminals who indicate rehabilitative potential. Rehabilitation reduces the number of people in jail and prison and reduces the likelihood of a repeat offence.

Incapacitation protects the public from the defendant and is achieved by house arrest, incarceration, or the death penalty. Retribution balances the scales of justice and is intended to punish the defendant in a way equal to the crime committed. The retribution theory of punishment is believed to increase victims' and society's confidence in the judicial system. The theory behind retribution is that the punishment should fit the crime and embraces the phrase "eye for an eye." For example, if a defendant is convicted of first-degree murder, the prosecution may seek the death penalty as punishment. Restitution is a form of punishment used to rectify (correct) an injury that the defendant inflicted on a victim. This form of punishment also penalizes the defendant financially. For example, a case may arise in which the defendant is prosecuted for vandalizing the victim's car. As part of the defendant's sentence, the court can order the defendant to financially pay for the damage caused to the victim's car.

Thus, there are four primary goals of the correctional system: deterrence, incapacitation, retribution and rehabilitation

Correctional Counseling by Psychologist

Correctional counsellors provide a variety of services to people who are currently incarcerated or on parole/probation for a crime. Correctional counselling research integrates mainstream criminal justice theories to the psychology of rehabilitation in the correctional setting. Correctional counseling's purpose is to lessen the likelihood of an ex-offender committing a crime after being incarcerated. In order to avoid repeating their actions, people must address the underlying factors that drive their criminal behaviour – such as greed, intoxication-induced stupefaction, addiction, and unemployment. Prison counseling's purpose is to help offenders comprehend how their actions broke social norms and expectations, as well as the amount of harm they cause themselves, their family members, and the victims' families. By helping criminals grasp these psychological and social concepts, corrections counsellors can help reduce the likelihood of repeat offenders breaking these standards and returning to prison.

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Throughout the course of the twentieth century, the philosophical basis of incarceration has evolved significantly and still growing. The two poles between which this ideological pendulum typically swings include retribution and rehabilitation through correctional counseling. For several decades in the mid-twentieth century, the notion of rehabilitative incarceration prevailed, and methods ranging from correctional counseling to vocational training were offered to prisoners in many correctional facilities.

The factors that lead people to engage in criminal activity, which are numerous, complicated, and varied, can be addressed through correctional therapy. Internal and external variables are the two basic categories in which these elements can be classified. Internal elements that influence crime have been intensively explored throughout the twentieth century. Life experiences, socioeconomic position, substance misuse, emotional instability, and inadequate coping mechanisms are all internal factors that might lead to suicide. Socioeconomic conditions, academic and vocational opportunities, a familial and/or community environment in which criminal activity is accepted and normalised, exposure to criminal activity and contact with criminals, and sociocultural marginalisation are some of the external factors that can precipitate crime. Situational circumstances are also included in this category, as they can have an impact on a person's proclivity to commit crime. Situational considerations, on the other hand, are generally thought to be less relevant than the other internal and external risk factors listed. Internal, environmental, and situational factors can all play a role in determining one's proclivity to engage in criminal action.

It's critical to choose criteria for evaluating the success of clinical interventions taken by correctional mental health specialists. It is clear that review can occur at both the individual and institutional levels. Mental health practitioners can assess an inmate's progress based on behavioural changes and a decrease in violent behaviours on an individual basis. Furthermore, psychologists would be able to employ drug tests to determine the effectiveness of addiction counselling.

Although individual measures provide professionals with a general idea of how their interventions are working, perhaps the best indication of the efficacy of interventions would be analysis of data. Mental health professionals could choose to analyze the recidivism rates of released offenders that had been treated during pre and post remand phase. Higher recidivism rates would indicate that the interventions of the staff had not been effective; lower rates would indicate success. Although there are no direct measures in this case, there are a number of statistics that can be extrapolated for correlation.

Correctional Counseling by Police

The Tamil Nadu State Police is the state's major law enforcement agency in India. It is India's sixth largest state police force, with a history dating back over 150 years. The police-to-population ratio in Tamil Nadu is 1:632. The current study was conducted in the North Chennai unit of the Greater Chennai Authorities (GCP), where police have traditionally focused on crimes involving the human body and drugs. The demography of this region is defined by a higher number of fisherman living along the coast in sub-optimal living circumstances and individuals living in slum regions. This section of Chennai has long been a haven for rowdies and antisocial individuals due to its lack of civic services. To lessen the harm done to individuals, families, and society as a whole The office of the Joint Commissioner of Police, North Chennai, conceptualised Advance Crime Prevention as an effective crime prevention strategy, and police correctional counselling was implemented as a method to reduce the likelihood of the same offender committing another crime after being released from judicial remand. Ex-offenders commit the most terrible acts, according to analysis, and a broad hypothesis was established that pre-remand counselling could assist diminish the criminal bent of mind in offenders.

Objectives

1. To study about correctional counseling and motivation for remand prisoners.
2. To study relationship between correctional counseling and criminal propensity.
3. To propose the findings as methods to correct sociopath traits in remand prisoners.
4. To propose the findings to decide on the correct method and time to counsel the remand prisoners.

Hypothesis

1. There is a significant change in sociopath traits of convicts after correctional counseling therapy.
2. There is a significant change in sociopath traits of convicts after motivation by Police.
3. A combination of correctional counseling by Psychologist and Motivation by Police together is more effective in changing the sociopath traits in convicts than when done by one of them.
4. There is a significant change in sociopath traits of convicts when the correctional technique is done before remand.

Methodology

Research Design

It is a Comparative Evaluation Study by Quasi Experimental Design, where we intend to establish a cause-and-effect relationship between an independent and dependent variable.

Sampling

1. Sample 1 includes 25 'accused persons' who will be made to attend motivational programme by a Police Officer before remand.
2. Sample 2 includes 25 accused persons who will be given correctional counseling therapy by a Correctional Psychologist before remand.
3. Sample 3 includes 25 accused persons who will be made to attend motivational programme by a Police officer and also will be given correctional counseling therapy by a Correctional Psychologist before remand.
4. Sample 4 includes 25 accused persons who will be made to attend motivational programme by a Police Officer after remand.
5. Sample 5 includes 25 accused persons who will be given correctional counseling therapy by a Correctional Psychologist after remand.
6. Sample 6 includes 25 accused persons who will be made to attend motivational programme by a Police officer and also will be given correctional counseling therapy by a Correctional Psychologist after remand.

Population

150 remand convicts from North Chennai were chosen based on random selection. 75 of them were given intervention before remand. 75 of them were given intervention after completing the remand period but during the conditional bail period.

Data source and data collection

Primary data sources

The Levenson Self-report Psychopathy Scale (LSRP) was created in 1995 by Michael R Levenson. It is a measure of psychopathic/sociopathic (interchangeable) traits. Psychopathy/sociopathy are colloquial terms for Anti-social Personality Disorder, originally two Subscales, 26 items

-Primary psychopathy (psychopathic emotional affect) – 16 items

-Secondary psychopathy (psychopathic lifestyle) – 10 items

More current research proposes a three-way model (three sub-scales) which can be broken up into egocentricity, callousness and anti-social.

Example items

- Success is based on survival of the fittest; I am not concerned with the losers
- I find that I am able to pursue one goal for a long time

Validity checks

- Internal validity – Cronbach's alpha: .84 (Sellbom, 2009)
- Has been validated with prison and non-prison samples
- Good test-retest reliability
- Good convergent reliability with other psychopathy measures (Sellbom, 2011)

Cross-cultural evidence

The LSRP was originally developed for offenders from Western countries specifically for North America. The LSRP has since been translated into Chinese, and used for Chinese populations as well. Internal convergent and discriminate validity remained high (Shou, Sellbom & Han, 2016).

Secondary Data Source

Details of the sample

The basic details of all sample were collected in a form by interview

Date :	Drug / Alcohol usage : Yes / No :
Name: ID:	Broken family : Yes / No :
Age :	Spouse Divorced / Died
Educational qualification :	First crime case : Yes / No
Current Job :	Married :Yes / No
Income :	Children Details :

Data cleaning and analysis on collected data

Anti-social score from Levenson Self-report Psychopathy Scale (LSRP) was calculated for each participant of the study and mean percentage of anti-social score difference before and after intervention of specific population was calculated. Each population had 25 samples each. 6 population clusters were formed.

Findings

Sample ID	Intervention given by	Efficiency in Percentage
S1	Police before remand	98.8

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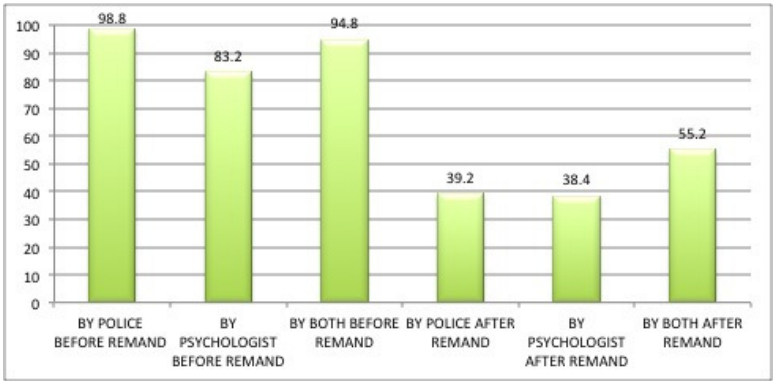
Sample ID	Intervention given by	Efficiency in Percentage
S2	Psychologist before remand	83.2
S3	Both before remand	94.8
S4	Police after remand	39.2
S5	Psychologist after remand	38.4
S6	Both after remand	55.2



The Efficiency of correctional counseling intervention to reduce anti social traits is better when it is done by a police before remand than when its done by a psychologist or by both psychologist and police. The efficiency of correctional counseling intervention to reduce anti social traits is better when it is done before remand and not effective when done after remand. Also, to get in touch with the accused after remand was found to be difficult during the research period.

