RESEARCH ARTICLE

Revolutionizing e-Learning with AR, VR, And AI

Nilesh Anute[1], Geetali Tilak[2*]

Abstract
According to its increased accessibility, enhanced movement, and ability to provide learners with individualized settings for learning, remote instruction has emerged as a crucial component of contemporary schooling. The emergence of artificially intelligent (AI), augmented reality or AR, and virtual reality, or VR, is expected to cause even more impairment to remote education. In this study, the prospective use of VR is investigated describing the advantages, uses, challenges, and limitations of AI and AR in e-learning. This essay explores the prospects and ramifications for online education going forward, as well as possible trends and advancements in the industry. Ultimately, virtual reality, augmented reality, and artificial intelligence (AI) in distance learning has the potential to completely transform the educational landscape and alter how people educate in the near future.

Keywords: Future developments in distance education, Instructional technology, Experiential education, Virtual realities (VR), Augmented Reality (AR), AI, Electronic learning, Customized learning.

Introduction
The context of education has seen a significant change in the previous 10 years, with online education becoming a more popular and practical method of training. Thousands of students globally are enrolled in online courses and programs, which are part of online education, which is defined as the delivery of education using digital technology. The World Economic Forum's research "The Future of Online Learning" projects that there will be 117 million online learners globally by 2020. The COVID-19 epidemic has expedited the uptake of online education, as educational institutions were compelled to transition to distance education in order to guarantee the security of their staff and pupils. As, per UNESCO the global pandemic led to the closure of schools impacting than 1.2 billion students worldwide and prompting many to shift to learning.

[1]ASM'S Institute of Business Management and Research, Pune, Maharashtra, India.

[2]Tilak Maharashtra Vidyapeeth, Pune, Maharashtra, India.

*Corresponding Author: Geetali Tilak, Tilak Maharashtra Vidyapeeth, Pune, Maharashtra, India., E-Mail: geetali.tilak@gmail.com

Background
While online learning offers benefits such, as access, flexibility and user friendliness it also comes with certain downsides. Issues like student disengagement, waning interest and limited interaction can impede the effectiveness of learning. To tackle these challenges and improve the quality of education researchers and educational institutions are exploring methods like virtual reality (VR) augmented reality (AR) and artificial intelligence (AI) technologies (Figure 1). By incorporating visuals, feedback mechanisms and interactive graphics educators can provide students with context and information using AR tools. This article delves into how these advancements could revolutionize the landscape of education. It begins by defining distance learnings role in todays society before delving into an exploration of VR, AR and AI technologies within this context (Figure 2). The discussion then shifts to the articles objectithe objectives and significance of the article research methodology employed, presenting findings and fostering discussion among readers. Lastly experts will summarize the outcomes. Offer recommendations, for research endeavours.

Literature Review
The approach utilized in this study involves the method known as the literature review. It entails an approach, to finding, gathering, assessing and summarizing material pertaining to a specific research subject. Through the application of this method the study aims to gain an insight
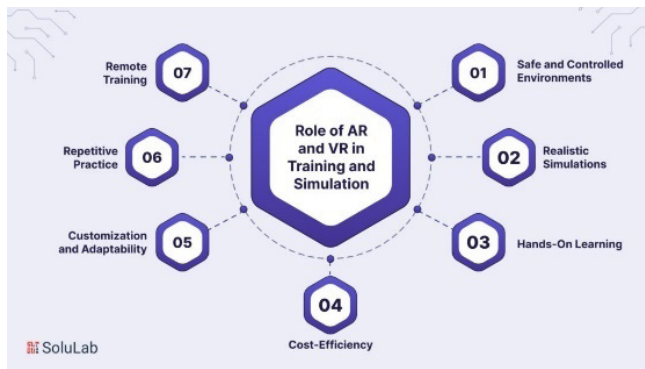
Figure 1: Role of AR and VR in education

into the body of information that's pertinent to the topic, at hand.

Search Approach

A systematic search approach was employed to find research materials, for this study. Various scientific databases, including Science Direct, Scopus and Google Scholar were consulted. The search terms included phrases like " education " " reality," "Augment Reality," "Artificial Intelligence " "learning," and "knowledge acquisition experience," along, with their corresponding synonyms and variations. The search was restricted to articles published between 2017 and 2023 to capture the advancements in this field. To guarantee the reliability and excellence of the materials the search focused mainly on peer reviewed papers.

Evaluation Standards

A look through the literature turned up many papers, and the choosing process was split into two stages. In order to figure out the relevance of the texts to the issue, the first step was screening them based on their headings and summaries. Books that fell beyond the parameters and addressed topics outside the purview of online education, virtual reality, augmented reality, and artificial intelligence were not included. In addition, the suitability and quality of the complete text formatting sections of the chosen articles were scrutinized and assessed.

