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A Review study of promoting Kolb's Experiential Learning Model (ELM) through the incorporation of Augmented Reality (AR) technology in Indian classrooms

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Abstract

The Augmented Reality has been discussed at a wide range across the global educational stage due to its potential to create an immersive set up which led to experiential learning for the learners. As, experiential learning largely talks about the creating concrete experiences to active experimentation, here Augmented Reality (AR) act as a catalyst tool to promote the variety of knowledge creation through the suitable usage of technological intervention which can be termed as "Engineered Education", it implies that education can be crafted and shaped accordingly and differs for an individual learner. Augmented Reality is one step ahead of virtual reality as it takes consideration of real-life scenarios and do not create a synthetic experience as in virtual reality. Augmented Reality has the ability to transforms the teaching-learning process by suitable intervention with the help of 'machine-learning' that here suggest the usage of head-mounted gears and technological applications during the learning process and further creates the path for active experiential learning. Therefore, this paper is going to talk about incorporation of AR technology for knowledge creation and enhancing learning process. Thus, Experiential learning here promotes interactivity, tactile learning experiences and vividness for the future learners through continuous technological development such as Augmented Reality (AR).

Keywords: *Engineered Education, Experiential Learning, Augmented Reality, Virtual Reality, Immersive Learning, Machine Learning.*

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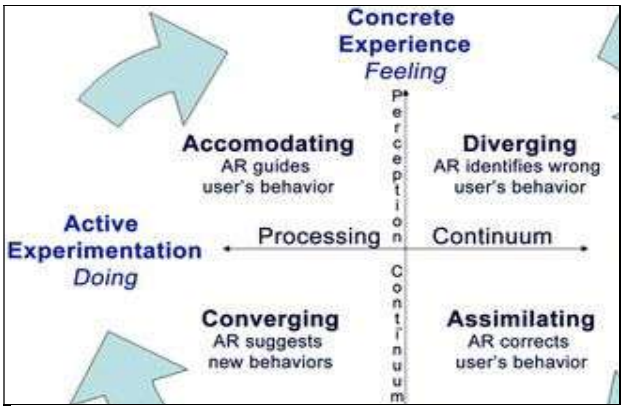
1. INTRODUCTION

The field of Augmented Reality (AR) has expanded its roots and reached to various sectors of society like-Défense, medicine and now education too. The emergence of AR is a reminder of change in terms of behavioural and cognitive aspects of human thinking. The recent advancements in psychology, education and technology created a space where many critical questions have arisen, such as: How AR will create a live experience for its users? How it can be integrated in education in such an away that promotes simulated environment?

Augmented Reality is an interactive, real-time, immersive technology which can be used through apps and through head-mounted gears that can helps in experiencing 3-D, real life learning within the walls of a classroom. It will not only help in effective learning but also increase retention capacity of the learners whose having short attention span.

The diagram below shows how Kolb's experiential learning model can be implemented efficiently by integrating Augmented Reality into its all stages;

- Diverging: AR identifies wrong user's behaviour
- Assimilating: AR corrects user's behaviour
- Converging: AR suggests new behaviours
- Accommodating: AR guides user's behaviour



The role of AR in the experiential cycle, adapted from Kolb

Source:
(ntiersin.org/journals/psychiatry/articles/10.3389/fpsyt.2016.00164/full)