Results

1. There is a significant change in sociopath traits of convicts after correctional counseling therapy.
2. There is a significant change in sociopath traits of convicts after motivation by Police.
3. There is a significant change in sociopath traits of convicts after motivation by Psychologist but not as effective as when done by police alone.
4. A combination of correctional counseling by Psychologist and Motivation by Police together is not more effective in changing the sociopath traits in convicts than when done by Police alone.
5. There is a significant change in sociopath traits of convicts when the correctional technique is done before remand and not so effective when done after remand.

Conclusion

Once an offender is caught by police, he / she is brought to the station first and then they are produced in court and remanded. According to this study, the duration when the offender is at the station with police is considered the most effective period for attitude and behavior correction . The study reveals that proper counseling given by police during this period is most effective in changing the offender's anti social behavioral pattern. Also, the study proved that the relationship between a correctional counselor and an offender cannot be successfully established at the moment of arrest and they seem to listen more to police at that point of time. After the remand period is complete, once they are back home, convincing them to come for counseling was seen to be a tuff-task and correctional counseling is seen to a be a failure during this period due to the following reasons:

- Their lawyers think this counseling will distract the regular flow of their case.
- Incapacitation do not happen inmost cases and the offender gets back to his routine thus not ready for any correctional counseling.
- In many cases, incarceration is seen to become habitual and its not any more a form of deterrence.

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Papers in Tamil

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உயர்தொடக்க நிலைகளில் அறிவியல் கற்றலில் செயல்திட்ட முறையின் தாக்கம்

சுகன்யா, வெ.
விரிவுரையாளர், மாவட்ட ஆசிரியர்க்கல்வி மற்றும் பயிற்சி நிறுவனம்,
உத்தமசோழபுரம், சேலம்

முன்னுரை

மனிதவாழ்வோடு அறிவியல் நெருங்கிய தொடர்பு கொண்டுள்ளதால் அறிவியலை கற்பது மிகவும் இன்றியமையானதாகும். அறிவியல் பாடமானது மாணவர்கள் ஒவ்வொருவரும் அனுபவித்து கற்கவேண்டிய ஒன்றாகும்.அறிவியல் கருத்துக்களை தகவல்களாகவும், செய்திகளாகவும் கற்றுக்கொள்வதை விட மாணவர்கள் செய்து பார்த்துக்கற்றுக்கொள்ளும் போது மாணவர்களின் சிந்தனை,செயல்,பிரச்சனைகளுக்குத் தீர்வுகாணுதல் மற்றும் பிற அறிவியல் மனப்பான்மைகளும் மாணவர்களிடையே வளரும். மாணவர்கள் அறிவியல் கருத்துக்களை கற்றப்பின் அவற்றை வாழ்க்கையோடு தொடர்படுத்தவும், புதியவை படைத்திடும் ஆற்றலை வளர்ப்பதாவும் மற்றும் சுற்றுசூழல் பற்றிய விழிப்புணர்வு பெற்றிருக்கவேண்டும்.அறிவியல் கற்றல் மாணவர்களை தற்சார்புடையவர்களாகவும் மற்றும் தன்னம்பிக்கையுடைவர்களாகவும் மாற்றும்.

செயல்திட்ட முறை வரையறை :

"செயல்திட்டமுறை என்பது சமூகச் சூழ்நிலையில் கற்போர் ஒரு குறிப்பிட்ட நோக்கத்துடன், ஒரு செயலில் முழு மனதோடு ஈடுபட்டு உண்மையைக் கற்றுக் கொள்ளும் முறை" கில்பர்ட் கூற்று. ஸ்டீபன் கூற்றுப்படி "செயல்திட்ட முறை என்பது சமூகச் சூழ்லில் பிரச்சனைக்கு தீர்வு காணும் முறையாகும்".

செயல் திட்டங்களின் வகைகள் :

பள்ளிகளில் மேற்கொள்ளப்படும் செயல்திட்டங்களை மூன்று வகைகளாகக் கொள்ளலாம்.
பிரச்சனை தீர்க்கும் முறை :

1. மாணவர்கள் தமக்குத் தெரிந்த அறிவியல் கருத்துக்களை சரிபார்க்க உதவும் செயல் திட்ட முறை. எ.கா : எரிதலுக்கு ஆக்சிஜன் தேவை என்ற சோதனையை செய்தல்.
2. சிறப்பு அறிக்கை வகை :- மாணவர்கள் தனியாக அறிவியல் சார்ந்த பிரச்சினைக்குத் தீர்வு காண நூல்களைப் படித்தும், ஆய்வுகளை மேற்க்கொண்டும், விவரங்களையும், செய்திகளையும் சேகரித்து அதிலிருந்து முடிவு காணுதல். எ.கா:நீர் மாசுபடுவதால் மனிதர்களுக்கு ஏற்படும் பாதிப்புகள்.
3. ஆராய்ச்சி வகை : மாணவர்கள் தனது வயது, வகுப்பு மற்றும் ஆர்வத்திற்கு ஏற்ப பிரச்சினைகளைத் தேர்வு செய்து குழுவாகவோ (அ) தனியாகவோ சோதனைகைள் செய்து தகவல் சேகரித்து தொகுத்து, பகுத்து,ஆராய்ச்சி கட்டுரைகளை சமர்பிப்பது.

செயல்திட்டத்தின் படிநிலைகள் :

1. **செயல்திட்டத்திற்கான சூழலை உருவாக்குதல் *(Providing Situation for a Project).*** மாணவர்களிடம், அறிவியல் வினாக்களை எழுப்பி செயல்திட்டத்திற்கான தலைப்பை தேர்வுசெய்திட வாய்ப்பளிக்ககூடிய சூழலை உருவாக்கி தருதல். மாணவர்கள் பள்ளியிலோ அல்லது வீட்டிலோ செயல்திட்டத்தினை மேற்க்கொள்ளக்கூடிய வகையில் தலைப்பை தேர்வுசெய்வதற்கு ஆசிரியர் மாணவர்களுக்கு உதவுதல்.
2. **செயல்திட்டத்தினை தேர்வு செய்தல் *(Selecting a Project)***
   - மாணவர்களின் ஆர்வத்திற்கேற்ப்ப தேர்வு செய்தல்.
   - மாணவர்களின் அறிவிற்கேற்ப்ப தேர்வு செய்தல்.
   - செயல்திட்டம் மேற்கொள்ளத் தேவையான வசதிகளை அறிந்த பிறகு தேர்வுசெய்தல்.
   - நடைமுறைக்கேற்ப்பவும், பயனுள்ளதாகவும், கற்றல் அனுபவங்களைத் தரக்கூடியதாகவும் செயல்திட்டம் இருக்க வேண்டும்.
3. **செயல்திட்டத்தினை திட்டமிடுதல் *(Planning a Project)* :**
   - செயல்திட்டத்தினை செயல்படுத்துவதற்கு தேவையான பொருட்கள், கருவிகள், செய்யவேண்டிய முறை, தகவல் சேகரித்தல் போன்றவைகளைத் திட்டமிட வேண்டும்.
   - குழுச் செயல் திட்டமாக இருப்பின், குழுவில் உள்ளவர்களுக்கு அவர்களின் திறமை மற்றும் விருப்பத்திற்கேற்ப வேலைகளைப் பகிர்ந்தளிக்க வேண்டும்.

- மாணவர்கள் ஆசிரியர்களிடம் கலந்துரையாடி திட்டமிடவேண்டும்.

4. **செயல்திட்டத்தினைச் செயல்படுத்துதல் *(Execution of a Project)*:**
   - மாணவர்களுக்கு செயல்திட்டம் செய்ய தேவையான கருவிகள், தொழில்நுட்பம் பற்றி ஆசிரியர் எடுத்துரைத்து மாணவர்கள் செயல்திட்டத்தை மேற்கொள்ள செய்யவேண்டும்.
   - செயல்திட்டத்தினைச் செயல்படுத்துவதற்கு மாணவர்களுக்கு முழுச் சுதந்திரம் அளிக்கப்பட வேண்டும்.
   - செயல்திட்டம் மேற்கொள்ளும் சிக்கல்களை மாணவர்களே சமாளிக்கவும், செயல்படுத்தவும் ஆசிரியர்கள் வழிகாட்ட வேண்டும்.
   - செயல்திட்டத்தின் படிப்படியான முன்னேற்றம் பற்றி வல்லுநர்களுடன் ஆசிரியர்கள் மேலாய்வு செய்தல் வேண்டும்.
5. **செயல்திட்டத்தினை மதிப்பிடல் *(Evaluation of a Project)***
   - கற்றல் நோக்கம் நிறைவேறியதா என்பதை அடிப்படையாகக் கொண்டு மதிப்பிடல்.
   - செயல்திட்டத்தின் தரம்.
   - செயல்திட்டம் பயனுள்ள வகையில் அமைந்ததா? மாணவர்கள் புதியகருத்துக்களை கற்றுகொண்டுள்ளனரா?
   - செயல்திட்டத்தில் பயன்படுத்தப்பட்ட பொருட்களைக் கொண்டும். மேற்கண்டவைகளை அடிப்படையாகக் கொண்டு மாணவர்களின் செயல்திட்டத்தினை மதிப்பீடு செய்யலாம்.
6. **செயல்திட்டத்தினை பதிவு செய்தல் *(Recording a Project)*:**

   செயல்திட்டத்தினை மேற்கொண்டதிலிருந்து ஒவ்வொரு நிகழ்வுகளையும் செய்திகளையும்,விவரங்களையும் மாணவர்கள் பதிவு செய்தல் வேண்டும். பதிவுகளின் அடிப்படையில் அறிக்கை தயார்செய்ய வேண்டும்.

