

AUGMENTED REALITY AND VIRTUAL REALITY: A DIGITAL TRANSFORMATION IN EDUCATION

Ms. Khushboo^{,1}, Dr Vinod Kumar Srivastava²*

. ¹PhD Research Scholar, Department of Computer Science and Applications, Faculty of Management and Commerce, Baba Mastnath University, Rohtak

*². Professor, Head of Department of Computer Science and Applications, Faculty of Management and Commerce, Baba Mastnath University, Rohtak,
srivastava_v_k@yahoo.com*

** Corresponding Author: write.khushboo@gmail.com*

ABSTRACT

Education hinges on the pivotal factor of the learning. Education is the cornerstone to explore new ideas and with this exploring creativity we can develop the World as well. Digital transformation is the evolution of the operational backbone driven by latest technologies like IoTs, Augmented Reality and Virtual Reality. AR/VR are not confined only with gaming and entertainment , but have a great impact on education as well with its interactive and engaging real time experiences. These technologies enhance the real world by affixing layers of digital elements into it. We can experience the concepts via our senses and perception system, that is our five basic senses. The capacity held by these technologies is unlimited and flawless. The purpose of this paper is to give a broader view about the use of Augmented reality, Virtual Reality in the field of Education and achieving the sustainable Goal as well.

Keywords: Digital Transformation, Augmented Reality ,Virtual Reality, Sustainable Goals

Introduction: When we analyze the technologies employed in educational settings from historical times to the present, there is a big transformation or can be termed as Digital Transformation. A change has transpired in from chalk and blackboards to Information

technology landscape, smartboards, even to cognitive technologies like Augmented Reality and Virtual Reality with artificial Intelligence. AR/VR (Augmented Reality and Virtual Reality) are new technologies that has emerged with potential for application in education. In The past few years, the extensive utilization of computer and internet technologies in various aspects of our lives has been so pervasive that the exclusion of educational services from this domain was inconceivable. Utilizing AR/VR in educational settings is gaining momentum as more schools embrace this transformative technology. Now a days it becomes possible even for an average user, to move into the sphere of graphics. This fascination with the new reality frequently commences with computer games and endures indefinitely. It enables individuals to perceive the world around them through an alternate dimension, providing immersive encounters that transcend the limits of reality, including those that are yet to be conceived. AR/VR supports the seamless interaction between the real and virtual environments and allows a tangible interface metaphor to be used for object manipulation. This paper summarizes the potential of augmented reality and virtual reality.

Analyzing the contribution of AR/VR integration into education: Augmented Reality is defined as a technology that integrates virtual objects seamlessly with the real world and enables interaction between them. Although Augmented Reality applications serve purposes across diverse domains, their most profound influence is witnessed within the realm of education. AR technology enables the fusion of tangible objects and virtual data, fostering heightened student engagement with real-world surroundings and enhancing their educational experience. (Yeom, 2011)

AR applications facilitate students' comprehension and understanding regarding intangible notion of learning and teaching process; it fosters collaborative settings for students to exchange information collectively. (Chiang, 2022). Moreover scholarly research substantiates that these settings notably enhance students' learning outcomes. Additionally, AR is understood for its capacity to heighten students' engagement, motivation and experiential learning in the educational domain while fascinating the transfer of knowledge and skills acquired in virtual

environments to real- world settings. Technology has become embedded in education and the results indicate enhancing learning outcomes in a positive manner. In addition,the majority of studies undertaken on Augmented Reality thus far indicate that students exhibit enthusiasm and keen interest in utilizing this technology for learning. Nowadays three dimensional graphics have broken down borders and constraints, opening up new possibilities for learning and enhancing with a fourth dimension-the dimension of our imagination. However, it's never sufficient: individuals consistently crave more. They want to step into this world and interact with it instead of just watching a picture on the monitor.Virtual Reality (VR), the technology that has gained immense popularity and become a prevailing trend in the current decade, refers to the immersive digital experience that simulates real- world environments.



source:<https://www.forbes.com/sites/bernardmarr/2021/07/23/10-best-examples-of-vr-and-ar-in-education/?sh=78e8b60d1f48>

VR as a learning tool was initially adopted for workplace training scenarios, most notably for flight simulators.As graphic capabilities, ambisonic audio, animated visuals and affordability have progressed, Virtual Reality (VR) has expanded its applications, encompassing a broader range of use cases, including its integration into the field of education. Today,using VR students actively immerse themselves in the lesson content, practice practical life skills and enhanced

information retention. Furthermore, employing high-performing personal computers (PCs) in conjunction with virtual reality (VR) technology can provide an even more immersive educational encounter, characterized by crisp visuals and seamless animations.

Virtual Reality has capabilities that could turn it into a valuable asset for education. For instance, a study conducted at Penn State University revealed that students who utilized immersive virtual reality to complete a task accomplishes it over two times faster compared to students using conventional computer programs.

In the education sector researchers and practitioners have been delving into the possibilities and opportunities presented by AR and VR in education and training. For instance, (Azuma, 1997) demonstrates the efficacy of these technologies in terms of training and education across diverse domains, including but not limited to healthcare, operations, management and geography.

Benefits of Digital Transformation in Education and Sustainability:

Over time, educators have increasingly become captivated by the newfound possibilities arising from AR/VR technology, recognizing its potential to revolutionize education.