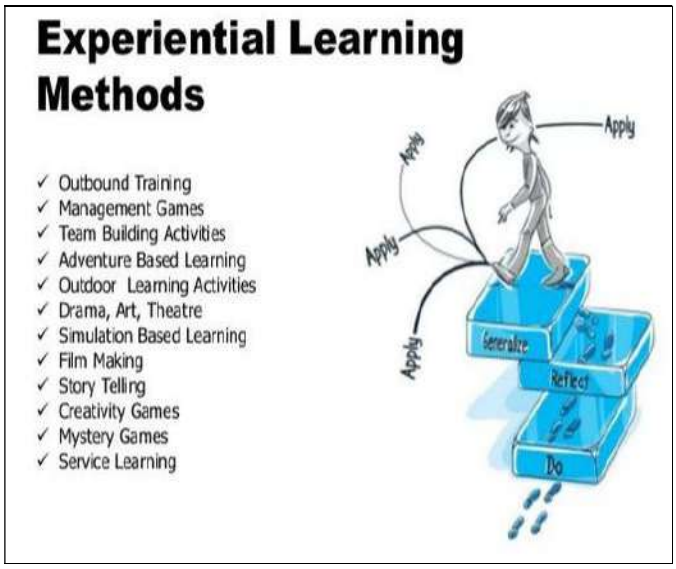
2. THEORETICAL FRAMEWORK

Kesim (2012) compared the study on the 3-D learning tools and 2-D tools which are usually educational teaching-learning tools which creates a learning gap in the cognition of the students. The combination of AR with educational content new innovative application which enhances the effectiveness and attractiveness of learning as an experience. **Lee (2012)** examined the rapidly changing society where every day we are flooded with new information and the choice of learning has become highly personalized and the information needs to be adopted and applied at the right time and right place in order to efficiently converting the information into knowledge. **Mehta (2017)** discussed about the augmented reality and its role on promoting active learning ideas and regards learning from only books as a mundane and passive process. Also, it highlights the downfall of the education system and the degradation of the learning quality among students due to obsolete teaching-learning methods. This system helps the students to learn from smartphones, apps, and the intended books. **Gandolli (2018)** conducted a study and found that Augmented reality is an immersive experience, especially at the school level which provides a holistic learning experience at the beginning stage of education of learner which not only enhances the learning but also leads to the advancement of the creativity level of the learners. **Arduini (2020)** found that Augmented reality helps in exploring the unexplored and it has been rapidly in recent years. In the field of education, it acts as a catalyst in promoting experiential learning and provides a massive diffusion of enhanced learning. **Kumar (2020)** described in his study, Augmented reality as a combination of virtual & real objects in a real environment. Also, there are various constraints in order to implement AR such as – Financial, Technological. Pedagogical and learning ability constraints. But with a suitable intervention, we can easily utilize AR as an educational technology at its best. **Reddy (2020)** investigated the massive intervention of technology in our lives, as digital technologies have created their own space in the educational ecosystem which led to creating a new age learning, however, this also poses a challenge to the cognitive skills of the learner who needs to understand that the technology in any form is a supplement to learning not a substitute. **Siddiqua (2020)** conducted a study which revealed that

learning from traditional method is great but learning from interesting activities is amazing too. With the help of AR, we can now comprehend various complicated tasks quite easily, it also enhances our computational skills and imagination capacity. The 3-D model of learning provides an edge over traditional learning which not only gives a new perspective to learning but also provides new meaning to our understanding. **Singaravelu (2020)** studied with the advent of new emerging technologies, new age education focused on inter-disciplinary and multi-disciplinary learning which can be easily adopted through AR technology, as it gives a unique medium to combine real and virtual world, the learner can now have effective and attractive teaching and learning process. **Czerkawski (2021)** examined that studies have shown that education is a personalized experience and with the help of augmented reality we can actually help in achieving this and incorporating a range of innovative ideas which get translated into experiences with the help of augmented reality and related technologies emerged in contemporary times. **Vuta (2021)** probed in the study that digital technologies have reshaped the entire world., the world which we perceive differs a lot from the world which had perceived decades back, similarly in the field of education too, digital technologies have left a huge footprint with the new emerging technologies like AR educators can now provide specialized methods of teaching with new age curriculum and contemporary evaluation strategies beyond time and space. **Han (2022)** gauged that AR is not just a tool for the teaching-learning process but a professional training strategy and an instructional designing tool which helps in creating a holistic learning experience which creates a log lasting learning immersion on the minds of the young learners. It acts as a medium to enhance joyful learning. **Jumani (2022)** described in the research review that AR & VR are quite deep technologies embedded with the idea of simulated learning which creates an environment of executing collaboration of machine learning and human creativity. The first idea of VR was created in 1965 and used for a virtual world artificial experience which is interactive, multi-sensor and immersive. Then, came AR which has an overlay of real-world inputs on the virtual world display. It can be called the extension and better version of VR.