செயல்திட்ட முறை மூலம் அறிவியல் கற்பதால் மாணவர்களிடையே ஏற்படும் தாக்கம்

- செயல்திட்டமுறை மாணவர்களிடையே ஆய்வு செய்யும் மனப்பான்மை வளர்கிறது.
- அறிவியல் மீது மாணவர்களுக்கு ஆர்வத்தை ஏற்படுத்துகிறது.
- மாணவர்கள் தங்களது ஆர்வத்திற்கேற்ப தாங்களாகவே செயல்திட்ட தலைப்புகளைத் தேர்ந்தெடுப்பதால் முழு ஈடுபாட்டுடன் செயல்திட்டத்தில் பங்கேற்கின்றனர்.
- மாணவர்கள் சமூகச்சூழலில் ஏற்படும் பிரச்சனைகளுக்குத் தீர்வு காண்பதால் சமூகத்தின் மேல் அக்கறையோடு காணப்படுவர்.
- செயல்திட்டத்தில் உடலும், மனமும் ஒருங்கிணைக்கும் வாய்ப்பு உள்ளதால் உடலளவிலும் மற்றும் ஒருமித்த வளர்ச்சி மாணவர்களிடையே காணப்படுகிறது.
- குழுச் செயல்திட்டங்கள் வாயிலாக குழுப் பண்பு அதிகரிக்கிறது.
- சமூகப் பிரச்சனைகளுக்கு அறிவியல் ரீதியில் தீர்வுகாண்பதால் மாணவர்களிடையே தன்னம்பிக்கை, விடாமுயற்சி மற்றும் அறிவியல் மனப்பான்மை மேம்படுகிறது.
- அனுபவங்கள் வாயிலாக கற்பதால் மாணவர்கள் மனதில் அறிவியல் கருத்துக்கள் நிலைத்து நிற்கின்றன.
- மாணவர்கள் தாங்கள் கற்றதினை வாழ்க்கையில் பயன்படுத்துகின்றனர்.
- சமூக இடைவினைப் புரிதல் *(Social Interaction)* மற்றும் ஒத்துழைப்பு நல்குதல் போன்ற சமூகப்பண்புகள் மேம்படுகிறது.
- இயற்கைச் சூழல்*(Physical Environment)* மற்றும் உயிர்ச்சூழலில் *(Biological Environment)* அறிவியல் உண்மைகளை கண்டறிவதில் மாணவர்களிடையே ஆர்வம் ஏற்படுகிறது.
- மாணவர்களின் படைப்பாற்றல் திறன் மேம்படுகிறது.
- மாணவர்களின் சிக்கல் தீர்க்கும் திறன் *(Problem Solving Skill)*, முடிவெடுக்கும் திறன் *(Decision Making Skill)* மற்றும் தகவல்தொடர்புத் திறன் *(Communicative Skill)* போன்ற வாழ்வியல் திறன்கள் மேம்படுகின்றன.

முடிவுரை

செயல்திட்டம் அடிப்படையிலான கற்றல் முறையானது மாணவர்கள் மையமாகக் கொண்ட கற்பித்தல் முறையாகும். இம்முறையினால் மாணவர்கள் வாழ்க்கைச் சூழலில் தாங்கள் எதிர்கொள்ளும் சிக்கல்கள் மற்றும் சவால்களை தீவிரமாக ஆராய்வதன் காரணமான ஆழ்ந்த அறிவை பெறுகின்றார்கள். செயல்திட்ட முறையானது மனப்பாடம் செய்து கற்கும் முறையிலிருந்து முரண்பட்டு செய்து கற்பதால் மாணவர்கள் ஆற்வத்துடன் கற்றலில் ஈடுபடுகின்றனர். செயல்திட்டமுறையின் வாயிலாக சிக்கல் தீர்க்கும் திறன், முடிவெடுக்கும் திறன் பெறுவதால் மாணவர்கள் தங்கள் வாழ்க்கையில் ஏற்படும் சிக்கல்களை அறிவியல் ரீதியாகச் சிந்தித்து திறம்பட எதிர்கொள்கின்றனர்.

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பயனுறுகற்றல்

ஜயப்பன், த.
விரிவுரையாளர், மாவட்ட ஆசிரியர் கல்வி மற்றும் பயிற்சி நிறுவனம், இராணிப்பேட்டை

அறிமுகம்

இன்றைய காலகட்டத்தில் நாம் விவாதிக்கப்பட வேண்டியமுக்கிய கருதுபொருள்களுள் ஒன்று பயனுறுகற்றல். கற்றல் என்பது என்ன? கல்வி என்பது ஒருவர் தன்னையறிவதும் சேவை செய்வதும்என்று குருநானக்கும், ஒருவர் தனது சூழலை சமாளிக்கவும், தேவைகளை நிறைவேற்றி கொள்ளவதற்குமான திறன்களை வளர்ப்பது என்று ஜான்டுயீயும், மனிதத்தை வளர்ப்பது (Man Making) என்று விவேகானந்தரும் விளக்குகிறார்கள்.கல்வி என்பது ஒரு குழந்தையிடம் தனக்கென ஒரு நிலைத்த நடத்தை மாற்றத்திற்கு வழிவகுக்கும் செயல்முறை, மேலும் அது சேவையையும் மனிதத்தையும் வளர்ப்பது என்ற புரிதல் நமக்கு தேவை. அது ஒரு குழந்தையின் அன்றாட வாழ்க்கை நிகழ்வுகளை திறன்பட எதிர்கொள்ளும் திறனை வழங்குவதோடு, தான் கற்று கொண்ட ஒவ்வொன்றும் தனக்கும் தன்னை சார்ந்தவருக்கும் பயன் தருவதாக அமைதல் மிக மிக அவசியமாகிறது. மேலும் கற்றலானது தான் வாழும் சூழலில்உள்ளவரோடுஇணக்கமாகவும்உறுதுணையாகவும்வாழ வழிவகை செய்வதாகும்.தற்போது பயனுறுகற்றல் என்ற சொல் அதிகம் கவனம் பெறுகிறது, ஏனெனில்போட்டியைமட்டுமே ஊக்குவித்து கொண்டிருக்கும் இந்த உலகில் வெற்றிக்கொள்ள பன்முக திறன் கொண்டவராக திகழ்தல் அவசியமாகும். இப்போட்டி சூழல் இயல்பானதாகவும் நிதானத்துடன் வளர்க்கப்பட வேண்டிய ஒன்று என்பதே எங்களைப் போன்றவரின் எதிர்பார்ப்பு.

பயனுறு கற்றல் (MeaningfulLearning)

கற்பவர்கள் தான் ஏற்கனவே தெரிந்தவற்றிலிருந்து புதிய தகவல்களோடு தொடர்புபடுத்தும் அறிவுசார் செய்முறை பயனுறு கற்றல் என்கிறோம். பயனுறுகற்றல் என்பது மனப்பாட முறைக்கு எதிரான திசையில் நம்மைப் பயணிக்க செய்வது. இது நீண்ட நினைவுப் பகுதியில் சேமித்து வைக்கப்பட்டுள்ள தகவல்களுக்கும் புதிய தகவல்களுக்கும் ஆன தொடர்பைக் காணும்செயல்முறையாகும். கருத்துகளைப் புரிந்துக்கொள்ளுதல் என்பது ஏதோ ஒரு கருத்து பற்றி மேலோட்டமாக தெரிந்து கொள்வதோடு, அதுகுறித்து ஆராய்ந்து/பகுத்தாராய்வதுஒரு முடிவை பெறுவது, சர்ச்சைக்குரிய தலைப்புகளில் விவாதிக்க செய்வது, விளக்குவது, சிறப்பாக எடுத்துரைப்பது போன்றவைகளை உள்ளடக்கியது. அவ்வாறான கற்றல் அணுகுமுறைகளை குழந்தைகளிடம் வளர்த்தெடுப்பது கால தேவை என்பதை ஆசிரியர்கள் உணருதல் வேண்டும்.

பயனுறு கற்றலின் செயல்முறையானது பியாஜேவின் கருத்துகளின் ஒருங்கமைவோடு (Piaget s Assimilation) ஒத்திருக்கிறது.பெரும்பாலான சூழல்களில்,மனன கற்றலை விட தகவல்களைநீண்ட நினைவிலிப் பகுதியில்சேமித்து வைப்பதில் பயனுள்ள கற்றல் பயனளிக்கும் என்பது நிருபிக்கப்பட்டுள்ளது. ஒரு குழந்தை இந்த உலகில் தான் ஏற்கனவே தெரிந்து வைத்துள்ள தகவல்களைப் புதிய தகவலோடுதொடர்புபடுத்துவதோடு, என்னதெரியும் அல்லது அத்தகவலை எவ்வாறு நம்புகிறோம் எனும்போது பயனுள்ள கற்றலின் அவசியம் புரிய வருகிறது. ஒவ்வொரு குழந்தைகளிடம் ஏற்கனவே பழகிய தன் சூழல் சார்ந்த அனுபவங்களில் இருந்து கற்றல் துவங்கப்படுகிறது. குழந்தைகளிடம் கருத்துருவாக்கம் (Concept formation) ஏற்படுத்த ஆக்கபூர்வமான கற்றல் (Constructivist Learning) அல்லது பயனுறு கற்றல் (Meaningful Learning) தொடக்க வகுப்பிலேயே அறிமுகம் செய்ய வேண்டும்.