- **Interactivity:** Real time interactions as well as social intersections, a feedback mechanism is possible by giving comprehensible reactions.
- **Simulation:** Creation of innovative and experimental scenarios and a variety of explorative options.
- **Submergence:** Immersive experiences involve the development of virtual environments, such as virtual laboratories, and the utilization of 3D visualization to provide a heightened sense of realism and perception.
- **Collaboration:** education in virtual associations, which can also create group cohesiveness.
- **Learnability:** Expanding cognitive learning, such as improving concentration skills,

understanding various contexts and establishing connections, in order to facilitate independent learning regardless of location and time.

- Engagement: Increasing motivation through fun and playful learning.
- Cost Effectiveness: Lowering the risk of sunk costs due various scenarios being displayed through off the shelf devices.

Even long after the use of Augmented Reality and virtual reality technologies in education, students retain vivid memories of their experiences and eagerly reflect on them in future lessons. These technologies prove to be particularly beneficial for learners with learning challenges. They provide a secured and supervised setting for learners to explore and understand the surrounding environment..Among primary school students, immersive classrooms using VR are especially popular in assisting those with learning difficulties. In immersive classrooms, teachers can facilitate instructional sessions in a more conventional manner while students still have the freedom to look around and engage in virtual environment exploration. (Ebinger, 2022).This familiarity prevents students from feeling confined or overwhelmed.

Furthermore, research has shown that AR/VR are helpful learning aids for learners with autism. These approaches encounter a unique and engaging way to present information, cater to different learning styles, and provide personalized learning experiences for students on the autism spectrum.(Chang, 2011). Overall, AR and VR innovations possess the capacity to revolutionize education by creating inclusive and interacting learning environments that benefit all students, particularly those with learning difficulties or special needs.

.Applications of AR/VR in Education:

1. Utilizing augmented reality, one can illuminate science concepts with vibrancy in a captivating manner. For instance, we can create a virtual tornado and bring it directly into the classroom, enabling students to witness the destructive power of these storms up close. This immersive experience provides a deeper understanding of tornados and engages students in their learning. Similarly, students can participate in an augmented

reality experience of a beehive, exploring the inner workings of the hive and observing how bees collaborate to support their community.

2. The SkyView app leverages augmented and virtual reality overlays to enable the exploration of the Universe by students. By pointing their mobile devices upwards, users can engage in stars and constellations, planets and even satellite identification. This interactive experience enhances astronomical knowledge and fosters curiosity about the cosmos.
3. The Froggipedia app revolutionized biology education by allowing students to discover the internal organs of a frog through augmented reality and virtual reality technologies. This innovative approach replaces the traditional and often distressing process of dissecting frogs, offering humane and immersive alternatives.
4. Microsoft HoloLens has introduced mixed reality applications that enable medical interns and clinical learners to gain insight into the anatomy of the human body. By navigating through the bloodstream, isolating organs, and exploring their structures, learners can deepen their understanding of anatomy and gain insights into treating medical conditions.
5. Immersive VR education, in collaboration with BBC, has produced “1943 Berlin Blitz in 360°.” This educational experience utilizes real life visuals from a late night mission in Nazi Germany, providing students with a glimpse into the lived experiences during significant historical events.
6. Google Expeditions offers highly engaging educational excursions, allowing teachers to virtually transport their students to locations like BaseCamo at Mount Everest or the Louvre. Through these virtual expeditions, students can explore places that may otherwise be inaccessible, enhancing their understanding of the world.
7. Virtual Speech provides virtual reality simulations for practicing public speaking. Users

can use virtual reality goggles and practice speeches confronting virtual audiences, offering a realistic and immersive environment for improving presentation skills.

8. Steam's VR Museum of Fine Arts offers an up-close viewing experience of world class paintings and sculptures, including iconic pieces like the Mona Lisa. Users can explore these artworks without the restrictions of crowds or protective glasses, enhancing appreciation and understanding of fine art.
9. Extended Reality, such as virtual reality, is utilized by police departments to train officers in handling riot situations or conducting arrests. By simulating specific scenarios, virtual reality training helps enhance safety for both officers and citizens.
10. Language learning becomes more immersive and effective with educational software like Mondly based on Virtual Reality. Users can engage in real conversations with virtual characters, providing a powerful and memorable language learning experience that goes beyond theoretical reading and allows practice in authentic contexts.

Conclusion: As emerging and versatile technologies, AR and VR demonstrates the transformation in Education and ESD. to attain a profound comprehension we first identified the contribution of AR/VR in these fields , then the benefits and various applications regarding the same from existing literature. This analysis show that AR and VR technologies are effective instruments to promote Education and Sustainability goals due to their simulative and interactive properties making a decisive contribution to the transfer of knowledge and values as well as to the understanding of action. Further Research should evaluate the effectiveness of immersive and interactive AR and VR in various scenarios for educational purposes.

References:

- Azuma, R. (1997). A survey of augmented reality. *Presence: Teleoperators and Virtual Environments*, 6, 355-385. DOI:10.1162/pres.1997.6.4.355
- Chiang, F.K. , Shang, X, Qiao, L. (2022). Augmented Reality in vocational Training: A systematic review of research and applications. *Volume 129, April 2022*, 107125. <https://doi.org/10.1016/j.chb.2021.107125>.
- Chang, G., Morreale, P., & Medicherla, P. (2011). Applications of Augmented Reality Systems in Education. *Proceedings of Society for Information Technology & Teacher Education International Conference 2010*, 1380-1385.
- Ebinger, Frank, Buttke, L.(2022). Augmented and virtual technologies in education for sustainable development: An expert based technology assessment. 2.
- SCY Yuen, G Yaoyuneyong: Augmented Reality: An overview and five directions for AR in education.
- Yeom, S.J. (2011). Augmented Reality for Learning Anatomy. *Proceedings ascilite 2011 Hobart: Concise Paper*. 1377-1384.