3. BACKGROUND OF THE STUDY

The National Education Policy (NEP) 2020 clearly iterates that "experiential learning" will be adopted in all stages of learning across all syllabuses, including hands-on learning approaches as well as sports/arts-integrated education." This is one if the most landmark document ij the history of education system which explicitly talks about "educational emergencies" which are need of the hour and cannot be ignored in order to tackle various pedagogical obstacles. One such initiative is new emerging digital technologies like- Augmented Reality (AR) and Virtual Reality(VR) which will include the simulated lessons, gamification and a proper system for the delivery of quality content for the learners of the future as well as for the current enrolled students. enrolled students.

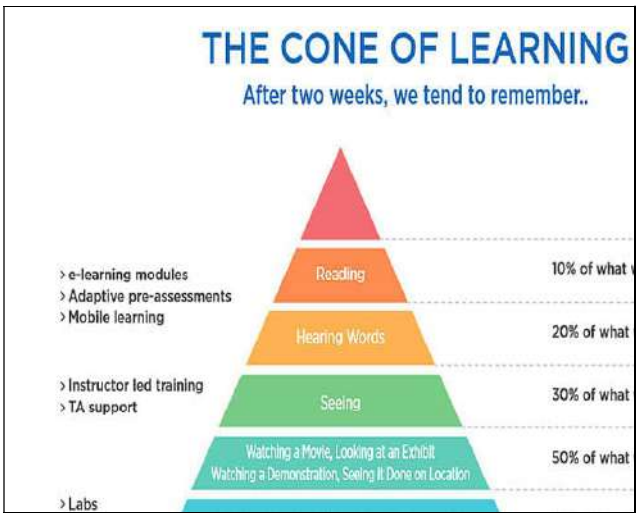


Source:
(https://www.outlife.in/experiential-learning.html)

4. RATIONALE OF THE STUDY

The idea behind connecting experiential Learning with Augmented Reality is based on the theory of Edgar dale's "The Cone of Experience" where he talks about the "cone of learning "which says that only reading through conventional methods leads to merely retention of 10% after two weeks of learning while through gamification, simulating a real-life experience such as through

AR can lead to learning and retention up to 90% after the two weeks.



Source: (https://www.simplilearn.com/has-e-learning-killed-the-learning-cone-article)

5. OBJECTIVES

- To explore the significance of augmented reality (AR) in promoting the Kolb's Experiential learning model.
- To study the various previous research in the field of augmented reality with the Kolb's Experiential learning model across the globe.
- To identify the research gap for further developments in the augmented reality with the Kolb's Experiential learning model.

6. RESEARCH METHODOLOGY

Qualitative research analysis is adopted as a method for analysis includes the reviewing and analysis of the articles, research papers, interviews and other published information in order to gain a deeper understanding of the prevailing scenario. These methods will help to understand the opinion and views of eminent and learned academicians and leading critical pedagogues.

7. ANALYSIS AND DISCUSSION

Real-time information overlay Augmented Reality provides a real-time interface for its learners as now-a-days learning is not restricted to classroom one can learn anywhere, anytime. So, with the help of AR several lessons, learning modules can be generated to provide experiential learning for the learners. While many educators believe that learning has to be essentially occurred within four walls of classroom now with the latest numerous forms of technological intervention augmented reality has opened new arenas of learning experiences with the help of innovation teaching-learning styles.

❖ AR in curriculum

In order to promote experiential learning in its true sense, AR needs to be properly integrated with the curriculum and the subject matter. And, not just to as once in a while lab visit but as a way to learn in the classroom. As, we cannot deny the fact that many times there are number of advancements happening all at once except educators, policy makers tend to forget the importance of updated and upgraded curriculum. So, the curriculum needs flexibility and broad themes in order to properly integrate the advancement in the learning segment of the education sector.

Learning motivation

Through reviewing many research papers, it has been observed that teaching through AR actually motivates the learners for exploring new aspects of the content and makes it more fun.