பயனுறு கற்றலை வகுப்பறையில் நிகழ்த்த பல்வேறு வழிமுறைகள் இருந்தாலும், ஆராய்ச்சியாளர்கள்வழங்கிய மூன்று முக்கிய வடிவங்கள்: விரிவுப்படுத்துதல், ஒருங்கிணைத்தல்மற்றும் காட்சிப்படுத்துதல் ஆகும். இவை மூன்றும் இயற்கையில் ஆக்கபூர்வமானவை. அவைகள்பல தகவல்களை ஒருங்கிணைத்துஒரு முழுமையான அர்த்தத்தை அல்லது பொருளை நமக்கு வழங்குகின்றன.

விரிவுபடுத்துதல் (Elaboration)

விரிவுபடுத்துதல் அல்லது விரிவாக்கம் செய்தல் என்பது கற்பவர்கள் ஒரு புதிய கருத்துக்களை அல்லது எண்ணங்களைப் பெறுவதற்காக,தங்களது முந்தைய அறிவைப் பயன்படுத்துவதாகும். இதன் மூலம் நம்மால் இயல்பாக சேமித்து வைக்கப்படும் தகவல்களை விட அதிகமான தகவல்களை சேமித்து வைக்க இயலும்.

எடுத்துக்காட்டு1:

ஒரு குறிப்பிட்ட வகை டைனோசர்களுக்கு சக்தி வாய்ந்த தாடைகள் மற்றும் கூர்மையான பற்கள் இருந்தன என்று படிக்கும் ஒரு மாணவர், அந்த டைனோசர்கள் இறைச்சி உண்ணும் உயிரினங்களாக இருந்திருக்கும் என்பதை சரியாகயூகிப்பது.

எடுத்துக்காட்டு2:

பகா எண்களுக்கு 1 மற்றும் அதே எண்ணே காரணிகளாக அமையும் என்ற கருத்தை ஒரு மாணவர் கற்ற பிறகு பகா எண்களுக்கு வர்க்கம் மூலம் இயல் எண்ணாக அமையாது என்ற முடிவைப் பெறுகிறார். இது கருத்துகளை விரிவாக்கம் செய்தலுக்கான எடுத்துகாட்டாகும்.

இவ்வாறாக ஆசிரியர் விரிவாக்கமுறை மூலம் ஒரு குறிப்பிட்ட கருத்திலிருந்து இன்னபிற கருத்துகள் மற்றும் தேற்றங்கள் குறித்து குழந்தைகள் சிந்திக்கவும், முடிவை பெறவும்வாய்ப்பளிக்க வேண்டும்.ஆகவே, பள்ளியில்பயிலும் குழந்தைகள் ஒவ்வொருவரும் ஏதோ தகவல்களைப் பெற்றோம் என்றில்லாது,கற்றுக்கொள்ளும் கருத்துக்களைத் தொடந்து விரிவுப்படுத்துவதன் மூலம் அக்கருத்தை ஆழ்ந்து கற்க அதாவது பயனுறு கற்றலை நிகழ்த்த இயலும்.

ஒருங்கிணைக்கும் திறன் (Organization)

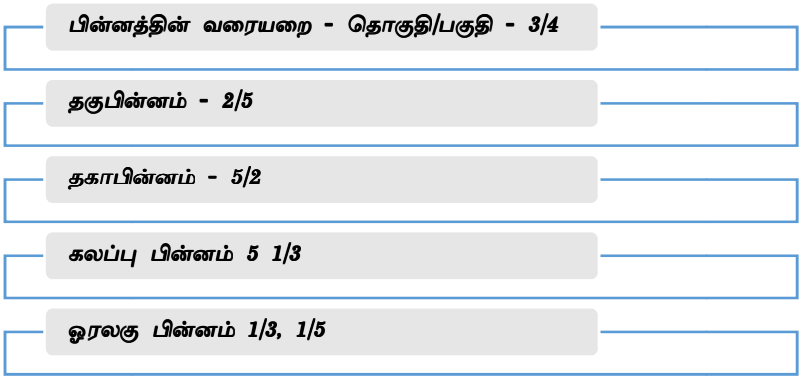
பெரும்பாலானோர் புதிய வழிமுறைகளைப் பின்பற்றும்போது, புதிய தகவல்களை கற்றுக்கொள்வதோடுமிக எளிதில் நினைவில் வைத்துக் கொள்கிறார்கள். தகவல்களை ஒருங்கிணைத்தல் என்பது சிறு சிறு புதிய தகவல்களுக்கு இடையேயுள்ள தொடர்புகளைக்கண்டறிவதோடு, ஒட்டுமொத்தமாக ஒரு ஒத்திசைவான புரிதலையும் கட்டமைப்பையும் உருவாக்கிக் கொள்ள வழிவகை செய்வதாகும். கற்பவர்கள் தாங்கள் கற்றுக்கொள்ளவேண்டிய வெவ்வேறு தகவல்களுக்கு இடையிலான தொடர்புகளை ஏற்படுத்தும் அறிவுசார் செயல்முறை ஒருங்கிணைப்புஆகும்.

தகவல்களை ஒருங்கிணைப்பதற்கான மற்றொரு வழி, அதன் பல்வேறு கருத்துகளுக்கிடையே தொடர்புகளை அடையாளம் காண்பது. எடுத்துக்காட்டாக, ஒரு மாணவர் இயற்பியலில் வேகம், முடுக்கம், விசை மற்றும் நிறைபற்றி படிக்கும்போது,இக்கருத்துக்கள் எவ்வாறு ஒன்றோடொன்று தொடர்புடையதாக உள்ளன என அறிந்து கொள்வதன் மூலம் அக்கருத்துகளை நன்கு புரிந்து கொள்ள முடிகிறது. வேகம் என்பது முடுக்கம் மற்றும் நேரத்தின் பெருக்கற்பலனாகும். இதை $v = a \times t$ எனக் குறிக்கிறோம். மாணவர்கள் வெறுமனே சூத்திரங்களை மனப்பாடம் செய்யாமல்,அச்சூத்திரங்களுக்கு இடையிலான தொடர்பைப் புரிதலுடன்உணர்ந்து கொள்வது அவசியமாகும்.

ஆசிரியர் பாட கருத்துக்களைஒரு குறிப்பிட்ட கட்டமைப்பில் ஒருங்கிணைத்து வழங்கும்போது, அது மாணவர்களுக்கு எளிதாக புரிவதை நாம் காணலாம். எடுத்துக்காட்டாக, ஒரு மாணவர் பின்னம் மற்றும் அதன் வகைகளைப் படித்த பிறகு குறிப்பெடுக்கிறார் எனில் அது எந்த ஒரு கருத்தையும் விடுபடாமல் விவாதிக்க உதவும்.

எடுத்துகாட்டு 3:

ஆசிரியர் பின்ன வரையறை, பின்ன வகைகளை விளக்கிய பிறகு குழந்தைகள் ஒவ்வொருவரும் தனக்கேற்றவாறு தொகுக்க பின்வரும் வகையில் பட்டியலிடலாம் அல்லது குறிப்பெடுக்கலாம். இது நீண்ட நினைவு பகுதியில் முழுமையான தகவல்களை சேமித்து வைக்க இயலும்.



பயனுள்ள வகையில் தகவல்களை ஒருங்கிணைப்பதற்கான மாற்று வழி அட்டவணைப்படுத்துதல். குழந்தைகள் தொடர்புடைய கருத்துகளை ஒரு குறிப்பிட்ட பண்புகளின் அடிப்படையில் ஒப்பிட இம்முறை பயன்படுகிறது.

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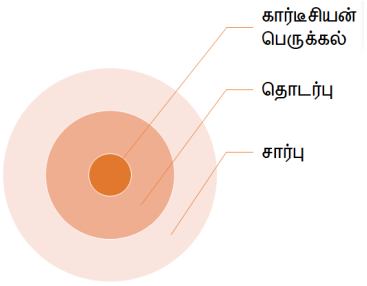
எடுத்துகாட்டு 4: வடிவங்களும் அதன் சுற்றளவு மற்றும் பரப்பளவுகளின் சூத்திரத்தை அட்டவணைப்படுத்துவதன் மூலம் எளிதாக நினைவில் கொள்ள உதவும்.

வடிவம்/அளவீடு	சதுரம்	செவ்வகம்	முக்கோணம்	வட்டம்
பரப்பளவு	$a \times a$	$l \times b$	$\frac{1}{2} \times (a+b)$	πr^2
சுற்றளவு	$4 \times a$	$2(l+b)$	$a+b+c$	$2\pi r$

கருத்துவரைபடங்கள் மூலம் பாட கருத்துக்களை எவ்வாறு விளக்கலாம் என்பதை மாணவர்களுக்கு கற்பிப்பது ஒரு புதிய அணுகுமுறைஆகும். கருத்துவரைபடங்களில் உள்ளதொடர்புகளை சொற்களாகவோ அல்லது குறுகிய சொற்றொடராகவோ குறித்து காட்டுகிறோம். கருத்து வரைபடங்கள் விரைவாகவும் எளிதாகவும் உருவாக்க பல மென்பொருள் உள்ளன.