Information Evaluation

To identify common topics, styles, and structures in the writings, the data acquired from the selected publications was compiled and analysed. The parts that focused on the applications of AI, VR, and AR in online education, as well as the benefits and drawbacks of these developments in terms of how they impact the motivation and involvement of students, were organized in line with the following sections that each addressed. The contextual strategy utilized in the research included classifying and organizing the data into numerous layers and topics.

Evaluation of Quality

To make sure that the research review was thorough and of excellent standard, it was appraised. Each task fulfilled the same requirements, and disagreements were settled by having authors come to an agreement. Already established criteria, such as rigorous methodology, reliability, functionality, and efficacy were used to assess the selected publications. Utilizing information from several studies, especially reliable publications and pertinent works on the subject, the conclusions and recommendations were confirmed.

Methodology

The "scientific research" method was utilized in the inquiry. Information is gathered and analysed in this sequence to check that the findings are true and to obtain helpful comprehension. By focusing on actual data and belongings that maybe seen, the study creates certain that the results are located really and can be used in up-to-date classrooms. For the practical study, surveys, interviews, and tests accompanying students and teachers the one were energetically complicated in online instruction were used to collect data (Lin *et al.,* 2020). Then, this information was painstakingly look at to discover how VR, AR, and AI technologies influence the kind and value of online learning.

Results

The analysed of research has shown some noteworthy developments and chances to use VR, AR, and AI in e-learning. In general, the results indicate that by using a variety of techniques, these advancements have the ability to greatly improve the efficacy and participation of online education sessions. Customized and adaptable instructional materials are among the many ways that VR, AR, and AI may improve online education. Because there isn't a comparable in person interaction among students and teachers as in traditional educational settings, online instruction has historically found it difficult to give students the same level of customized personalized assistance. Machine learning algorithms, for instance, may be used to analyse performance metrics from students and pinpoint areas in which they are failing or succeeding. This information enables teachers to modify their pedagogical approaches.

Table 1 provides a comprehensive overview of the significant role that innovations related to virtual reality, augmented reality, and artificial intelligence play in enhancing learning in a range of scenarios.

With the application of digitally produced graphic elements, feature writing, music, and additional impacts, AR, VR, and also AI is a cutting-edge innovation that combines both physical and digital environments to provide an amazing user engagement. It can now be combined with different technological ideas like deep
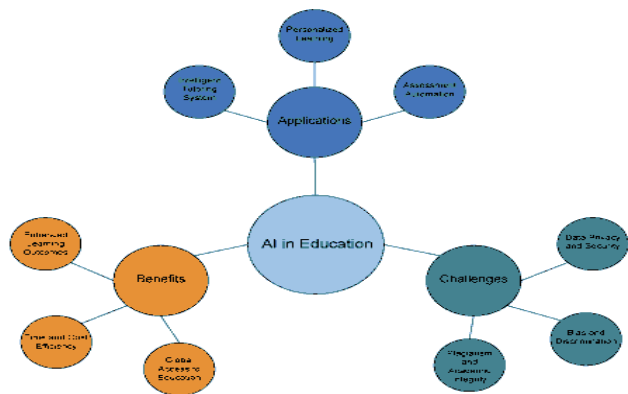
Figure 2: AI in education

computation, and algorithmic learning thanks to recent research and advancement. Due to pupil's absence of appropriate sensibility and understanding as competent specialists, universities have had difficulties in recent times in encouraging pupils to pursue job opportunities in the building, engineering, development, and management fields. Computer-enabled education has been used as a solution to this issue. Different approaches to computer-assisted instruction exist, based on the pupil's availability of resources and equipment. Students in remote locations with little resources might benefit from an improved interaction thanks to mobile virtual reality, augmented reality which can function absent of internet access.

In addition to providing a tactile graphical paradigm for manipulating objects, AI, AR, VR facilitates communication between imaginary and actual surroundings. Marker-oriented and markerless augmented reality are now one of the most popular forms of AR. The AR material is identified via the usage of an ImageTarget/Marker as graphical indicators or creates in marker-based AR for prediction. Tutors may think more deeply regarding the aspects of mobile pupils thanks to R-Technologies like AR, MR, and VR, which elevate any situation, environment, or expertise to a new degree of comprehension. More and more, AR, AI and VR is transforming how students "develop on the shift."

Education technologies based on augmented reality, artificial intelligence, and virtual reality have the possibility of improve educational results in kindergarten through 12 and university settings by revolutionizing the way pupils learn (Table 2). Immersion technologies may provide chances for educational tasks such as touring a distant place or doing science experiments that might have required a lot of travelling or money. These encounters may also go beyond the confines of real world to provide possibilities for learning such as going to another galaxy or historical era or working with larger-than-life representations of tiny items that wouldn't be practically conceivable otherwise.