Hands-on learning and experiential learning provide various joyful opportunities to learn and with the integration of technological tools like-Augmented Reality, students tend to participate more and also it increases the retention capacity of learners. It has been also found out learning through simulated videos, animation and gamification lead to retention up to 90% .

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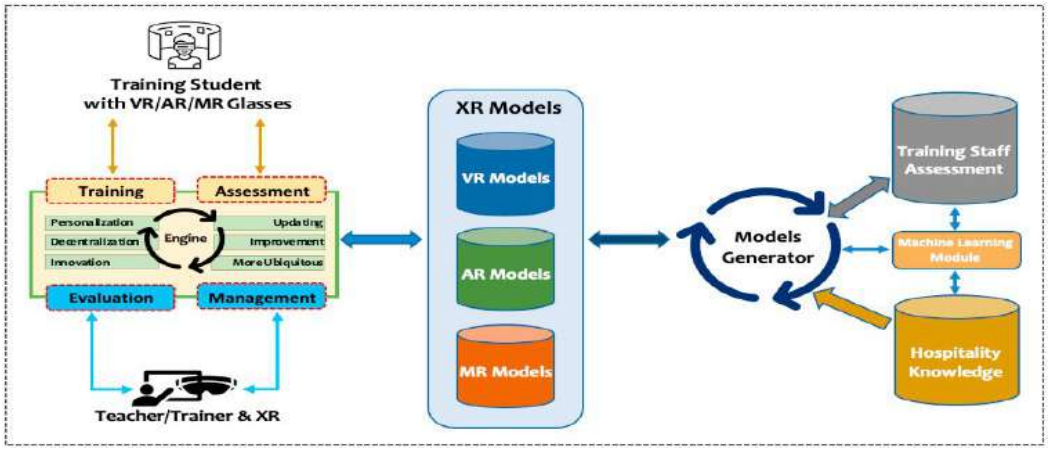


Source: (www.sciencedirect.com)

❖ **Remote collaboration**

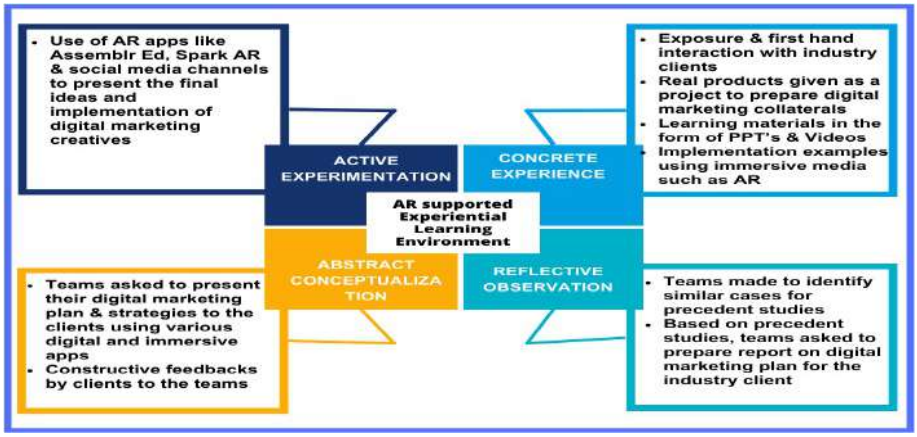
With the help of AR, we can even to distant remote collaboration with many learners at a same time. As, Kolb's experiential model discuss about active experimentation one can work in groups on a specific project and further share their ideas together. In the age of interdisciplinary learning with the help various Augmented Learning websites and tools one can contribute ideas and built an active collaborative learning.

❖ **Safe Learning Environments with Inclusivity**

With the help of appropriate technological tool like-AR one can promotes inclusivity in its true sense. The Kolb's experiential model talks about changing concrete experience to abstract conceptualisation for which we need to involve all sensory organs into learning process and to make it happen the AR provides a support system and act as a learning interface for all kinds of learners. Inclusion is a necessity as well as right of every learner; in order to promote inclusivity, we can adopt various AR tools for different learners like-auditory, visual, kinaesthetic learners.