எடுத்துகாட்டு 5:

ஒரு குறிப்பிட்ட தலைப்பை உள்ளடக்கிய கருத்துகளின் வரைபடம் மற்றும் அவற்றின் தொடர்புகளை உள்ளடக்கிய வரைபடத்தை கருத்து வரைபடம் என்கிறோம். இது கற்றலை மேம்படுத்துவதோடு, கருத்துகளை நீண்ட நினைவு பகுதிகளில் சேமித்து உதவுகிறது. கார்டீசியன் பெருக்கல், தொடர்பு மற்றும் சார்பு ஆகிய கருத்துகளுக்கு இடைப்பட்ட தொடர்பினை கருத்து வரைபடம் மூலம் பின்வருமாறு விளக்கலாம்.



மேற்காணும் முறைகள் சுயமான கட்டமைப்பு மூலம் மாணவர்களுக்கு திறம்பட கற்றுக்கொள்ள உதவுவது மட்டுமல்லாமல், ஆசிரியர்கள் மாணவர்களின் கற்றலை மதிப்பிடவும் இது உதவுகிறது.

காட்சிப்படுத்துதல்/உருவகப்படுத்துதல் (Visual imagery)

ஒரு கருத்து மனதில் நிறுத்தி கொள்ள மன படத்தை உருவாக்கும் செயல்முறை உருவகப்படுத்துதல்/ காட்சிப்படுத்துதல் என்கிறோம். நாம் கருத்துக்களைப் படங்களாக்கி நீண்டகால நினைவகத்தில் குறியாக்கம் செய்யக்கூடிய ஒரு சிறந்த வழியாகும். பல மீட்பு ஆய்வுகள், கருத்துக்கள் அல்லது சிந்தனைகள் காட்சி படங்களாக உருவகப்படுத்துவது வழக்கம் .தகவல்களைச் சேமிப்பதற்கான மிகவும் பயனுள்ள முறையாக இதனைக் கருதலாம். சில வரலாற்று நிகழ்வுகளை மாணவர்கள் கற்பனை செய்யுமாறு கூறுதல் மேலும் கருத்தியல் ரீதியான கருத்துக்களை . படங்கள், வரைப்படங்கள, போன்றவற்றின் மூலம் விளக்கவோ அல்லது புரிந்துக் கொள்ளவோ இயலும் . காட்சிப்படுத்துதல்,குறிப்பெடுத்தல் மற்றும் அட்டவணைப்படுத்துதலை விட எளிதில் புரியும் தன்மைக் கொண்டது. படங்கள், வரைபடங்கள், வட்ட விளக்கப்படம், செவ்வக பட்டை விளக்கப்படம் போன்றவைகள் மூலம் உருவகப்படுத்தினால் அல்லது விளக்கினாலும் கூட அது கருத்துநிலையாக *(Abstract)* அமைபவை.

பயனுறு கற்றல் தொகுப்பை (Meaningful Learning Set) ஊக்குவித்தலும் கருத்துப்புரிதலும்

ஒரு ஆசிரியர் அறிந்த பயனுறு கற்றல் உத்திகளை மட்டுமே ஊக்குவிக்காது, குழந்தைகள் கொடுக்கப்பட்ட தொடர்புடைய தகவல்களை காரணத்தோடு ஒருங்கிணைக்கவும், புதிய எடுத்துக்காட்டுகளைக் குறித்து சிந்திக்கவும், பயன்பாடுகள் குறித்து யூகிக்கவும் செய்தல் வேண்டும். பள்ளிகளில் வழங்கப்படும் ஒரு குறிப்பிட்ட தலைப்புகளை மனப்பாடம் செய்வதற்கு பதிலாக புரிந்து கொள்ளுதல் அவசியம். அடிக்கடி குழந்தைகளிடம் காரணம் காரணகாரீயத்துடன் கூடிய விளக்கத்தை பெறுதல், ஒப்படைப்புகள் வழங்குதல் மற்றும் மதிப்பீடுகள் மனப்பாடங்களை சோதிப்பதைத் தவிர்த்து புரிதலை மையமாகக்கொண்டு அமைதல் வேண்டும். குழந்தைகள் ஒரு குறிப்பிட்ட தலைப்புகளில் உள்ள கருத்துக்களை தொடர்புடைய கருத்துக்கள் மற்றும் தேற்றங்களுக்கு இடையிலான தர்க்க தொடர்பைக் கண்டறிவதன்மூலம் ஆழ்ந்த புரிதலை உருவாக்க இயலும். கணிதத்தில்,கணக்குகளை தீர்ப்பதற்கான செயல்முறைகளை *(Computation Procedures)* மனப்பாடம் செய்யாது, அந்த செய்முறைகள் எந்த கணித கருத்தோடு தொடர்புடையது என்பதை குழந்தைகள் கற்க வேண்டும். ஒருவர் ஒரு குறிப்பிட்ட கருத்துகளை ஒருங்கிணைப்பதன் மூலம் எளிதில் நினைவு கூறவும் பயன்படுத்தவும் இயலும்.

வகுப்பறையில் கருத்து புரிதலுக்கு உதவும் பயனுறு கற்றல் உத்திகள்

- ஒரு பாட அலகில் இடம்பெறும் கருத்துக்கள், கற்றல் இடர்பாடுகள் மற்றும் மையக் கருத்தின் அடிப்படையில் ஒருங்கிணைத்தல்
- பள்ளியில் ஏற்கனவே கற்றதையும் அனுவங்களையும் புதிய தகவல்களோடு தொடர்புப்படுத்தி கற்றல்
- ஒவ்வொரு தலைப்புகளையும் ஆழ்ந்து கற்று வெளிப்படுத்துதல்- எடுத்துக்காட்டுகளைத் தருதல், காரணங்கள் மற்றும் விளைவுகளை வெளிக்கொணர்தல், எவ்வாறு குறிப்பிட்ட தகவல்களின் அடிப்படையில் பொதுவான முடிவு / விதியைப் பெறுதல்
- மாணவர்களின் வெளிப்படுத்தும் திறனை வளர்த்தல் - வாக்கியம் அமைத்தல், கேள்வி கேட்டல், ஒப்படைப்புகள் அளித்தல், மதிப்பீட்டு கூறுகளின் அடிப்படையில் மதிப்பிடுதல் - ஒன்றைப் பற்றிய கருத்து புரிதல் என்பது அதைப் பற்றிய அறிவைவிட முக்கியமானது.
- கற்றதை பிறருக்கு கற்றுத் தருதல் - மாணவர்களின் கற்பித்தலை மையப்படுத்தி, முக்கிய கருத்துக்களின் புரிதல் நோக்கி நகர்த்துதல் வேண்டும்.

முடிவுரை

இப்பயனுள்ள கற்றல் முறை பழைய தகவல்களோடு புதிய தகவல்களைத் தொடர்புப்படுத்தி அறிவை விரிவாக்கம் செய்வதாகும். மாணவர்கள் அத்தகவல்களைத் தனித்தோ அல்லது ஒன்றிணைத்தோ மனதில் ஒரு வரைபடமாக்கி கொள்ளும் இந்த கற்றல் முறையை நாம் அனைத்து வயதினருக்கும் அறிமுகம் செய்வதன் மூலம் நிலையான கற்றல் பயனை உருவாக்க எதுவாக அமையும். தொடர்ந்து அறிவை விரிவாக்கம் செய்யும் பழக்கத்தை ஒவ்வொரு மாணவரிடமும் ஆசிரியர்கள் விதைப்பதால் கருத்துக்களின் முழுமையான பயன்பாட்டை அறிந்துக் கொள்ள அதிகபட்ச வாய்ப்பாக அமையும். அத்தகைய பயனுறு கற்றல் முறையை மாணவர்களுக்கு ஆசிரியர்கள் அறிமுகம் செய்து, பழக்கப்படுத்துதல் காலத்தேவை என்பதை உணர்வோம், செயல்படுவோம்.

மேற்கோள் நூல்கள்

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பிரச்சனை அடிப்படையிலான கற்றல் - ஓர் பார்வை

கோவிந்த பிரகாஷ், பெ.
முதுநிலை விரிவுரையாளர், மாவட்ட ஆசிரியர் கல்வி மற்றும் பயிற்சி நிறுவனம்,
உத்தமசோழபுரம், சேலம்

முன்னுரை

ஒவ்வொரு காலக்கட்டத்திலும் மக்களின் தேவை அடிப்படையில் புரட்சி ஏற்படுத்தப்பட்டு அவை அக்காலகட்டத்தின் யுகமாக கருதப்படுகின்றது. கி.பி.1880 க்கு முன் விவசாயத்தின் சகாப்தம் எனப்பட்டது. 1880 முதல் 1985 வரை தொழிற்துறை புரட்சியின் சகாப்தம் எனப்பட்டது. 1955 முதல் 2000 வரை தகவல் சகாப்தம் எனப்பட்டது. 1995 முதல் தற்பொழுது வரை அறிவின் சகாப்தம் எனப்படுகிறது. எனவே 21ஆம் நூற்றாண்டில் உயிர்வாழத் தேவையான திறன்களை மாணவர்களுக்கு, வழங்குவதற்கு வகுப்பறை முக்கிய பங்கு வகிக்கின்றது. பல முக்கிய திறன்களின் பிரச்சனை தீர்க்கும் திறன் முக்கிய பங்கு வகிக்கின்றது. எனவே எதிர்காலத்தை வரவேற்கும் வகையில் சிந்தனைச் திறனையும் விருப்பத்தையும் வளர்க்கக் கூடியதாக இருத்தல் வேண்டும். மேலும் பிரச்சனைகளை அறிவியல் முறையில் பகுப்பாய்வு செய்து புரிந்து கொள்ளும் வகையில் கல்வியானது அமைதல் வேண்டும். அதற்கு பிரச்சனை அடிப்படையிலான கற்றல் அணுகு முறைமுக்கியத்துவமாகிறது. எனவே தொடக்க கல்வி முதல் உயர்கல்வி வரை மாணவர்களுக்கு பிரச்சனைகளை தீர்க்கும் வகையில் பிரச்சனை அடிப்படையிலான கற்றல் அணுகு முறை கலைதிட்டத்திலும் பாட திட்டத்திலும் அமைக்கப்பட்டுள்ளன.