More individualized strategies that take into account different ways of learning, velocity, and aptitudes are made possible by hands-on instruction. In order to assist students, reach their fullest ability and leave fewer remaining they may modify their personal objectives while giving evaluation to instructors and pupils for particular education kinds. Immersion solutions are becoming more

Table 1: Role of virtual reality, augmented reality and artificial intelligence in enhancing learning experience

Aspect	Role of VR	Role of AR	Role of AI
Participation	Engaging and realistic simulations and experiences to enhance learner engagement and motivation	Integrate electronic information on actual items to create a dynamic and captivating educational setting	Customized instruction, flexible suggestions, and clever coaching services to boost student interest
Displaying	Enhance comprehension and memory by using virtual worlds and 3D models of illustrating difficult ideas and data	Students may see and engage with knowledge in relevance when digital content is superimposed over practical items.	Create data visualizations and graphical representations to improve comprehension and ideas..
Cooperation	To engage, interact, and collaborate with remote students, online classrooms and working settings are available.	Devices for augmented teamwork to facilitate actual time interaction and joint effort amongst students in shared physical settings.	Encourage cooperative learning via the creation of groups, peer evaluation, and internet resources.
Acquisition of Skills	Virtual instruction and scenarios simulation for real skill development and experiential learning	Augmented guidance and real time feedback to support to skill acquisition and practice	Adaptive learning system that tailors education and experience adapted to each learner's needs and progress.
Availability	Make learning available for students with impairments or restricted range of motion.	For students with a range of requirements, integrate digital environment with automated speech or additional adaptive capabilities.	technological aids for students with impairments, such as voice-to-text and speech detection.
Information Analysiss	Examine student data to find trends, areas of power, and opportunities for development so that you can guide individualized training.	Examine immediate information and the actions of users to gain understanding of the ability and behaviour of learners.	Making data-based choices to maximize instructive methodologies, customized learning pathways, and educative materials.

Table 2: Using AR, VR, and AI in education to create interesting educational settings

Innovation	Case study examplese	Advantage and interaction
Virtual reality (VR)	Education in science	Immersion-based scenarios improve comprehension and involvement. Accessibility to a site that is unavailable for instructional purposes
	Language learning	Participation in a virtual speech for engaging training.
	Historical re-enactments	Stepping into historical events through interactive storytelling.
Augmented reality (AR)	Education on the anatomiesn	Digital 3D designs superimposed over tangible objects to enable student engagement.
	Museum education	Electronic features and improved details at museums and sites of history.
	Engaging virtual worlds	Engaging with digital items in real life to facilitate actual education.
rtificial intelligence (AI)	Flexible education	Individualized learning programs based on each person's requirements and tastes.
	Skilful mentoring programs	Instantaneous input and guidance for customized education.
	Natural language processing (NLP)	Catboats or talking agents for engaging education.

and more desirable among administrators and teachers in kindergarten through 12th grade because they may supplement, completely replace, or augment conventional instructional methods. They may be used to engage pupils with mental or educational challenges, minimize disruptions during distance education, and facilitate integrated and online education. With almost two-thirds of higher-education universities already perhaps completely or partly implemented augmented reality, AI, and virtual reality solutions, and one-third evaluating them, it is clear that artificial intelligence (AI) methods are also beneficial in more sophisticated learning contexts. In comparison to more conventional with-person situations, immersing models are comparatively inexpensive and preserve the same degree of engagement that gives users the impression that they're "truly there." This is especially helpful in dangerous or expensive situations, like medical training. Additionally, virtual models may help with soft-skills instruction, including conversation and negotiating techniques.

By enabling people to develop skills via hands-on activity and lowering the danger and expense of outdoor instruction, hands-on instruction may be used to enhance instruction in technical and vocational fields. In addition, augmented reality, AI, and virtual reality may improve hybrid approaches to education and scientific cooperation by enabling person-to-person real-time interaction between pupils and teachers wherever they may be in the world.

Discussion

The potential impact of augmented reality, on digital education augmented reality (AR) holds promise in enhancing education by making instructional content more captivating and interactive. AR technology adds digital facts on top of the real world, allowing students communicate with images, 3D models, and dossier about

their environment. For example, AR can help medical scholars determine more about the human body and how it works in a more experiential habit (Dhar *et al.* 2021). It can also help engineering students picture complicated machines and structures. AR also lets teachers and students work together in real-time, letting them use the same virtual objects and making the learning experience more interactive and interesting. Even though it has benefits, adding AR to eLearning has some problems. For example, businesses need more advanced gear, there could be technical issues, and teachers will need to come up with new ways to teach.