❖ **Real-World Application and Contextual Learning**

This is one of the major advantages for Augmented Reality is providing real-world simulation and application for the content and provides its meaning in a particular context. This will not only promote experiential learning in its purest form but also helps in providing perspective to the educational content in the real-world scenarios i.e. in learners life. Often learners criticize learning ways and education system, as they find lack of applicability of the content. With the AR appropriate integration of upgraded curriculum which shows simulated lesson videos, innovative assessment techniques and knowledge of real-world application of the concepts.



Source: (Implementation of ELM model's 4 elements along with AR in class)

8. NEW INITIATIVES

The term Metaverse signifies a group of virtual spaces that includes AR and VR technologies is now being utilized to reimagine and renegotiate the future of education. There are numerous ed-tech organizations including 'APPLE', has been experimenting with this technology and has recently launched 'Vision Pro' headset as the AR/VR simulation technology. It further creates the potential to enhance and improve the outcomes of the educational learning. One of the recent developments by Indian Institute of Technology Madras (IIT Madras) where Researchers are developing AR/VR (Augmented reality/Virtual Reality)-based learning tools for the teaching and learning process at the rural areas of India. Through these technologies there is an attempt to create an immersive environment for the experiential learning of the students which will enhance opportunities they are getting and make them competent for the future prospects.

9. WAY FORWARD

Therefore, the new initiatives can actually create an interactive learning environment for students and also helps the educators to frame much interesting content. Then only we will be successfully creating an **ARELC (Augmented Reality supported Experiential Learning Classroom).** First suggestion would be, *"Affordability",* we need to develop indigenous AR technologies which can be affordable to all. We cannot deny the fact that expensive technology often leads to marginalization of economic backward learners and creates a digital divide of 'have's' and 'have's not'. As, it is being observed that AR tools especially head-mounted gears and AR labs requires one-time big investment that's why many educational institutions are reluctant to establish it and even if they establish one it does not cater completely to the number of students they have. There is a ratio imbalance between available AR gadgets and the strength of the learners.

Secondly, *"Accessibility"*, it should in reach to even tier two cities we just cannot make it a luxury good just for handful people. A learning tool should be accessible to everyone irrespective of any background a learner belongs. Many a times technological tools don't get supported by the suitable infrastructural facilities and many tier-2 and tier-3 cities in India is still fighting with poverty either economic restriction or geographical barrier in order to implement a well efficient learning systems.

Thirdly, "*Trained professionals*" who knows to integrated this ARELC model in their classrooms and in their content. We should not forget that any technology or tool is not a substitute for a well-trained teacher. With the available technology and upgraded curriculum a well-versed professional is required who can handle the expectations of learner of current age Also, to cater to the challenges of the teaching professionalism.

Lastly, *"Government support",* without the support of the ruling ones none policies and be formulated nor can be implemented properly. As, we know every government has its own approach to implement policies for the education sector. Recently, many changes are example of that outlook only. Also, recently implemented NEP-2020 highlights various such perspective of government for improving and introducing new measures for the education sector. In one segment it talks about the AR/AI and its utility in the learning process.

10. CONCLUSION

Thus, we can say that Augmented Reality combined with Kolb's experiential learning model can be beneficial for the learners of new age. Further, it can help in developing skills and knowledge of 21st century like: Critical thinking, Collaborative Learning, Constructivist learning environment etc. The process from concrete experiences to reflective experiences and to abstract conceptualization to active experimentation can be effectively & efficiently implemented with the various AR tools and apps and with the appropriate measures discussed above we can create a classroom of the future. Hence, incorporating AR technology would create an inclusive environment for improved learning interest and to make motivated learners of the society. Also, AR is a game changing technological tool in the present, preparing us for the future. With the inclusive and sustainable education and need to innovate there is constant urge to adopt newer and finer technology which can helps in building the learners for tomorrow. At last we can say that, after the AI, AR is a emerging technology which can easily change the way a human brain learn.

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