பிரச்சனை அடிப்படையிலான கற்றல்

பிரச்சனை அடிப்படையிலான கற்றல் என்பது மாணவர் மைய, விசாரணை அடிப்படையிலான கற்றல் மாதிரி எனப்படுகின்றது. இதில் மாணவர்கள் பாடங்களை அனுபவங்கள் வாயிலாக கற்பர். இதில் திறந்த நிலை பிரச்சனைகளுக்கு ஆய்வாளர் என்ற நிலையில் மாணவர்கள் தீர்வு காண்பர். இம்முறை முதன் முதலில் கனடாவில் உள்ள மேக் மாஸ்டர் பல்கலைக் கழகத்தில் நடைமுறைப்படுத்தப்பட்டது. இது ஆரம்பத்தில் மருத்துவ அறிவியல் கல்வியில்பின்பற்றப்பட்டது.இது 1960க்கு முன்பிருந்து பின்பற்றப்பட்டு வரும் பிரசித்திப் பெற்ற கற்றல் முறையாகும். பொதுக் கல்வி, தொழில் நுட்பக் கல்வி, ஆசிரியர் கல்வி, தொழிற் கல்வி, மருத்துவ அறிவியல் கல்வி என பலத்துறைகளில் தற்பொழுது பின்பற்றப்படுகின்றது. திறந்த நிலைப் பிரச்சனைகளானது பாட நூல்கள், பல்வேறுப்பட்ட நூல்கள், வார இதழ்கள், மாத இதழ்கள், ஆய்வுக் கட்டுரைகள்,; ஆய்வு இதழ்கள், ஆய்வு அறிக்கையின் பரிந்துரைகள் ஆகியவற்றிலிருந்து கிடைக்கிறது.

பிரச்சனை அடிப்படையிலான கற்றல் உயர் கல்வியில் பயன்படுத்தபட்டு வரும் முறையாக இருப்பினும் தற்பொழுது பள்ளிக்கல்வியிலிருந்தே தேவைப்படும் இடத்தில் இம்முறை பின்பற்றப்படுகின்றது. தெரிந்தவைகளிலிருந்து தெரியாதவை நோக்கி செல்ல வேண்டும் எனவும் எளிமையிலிருந்து கடினப் பகுதிக்கு செல்ல வேண்டும் என்பதை மையமாகக் கொண்டு இம்முறை பள்ளிகளில் செயல்படுத்தப்படுகின்றது. பொதுவாக பிரச்சனை அடிப்படையிலான கற்றலானது கூர்சிந்தனைத்திறன், பிரச்சனைகளுக்கு தீர்வு காணும் திறன், தொடர்புக்கொள்ளும் திறன் ஆகியவற்றை மையமாகக் கொண்டு அத்திறன்களைமாணவர்களிடையே வளர்க்கின்றது.

பிரச்சனை அடிப்படையிலான கற்றலுக்கு கீழ்கண்ட பிரச்சனைகளையும்; அவைகளின் தீர்வுகளையும் சில உதாரணங்களாக கூறலாம்.

- ஒரு பிரச்சனையை எவ்வாறு அணுகுவது?
- மற்றவர்களுடன் எவ்வாறு இணக்கமாக செயல்படுவது?
- வேறுப்பட்ட கலாசார, பண்புகளை எவ்வாறு நேர்மறையாக அணுகுவது?
- குழுவில் எவ்வாறு குழு மனப்பான்மையுடன் செயல்படுவது?
- தன்னுடைய கற்றலை சிறப்பாக செய்வதற்கு பயன்படும் முறைகளை கண்டறிந்து அதனை நடைமுறைப்படுத்துவது போன்றவைகளாகும்.
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பிரச்சனைகளுக்கான தீர்வானது சிலக்கட்டுபாடுகளுக்குட்பட்டு சிறந்த தீர்வை கண்டறியும் வகையில் பயன்படுத்தப்படும் ஒரு செயல்முறையை கொண்டுள்ளது. பிரச்சனைகளை புதியதாக இருந்தாலும், சூழ்நிலை நன்றாக வரையறுக்கப்படாமல் இருந்தாலும், கொடுக்கப்பட்ட தகவல் தெளிவின்றி இருந்தாலும் பிரச்சனையை நன்றாக வரையறுக்கப்பட வேண்டும். பிரச்சனைகளை தீர்வு காணும் வகையில் அனுமானங்களை வரையறுக்கப்பட வேண்டும். அதற்கான திறனை மாணவர்கள் பெறுதல் வேண்டும்.

பிரச்சனைகளுக்கு தீர்வு காணும் திறன் என்பது ஒருவர் சந்திக்கும் பிரச்சனைகள் எதிர்மறை உணர்வுகள் போன்ற துன்பங்களிலிருந்து விடுபட உதவும்; திறன்கள் அனைத்தையும் பிரச்சனை

தீர்வுகாணும் திறன் என்கின்றோம். பிரச்சனை அல்லது சிக்கலுக்கான தீர்வு என்பது ஒரு பிரச்சனைகளைக் கண்டறிதல், சாத்தியமான பாதைகளை உருவாக்குதல் மற்றும் தீர்வுகான பொருத்தமான நடவடிக்கையை மேற்கொண்டு தீர்வு காண்பது ஆகும்.

பிரச்சனை அடிப்படையிலான கற்றல் ஒருவரின் தனிப்பட்ட வாழ்க்கையில் மட்டுமல்லாமல் அவருடைய தொழில் சார்ந்த செயல்களிலும் பொது வாழ்விலும் முக்கிய பங்கு வகிக்கின்றது. எனவே பிரச்சனை தீர்க்கும் திறன்களை மாணவ ஃ மாணவியர்கள் பள்ளிகளில் படிக்கும் பொழுதே வளர்த்து கொள்வதற்கு வாய்ப்பை ஏற்படுத்தி கொடுப்பது ஒவ்வொரு ஆசிரியரின் கடமையாகும்.

பிரச்சனை அடிப்படையிலான கற்றல்;; அணுகு முறையின் அவசியம்

உலகம் முழுவதும் பல பிரச்சனைகள் உள்ளன. அவற்றில் சில மிக எளிமையானவை மற்றவை சிக்கலானவை. பிரச்சனைகளை தீர்ப்பதற்கு ஒரு நபர் முன்னர் பெற்ற திறன்களை பயன்படுத்துதல் வேண்டும். பிரச்சனைகளைத் தாங்களே தீர்ப்பதன் மூலம் வாழ்வில் எதிர்கொள்ளப்படும் பல்வேறு பிரச்சனைகளுக்கு மாணவர்களால் தீர்வு காணமுடியும்.

பிரச்சனைகளை மாணவர்களிடம் கொடுத்து அவைகளை தீர்க்கும் பொழுது மாணவர்கள் கீழ்கண்ட திறன்களை பெறுவர். பிரச்சனைகளை கண்டறிதல், வரையறுத்தல், கருது கோள்களை அமைத்தல், அனுமானங்களை அமைத்தல், கருது கோள்களை சரிபார்த்தல், தகவல்களை சேகரித்தல், தகவல்களை பகுப்பாய்வு செய்தல், மன சோர்வு நீக்குதல் மன அழுத்தம் நீக்குதல், உற்றுநோக்கல், வினாக்களை கேட்டல், கவனித்தல், ஆய்வு சிந்தனை, படைப்பாற்றல், முடிவெடுக்கும் திறன், சார்ந்திருத்தல், கண்டறிதலுக்கான வடிவமைப்பு, கூர் சிந்தனை, குழு ஏற்படுத்தும் திறன், குழுவுடன் இணைந்து செயல்படுதல், தகவல்களில் காணப்படும் இடைவெளி அறிதல், தேவையற்ற தகவல்களை நீக்குதல், வெவ்வேறு கண்ணோட்டத்தில் பார்த்தல், வெவ்வேறு விதத்தில் பகுப்பாய்வு செய்தல், அணுகு முறை அனுமானம், வெவ்வேறு விதத்தில் பகுப்பாய்வு செய்தல், ஆழமான புரிதல், தயார் நிலையில் இருத்தல், தகவல் அளித்தல், முடிவுகளை விளக்குதல், பிரச்சனைகளுக்கான தொழில்நுட்பம், வாய்ப்புகளை சரியாக பயன்படுத்தி தீர்வுகான பயிற்சிகள், நேர்காணல், தடைகளை நீக்கும் திறன்,உடனடி தீர்வு, நீண்டகால தீர்வு போன்றவைகள்.