Immersive Virtual Reality Learning

Virtual reality (VR) creates a realistic learning space that can mimic real-life or fantastical situations. It gives students a way to learn through experience that is not possible with traditional methods. With VR-enabled eLearning, students can go on virtual field trips, do studies in a simulated lab, or practise skills without any danger. For instance, VR can take history students to the time of ancient civilizations and let them visit real-life historical sites (Chan*et al.*, 202). This engaging experience not only keeps people interested but also helps them understand and remember what they've learned. However, the general use of VR in eLearning is limited by things like the high cost of VR equipment, the need for strong technical infrastructure, and the fact that some users may feel sick when they move around.

Enhancing Personalized Learning with Artificial Intelligence

AI is changing eLearning by making it possible for students to have personalised learning paths that are based on their needs and tastes. AI algorithms can look at students' work, how they learn, and their progress to give them

personalised lessons and comments in real-time. This amount of customisation helps deal with the specific problems that each student is having, which makes their learning experience better. AI-powered teaching systems, for example, can figure out where a student is having trouble and offer extra help or different ways of looking at things (Fitria, 2021). AI can also do administrative jobs like taking attendance and grades automatically, which frees teachers to focus more on teaching. AI has many benefits, but it also raises ethical concerns about data privacy and the possibility of biased algorithms. To confirm that AI is used fairly and efficiently in instruction, it needs expected cautiously controlled.

Conclusion

In summary, a thorough review of improving educational opportunities, transforming learning using AI, AR, VR has brought attention to how revolutionary AI may be in the field of teaching. This study has looked at how intelligent machinery is changing the way that we educate, how we evaluate students, and how we streamline office processes. It additionally examined into the difficulties and worries that come with using robotics in learning, such as the necessity for teacher preparation, algorithmic prejudice, and information security.

AI will have an ever-greater influence on schooling as it develops. Artificial Intelligence (AI) has promise for enhancing student results, personalizing educational activities, and expanding educational accessibility and inclusivity. Teachers may improve involvement as well as retention by using AI to develop adaptable educational settings that meet the requirements of every student.

In the future, artificial intelligence has a great deal of promise to improve learning processes. AI-driven evaluation instruments may provide immediate insights into pupil achievement, and powered by AI, AR, VR adaptive educational programs may provide pupils individualized learning routes. AI can also make it easier for professors and students to collaborate, which will make their educational setting more dynamic and interesting. In summary, artificial intelligence (AI) has the potential to completely transform schooling by improving the learning process for pupils, changing the way that we educate, and streamlining administrative procedures. The use robotics in classrooms has enormous promise, even if there are obstacles to be solved. All learners may benefit from a more efficient, successful, and welcoming educational environment if instructors embrace AI and take full use of its possibilities.

References

Ardiny, H., &Khanmirza, E. (2018, October). The role of AR and VR technologies in education developments: opportunities and challenges.

Brandon_Hall_Group, 2022 Learning and Development Benchmarking Report. Brandon Hall Group, 2022.

Chan, C.S., Bogdanovic, J. and Kalivarapu, V., 2022. Applying immersive virtual reality for remote teaching architectural history. *Education and Information Technologies*, *27*(3), pp.4365-4397.https://www.researchgate.net/profile/Chiu-Shui-Chan/publication/355584196_Applying_immersive_virtual_reality_for_remote_teaching_architectural_history/links/6228d640a39db062db8d7537/Applying-immersive-virtual-reality-for-remote-teaching-architectural-history.pdf

Dhar, P., Rocks, T., Samarasinghe, R.M., Stephenson, G. and Smith, C., 2021. Augmented reality in medical education: students' experiences and learning outcomes. *Medical education online*, *26*(1), p.1953953.https://www.tandfonline.com/doi/pdf/10.1080/10872981.2021.1953953

Fitria, T.N., 2021, December. Artificial intelligence (AI) in education: Using AI tools for teaching and learning process. In *Prosiding Seminar Nasional & Call for Paper STIE AAS* (pp. 134-147). https://prosiding.stie-aas.ac.id/index.php/prosenas/article/download/106/104

J. Yu and Z. Hu. 2016. Is online learning the future of education?, September, Word Economic Forum.

Lin, Q., Yin, Y., Tang, X., Hadad, R. and Zhai, X., 2020. Assessing learning in technology-rich maker activities: A systematic review of empirical research. *Computers & education*, *157*, p.103944.https://www.sciencedirect.com/science/article/am/pii/S0360131520301421

UNESCO. (2020). School closures caused by Coronavirus (Covid-19).