மாணவர்களுக்கு பிரச்சனைகளை தீர்க்க, முறையான பயிற்சி அளிக்கும் பொழுது பிரச்சனைகளை கண்டு பயப்படாமல் அதனை எதிர்கொள்ள வழிவகை செய்யப்படுகின்றார்கள். முடிவெடுக்கும் தைரியம், முடிவெடுக்க செயல்படுவது, செயலுக்கான தயாரிப்புகளை உருவாக்குவது, தயாரிப்புகளை செயல்படுத்தும் பொழுது ஏற்படும் பிரச்சனைகளை சரியான முறையில் அணுகி வெற்றி கொள்வது பிரச்சனையின் அணுகுமுறையாகும். இவைகள் பள்ளி பருவத்தில் கற்கும்பொழுது அனைத்து துறைகளின் சவால்களை எதிர்கொண்டு ஒரு நாட்டின் எதிர்கால வளர்ச்சிக்கு மாணவர்கள் பங்குபெற வழிவகுக்கும், மாணவர்கள் அன்றாட வாழ்க்கையில் பிரச்சனைகளை எதிர் கொள்ளும் பொழுது அதனை தீர்ப்பதற்கான வழிமுறைகளை மாணவர்களுக்கு கற்று தரும். எனவே புதிய சூழ்நிலைகளில் ஏற்படும் பிரச்சனைகளை அவர்கள் மன மகிழ்வுடன் எதிர்கொள்ள முடியும். எனவே பள்ளிகளில் பிரச்சனை அடிப்படையிலான கற்றல்;; அணுகு முறை அவசியமாகிறது. பிரச்சனைக்கான தீர்வுகளை மாணவர்கள் கற்பதும்; அவசியமாகிறது.

பிரச்சனை அடிப்படையிலான கற்றலுக்கான வரையறைகள்

இம்முறையில் ஆசிரியர்கள் ஏதுவாளராக செயல்படுகின்றனர். இம்முறையில் ஆசிரியர் - மாணவர்கள் இணைந்து சிறிய குழுவாக செயல்படுகின்றனர். இவர்கள் பிரச்சனைகளை தீர்க்;க இணைந்து திட்டமிட்டு, தயாரித்து, வடிவமைத்து செயல்படுத்தி மதிப்பீடு செய்கின்றனர். அதாவது ஒரு பிரச்சனையை மையப்படுத்தி அதனை நேர்மறையாக அணுகுவதற்கு அப்பிரச்சனை தீர்வு ஒன்றாக இருப்பினும் பல்வேறு தீர்வுகளை முதலில் ஆசிரியர் - மாணவர்கள் இணைந்து சிறுக்குழுவில் தற்காலிகமாக பட்டியலிட்டு அதற்கான தகவல்களை சேகரிக்கின்றனர். பின்பு பிரச்சனையின் தீர்வு காண கூடுதல் தகவல்களை விசாரணை மேற்கொண்டு ஆய்வு செய்து அவ்விசாரணை மற்றும் ஆய்வின் அடிப்படையில் பல்வேறு வினாக்களைக் கேட்டு தகுதியான குறிப்பிட்ட தீர்வை கண்டறிந்து நடைமுறைப்பத்துகின்றனர். எனவே இம்முறை புதுமையான கற்றல் அணுகு முறை எனப்படுகின்றது.இவ்வகை கற்றலில் காரணம் அறிதல், உற்று நோக்குதல், பிரித்தறிதல், ஒற்றுமை, வேற்றுமைகளை அறிதல், பொதுமைப்படுத்துதல், கற்பனை செய்தல், முடிவை எட்டுதல், புதிய வழியில் முயற்சி செய்தல், பரிசோதனைகளை செய்து விளைவை சரிபார்த்தல், மனப்பான்மை, ஆர்வங்கள் ஆகியவைகளை கொண்டுள்ளன.

ஜோனசன் மற்றும் ஹங் (2000) என்பவர்கள் பிரச்சனை அடிப்படையிலான கற்றல் என்பது மாணவர் மைய, விசாரணை அடிப்படையிலான கற்றல் எனவும் இதில் மாணவர்கள் தங்களை ஈடுப்படுத்தி எப்பொழுதும் சுறுசுறுப்பாக செயல்பட்டு கற்கின்றனர் என குறிப்பிடுகின்றனர். மேலும் அது பல தலைப்புகளை உள்ளடக்கிய அணுகுமுறை எனக்குறிப்பிடுகின்றனர். ஒருக்கருத்தை அல்லது பிரச்சனையை செயல்பாட்டின்விளைவாக புரிந்துக்கொண்டு தீர்வு காண்பதே பிரச்சனை அடிப்படையிலான கற்றல் என பாரோஸ் மற்றும் டாம்பளின் (1980) குறிபிட்டுள்ளனர்.

பிரச்சனை அடிப்படையிலான கற்றல் என்பது ஒரு கற்பிக்கும் சாதனமாகும். சூழலை மையமாகக் கொண்டு கொடுக்கப்பட்ட அல்லது தேர்ந்தெடுக்கப்பட்ட பிரச்சனைகளுக்கு மாணவர்கள்

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தாங்களாகவே தீர்வு காணும் முறை என அல்பான்ஸ் மற்றும் மிட்செல் (1993)ல் குறிப்பிடுகின்றனர். கில்ஜெரிஸ் மற்றும் ஹரூண் (2011) என்பவர்கள் கற்றல் சூழ்நிலையிலுள்ள பிரச்சனைகளுக்கு மாணவர்கள் சிறுகுழுவாக செயல்பட்டு ஆசிரியர் மேற்பார்வையில் தீர்வு காண்கின்றனர் என்கின்றனர். சோனாசென் என்பவர் முன்பு கற்றுக் கொண்ட விதிகளின் அடிப்படையில் தீர்வுக்காண செயல்படுத்தப்படும் ஒரு தனிப்பட்ட சிந்தனையே பிரச்சனைகளுக்கான தீர்வு என்கின்றார். மேலும் இவ்விதிகளை எந்த சூழ்நிலையிலும் பிரச்சனைகளைத் தீர்ப்பதில் பயன்படுத்தலாம் என்கின்றார். ஜஸ்ஹாரா பிரச்சனைகளை தீர்க்கும் முறையானது மாணவர்கள் சுதந்திரமாக கற்க வாய்ப்புகளை ஏற்படுத்துகின்றது என்கிறார். இம்முறையில் உண்மைகளைத் தேடுவதற்கும், யோசனை உருவாக்குவதற்கும், பிரச்சனைகளை விரிவாக ஆராய்வதற்கும் ஊக்குவிக்கப்படுகின்றார்கள் என குறிப்பிடுகின்றார்.

ஒவ்வொரு தனிமனிதனுக்கும் பிரச்சனைகளைத் தீர்க்கப் போதுமான அறிவும் திறன்களும் தேவை என டகோனிஸ் குறிப்பிடுகின்றார். பிரச்சனைகளுக்குத் தீர்வை காண்பதற்குப் பதிலாக பிரச்சனைப் பற்றி எண்ணுவதற்கே அதிக சக்தியையும் நேரத்தையும் செலவிடுகின்றனர் என ஹென்றிஃபோர்டு குறிப்பிடுகின்றார். எனவே பிரச்சனை அடிப்படையிலான கற்றல் அணுகு முறையானதுநம்மை சுற்றியுள்ள அறிவியலின் அறிவை வழங்குவதையும், அறிவியல் ஆர்வத்தை தூண்டுவதையும், அறிவியல் மனப்பான்மை, அறிவியல் சிந்தனை வளர்ப்பதையும் நோக்கமாக கொண்டுள்ளது.

பிரச்சனை அடிப்படையிலான கற்றல் மாதிரிகள்

பாரோஸ் மாதிரி: பாரோஸ் பிரச்சனை அடிப்படையிலான கற்றல் மாதிரியானது (2011) கீழ்கண்ட உட்கூறுகளை கொண்டுள்ளது.

- 8 முதல் 10 வரையுள்ள மாணவர்கள் சிறுகுழுவில் சுறுசுறுப்பாக செயல்படுதல்.;
- ஆசிரியர் ஏதுவாளராக இருத்தல்.;
- மாணவர் மைய கற்றல்.
- ஏற்றுக் கொள்ளக்கூடிய பொருத்தமான பிரச்சனைகளுக்கு மட்டும் தீர்வுகாணல்.
- பிரச்சனை தீர்க்கும் திறன்களை பெற்றிருத்தல்
- இது சுய ஒழுக்குமுறை கற்றலாக செயல்படுகின்றது.

மாஸ்ட்ரிட் மாதிரி அல்லது ஏழு படி நிலை மாதிரி: மாஸ்ட்ரிட் மாதிரி அல்லது ஏழு படிநிலை மாதிரியானது கீழ்கண்ட படிநிலைகளை கொண்டுள்ளது.

ஆரம்ப நிலை

- பிரச்சனைகளை வகைப்படுத்தி தேர்ந்தெடுத்தல்.
- பிரச்சனைகளை வரையறுத்தல்.

பிரச்சனை அடிப்படையிலான கற்றல் நிலை.

- சிந்தனை தூண்டுதல் முறையில் விளக்கத்தை கண்டறிதல்.
- யோசனைகளை விவாதித்து அமைத்தல்.
- கற்றல் பிரச்சனைகளை உருவாக்குதல்.

இறுதிநிலை

- தற்காலிக பிரச்சனைகளுக்கான தீர்வுகளை விவரித்தல.
- ஒழுங்கிணைத்தல் மற்றும் அறிக்கை சமர்பித்தல்

பிரச்சனைஅடிப்படையிலான கற்றலுக்கு தீர்வுகாணும் முறைகள்

கீழ்கண்ட அறிவியல் முறைகள் பிரச்சனை அடிப்படையிலான கற்றலுக்கு தீர்வுகாண சிறந்ததாக அமைகின்றது.

1. ***மூலகாரணப்பகுப்பாய்வு :*** இந்த முறையில் தீர்வுகாண பிரச்சனைகளின் அடிப்படையை ஆராய்கின்றது. கற்பவர்களுக்கு கற்பனையான சிக்கல் சூழ்நிலைகளை வழங்குதல் வேண்டும். பிரச்சனைகளுக்கு தீர்வு காணும் வரை ஏன் என்று பலமுறைகேட்டு தீர்வு காணப்படவேண்டும். தேர்வு முறைகளில் முரண்பட்ட குழப்பமான விடைகளை கொடுத்து அதிலிருந்து சரியானவற்றை தேர்ந்தெடுத்தல் வேண்டும்.
2. ***காரணம் மற்றும் விளைவை ஏற்படுத்துதல்:*** பிரச்சனைகளின் மூலத்தை கண்டறிய விளக்கப்படம் தயாரித்தல் வேண்டும். இந்த வரைபடம் தீர்வைத்தடுக்கும் காரணிகள், தீர்ப்பதற்கு சாத்தியமான காரணங்களை அறியப்பயன்படுகின்றது.
3. ***கலந்துரையாடல்:*** சில பிரச்சனைகளை மாணவர்களிடையே விவரிக்க ஊக்கப்படுத்தி விவாதம் நடத்தலாம் இதன் மூலம் அன்றாட வாழ்க்கையில் ஏற்படும் பிரச்சனைகளை தீர்வுகாணும் அனுபவமாக அமைகின்றது.

4. விவாதங்கள்: விவாதங்களில் பங்கேற்பது சிந்தனையை தூண்டும் முறையாகும். தர்க்க ரீதியாக வாதங்கள் மற்றும் எதிர் வாதங்களை வைப்பது வாதங்களை சரியான வரிசையில் அமைப்பது போன்றவை கூர்சிந்தனையை தூண்டி பிரச்சனைகளுக்கு தீர்வு காண உதவுகின்றது.
5. **சிந்தனை தூண்டல் :** இம்முறை பிரச்சனைகளின் அசல் தன்மையை ஆராய்கின்றது. ஆக்கப்பூர்வமான தீர்வுகளை தருகின்றது. இதனால் இம்முறை பள்ளிகளிலிருந்தே மாணவர்களுக்கு வாய்ப்பாக வழங்கபடவேண்டும். சுதந்திரத்தை ஊக்குவிக்கும் இம்முறையில் பங்கேற்பவர்களிடம் விருப்பத்தகுந்த விவாதங்கள் நடைபெறுவதாலும் கருத்துகளை பகுத்து பார்ப்பதாலும் பல தீர்வுகள் கிடைக்கின்றன.
6. **படிப்படியாக செல்லும் முறை:** தர்க்க ரீதியான மற்றம் கணிதம் சிக்கல்களைத் தீர்ப்பதற்கான அல்லது வேறு சில பணிகளையும் படிப்படியாக செய்வதற்கான வழிமுறைகளின் தொகுப்பாகும். சமையல் செய்வது எப்படி? என்ற நிகழ்வில் செய்முறை படிப்படியாக நடைபெறுவதை குறிக்கின்றது. சிக்கலான கடின பிரச்சனைகளை தீர்க்க இம்முறை சிறந்ததாகும்.
7. **கண்டறிமுறை:** சவால்களை கொண்ட பிரச்சனைகளை தீர்க்க இம்முறை உதவுகின்றது. இது குறுகியகால இலக்குகளை அடைய மேற்கொள்ளும் செய்முறை ஆகும். இம்முறை பிரச்சனைகளை தீர்க்கும் சரியான முறை அல்ல. ஆயினும் உடனடி தீர்வுகாண இம்முறை சிறந்தது ஆகும்.
8. **முயன்று தவறுதல்:** எந்த ஒன்றினையும் கற்கும்பொழுது பலமுறை முயன்று தவறுகள் செய்து பின்னர் பயிற்சியின் காரணமாக ஒவ்வொரு முயற்சியிலும் தவறுகள் குறைந்து இறுதியில் சரியாகக் கற்றல். முயன்று கற்றலில் தவறு இருப்பினும் மீண்டும் மீண்டும் முயலும் பொழுது தவறு குறைகிறது. தொடர்ந்து முயலும் பொழுது தவறு குறைந்து சரியான கற்றலுக்குத் துணை புரிகின்றது.
9. **உட்காட்சி:** ஒன்றை அடைய ஒருவித நடத்தை தேவை. பொருத்தமான நடத்தை என்ற அறிவு உட்காட்சி மூலம் ஏற்படுகிறது. திடீரென தோன்றும் இத்தகையக் கற்றல் உட்காட்சி கற்றல் எனப்படுகிறது,; உட்காட்சி மூலம் பெற்ற கற்றல் எளிதில் பிற நிலைகளுக்கு மாற்றமடையும்.
10. **தனியாள் ஆய்வு:** ஓர் நபர் அல்லது ஓர் குழு அல்லது ஓர் நிகழ்வுப்பற்றிய ஆழமான ஆய்வு ஆகும். ஓர் நபர் அல்லது ஓர் குழு அல்லது ஓர் நிகழ்வுப் பற்றிப் படித்து ஆய்வுச்செய்து பொதுமைப்படுத்துவதாகும்.

நிறைகள்:

- இம்முறைமாணவர் மையக்கற்றல் கற்பித்தல் முறையாகும்.
- மகிழ்ச்சியான கற்றலுக்கு வழிவகுக்கின்றது.
- பாடக்கருத்தை ஆழமாக புரிந்துக்கொள்ள உதவுகின்றது.
- கற்றல் திறன் மேம்படுகின்றது.
- சுறுசுறப்புடன் செயல்படுவதற்கும்,ஈடுபாட்டுடன் கற்பதற்கும் உதவுகின்றது.
- நீண்ட நேரம் மாணவர்கள் படிப்பில் கவனம் செலுத்துவதற்கும்இ நீண்ட நாள் கற்றல் நிலைநிறுத்துவதற்கும் உதவுகின்றது.
- அக மகிழ்ச்சி அடைய செய்கின்றது.
- ஆசிரியர் மற்றும் மாணவர்களின் பல்நோக்கு சிந்தனையை வளர்த்து பல்வேறு செயல்களில் பங்குக்கொள்ள வழிவகுக்கின்றது.
- குழச்செயல்களிலும், தனியாகவும் செவ்வனே செயல்பட வழிவகுக்கின்றது.
- புதியன படைப்பதற்கு உதவுகின்றது.
- மாணவர்கள் பிரச்சனைகளை சாதகமாக மாற்றி நேர்மறையான பொருத்தமான தீர்வுகளை காண்கின்றனர்.

குறைகள்:

- எல்லா செயல்களிலும் முந்தைய அனுவங்கள் பிரச்சனை அடிப்படை கற்றலுக்கு போதுமானதாக அமைவதில்லை.
- ஒரு செயலை செய்து முடிக்க நீண்ட நேரம் அல்லது நீண்ட நாள் ஆகின்றது. எனவே மாணவர்கள் வேறு பாடங்களுக்கு நேரம் ஒதுக்குவது கடினமாகின்றது. இது மனச்சோர்வை ஏற்படுத்துகின்றது. பொறுத்தமான பிரச்சனைகளை தேர்ந்தெடுப்பது கடினமாகின்றது.
- குழுச்செயல்களில் அனைத்து மாணவர்களும் பங்கு கொள்வதில்லை. இதனால் மாணவர்களின் செயல்திறன் குறைகின்றது.
- புதிய புதிய வினாக்கள் நடைமுறைப்படுத்தும்பொழுது தோன்றுகின்றது.அவைகளுக்கு வழிகாட்ட ஆசிரியர்களின் வழிக்காட்டுதல்மாணவர்களுக்கு தேவைப்படுகின்றது.

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முடிவுரை

இம்முறையில் மாணவர்கள் தங்கள் அறிவில் காணப்படும் இடைவெளியை கண்டறிந்து அதற்கான தீர்வை கண்டறிவதால் மாணவர் பருவம் கடந்து குடும்ப வாழ்க்கை மேற்கொள்ளும் பொழுது, பொருள் ஈட்ட எத்துறையில் எவ்வகையான தொழில் மேற்கொண்டாலும்,அன்றாட வாழ்வில் தோன்றும் எம்மாதிரியான பிரச்சனைகளையும் எளிதில் கையாண்டு வெற்றி முடியும். ஒரு செயலை மேற்கொள்ளும் பொழுது அச்செயலின் சாதக பாதகங்களை பகுப்பாய்வு செய்வதால் மாணவர்கள் ஆரம்ப நிலையிலேயே தேவையற்றவற்றை விலக்கி விடுவர். இதனால் அனைவரின் பாராட்டுகளை பெற்று நாட்டின் சிறந்த குடிமகனாக செயல்பட்டு வீட்டையும், நாட்டையும் பாதுகாப்பர். எனவே சிறந்த பயன்களை தருகிறது. எனவே பிரச்சனை அடிப்படையிலான கற்றல் சிறந்த கற்றல் அணுகுமுறை என்பதில் ஐயமில்லை.

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TAMIL NADU OPEN UNIVERSITY

577-Anna Salai, Saidapet, Chennai – 600015, India
Phone: 044-24306600 | URL: www.tnou.ac.in