ISSN: 2754-6705

Journal of Mathematical & Computer Applications

SCIENTIFIC Research and Community

Review Article

Open Access

Advanced Applications of AR/VR in Immersive Education and Experiential Training

Syeda Kawsar

USA

ABSTRACT

Augmented Reality (AR) & Virtual Reality (VR) are considered as evolutive tools in education and training, along with enhancing progressive, multimedia &activity-based learning programs. Thus, they close the gap between the course content knowledge and applicability by offering realistic, interactive and engaging exercises and simulations. AR and VR allow for the simulation of real-life circumstances, and the educational processes offered can be customized to meet the needs of different industries to improve knowledge absorption. This paper aims to discuss the kind of influences that form the basis for AR/VR in various fields, with a significant emphasis on educational and training sectors. In the medical industry, AR/VR make it possible to practice surgeries and to study human anatomy deep and intricate with no potential endangerment to patients. The automotive design and manufacturing industries count on AR/VR as vocational training components to support exercises that would otherwise be risky, such as auto mechanics, aviation, construction ventures, and military applications for strategic planning and physical combat scenarios. Technology-based learning enhances the ability of students to learn interdependently and collaborate, hence enhancing learning. As it is seen, such strategies have virtually unlimited possibilities; nevertheless, there are still many difficulties; for example, high costs, limited availability, and the use of technology make such adoption difficult. This study realizes that there are some challenges like the cost of acquiring AR/VR devices, lack of utilization infrastructure in areas that have been deemed rural and remote and possible adverse health effects due to prolonged utilization of the devices that need to be dealt with.

***Corresponding author**

Syeda Kawsar, USA.

Received: March 01, 2023; **Accepted:** March 13, 2023, **Published:** March 17, 2023

Keywords: AR/VR, Learning and Teaching, Training, Simulation, Interactive Learning, Aviation

Introduction

Education and training have always been the fastest in adopting new technologies in order to improve teaching and learning processes. The terms Augmented Reality (AR) and Virtual Reality (VR) have shifted from being used majorly in gaming and entertainment to being revolutionizing means in learning and training These technologies provide learners with a chance to manipulate contextual representation where they can engage with learning contents in forms similar to the real world or blended versions. The growth of AR/VR has been made possible by the growth in headsets and smart glasses as well as the software platforms that set up complex virtual reality. As a result, this paper focuses on the analysis of the ways in which AR/VR is implemented in educational and training processes, the advantages and disadvantages of their use, and future prospects for paradigm shifts in learning.

Applications of AR/VR in Education

Each of the opportunities described above has its risks, but applying AR/VR in education can bring numerous benefits to the process, enhancing the learning outcomes.

Medical Education and Training

Today, the application of AR/VR technology is most effective in the medical field, especially for education. This is particularly helpful in practicing surgeries, especially for students and practitioners who work under virtual conditions with VR reducing risks of harm. For example, VR interactive training in Osso VR offers realistic surgical experiences to engage trainees with actual procedures that cannot be carried out on human bodies. Likewise, with the help of AR, learners benefit from more detailed and accurate visualizations of human anatomy by augmented 3D models on a physical model, thus improving their understanding of the human body's organization.

STEM Learning

Science, Technology, Engineering, and Mathematics (STEM) learning is enhanced by augmented reality/virtual reality. Particularly, these technologies help students illustrate ideas which cannot be depicted in two-dimensional space as molecules or extant astrophysical processes. Google Expeditions allows learners to participate in virtual field trips such as Mars, the human body system inside, etc., making learning fascinating.

Language Learning

AR/VR enables one-to-one and one-to-many real-life-like conversations with AI agent's avatars to L2 learners for practice [1]. This involves-theory approach assists more in mastering pronunciation, right grammar usage and cultural issues. Mondly VR has features that include ordering a meal at a restaurant, or even finding oneself at an airport, all of which are practical applications.

Education for History and Cultural

Through a concept called AR/VR we get an opportunity to relive civilizations, landmarks and many important events in history and

culture. In the same respect, students can navigate through the Pyramids of Giza, wander around Ancient Rome or actually be a part of history. This makes the experiences enhance relationality and better grasp of historical and cultural antecedents.

Applications of AR/VR in Training

Vocational and Skills Training

AR/VR in vocational training occurs for professional training areas which include automotive, welding, and construction. For example, aviation VR simulators allow pilots to perform flights in different weather conditions and improve their preparedness.

Military and Defence Training

Military training is an important application area of AR/VR where actual battlefields and situations are recreated. VR platforms allow soldiers to simulate tactical manoeuvres, use actual arms, and rehearse for emergencies in real geophysical environments. AR also complements real-world training because it provides the soldier with additional information that, for instance, superimposes a map or the location of the enemy onto their field of view.

Corporate and Soft Skills Training

Businesses use AR/VR for assessments, training, and development in the workplace to facilitate orientation, team building, and leadership development, to name but a few. Applying two types of immersive learning with VR, students are in a safe environment to meet a public speaking situation, carry out an interview or solve conflicts in the workplace [4]. When the scenarios presented are as close to real-life situations as possible then confidence and skills can be practised.

ERST

AR/VR is also useful in training first responders as well as anyone or any entity involved in handling crisis situations. Tabletop and games of natural disasters, fire outbreaks, or hazardous chemical spills let trainees to enhance their response options without genuine threats. These virtual actualisations enhance effective decision-making, co-ordination and preparedness. The impact of an organisation's internal environment on its ability to achieve its strategic objectives and goals is identified:

Impacts of AR/VR in Learning Content and Training

- **Immersive Learning:** The fact that it is possible to achieve realistic conditions leads to greater interaction and knowledge recycling.
- **Risk-Free Practice:** Students can learn and practice and make errors without having adverse effects on real life [2].
- **Personalized Learning:** AR/VR technologies allow variation in strategies and approaches to learning and teaching of lessons based on the needs and learning rate of the learners.
- **Global Accessibility:** In this regard, the use of information technology and especially internet connection is also a very powerful tool for the deployment of AR/VR applications in reaching out to hard-to-fine and presenter communities, thus enhancing access to quality education and training

Challenges and Limitations

Despite their transformative potential, AR/VR technologies face several challenges:

- **High Costs:** AR and VR technology, the hardware and the software behind it can be very costly for many institutions.
- **Technological Barriers:** Challenges that come with the implementation of the hardware include poor internet connection, compatibility of the devices, and lack of adequate technical support, all of which contribute to the slow uptake of solutions [3].
- **Accessibility Concerns:** Due to this, it will not be easy for persons with disabilities to fully embrace the use of AR/VR in their business, thus the need to embrace inclusive design.
- **Health and Safety Risks:** It was also revealed that discomfort such as eye fatigue, motion sickness, and discomfort on the head, neck, and other parts of the body may be experienced when the users of AR/VR headsets are very many, and their duration of use is long.

AR/VR in Education and Training and Their Future Possibilities

Thus, as the technology of AR/VR grows as well, potential areas of its application will also widen. New innovations include using AI for learning experiences, utilising 5G for networks, and haptic feedback for touch experiences. Further, cuts in the cost of AR/VR hardware, along with making them much more accessible also, will automatically introduce more equitable usage. AR/VR is being seen as a discovery opportunity by governments and a large number of educational establishments all over the world. For instance, projects like the EU-financed project on the future of work and learning called XR4ALL to boost innovation in extended reality technologies is being developed.

Conclusion

AR/VR have revolutionised education and training domains by making education creative, collaborative, and realistic. Used in everything from medical simulations to corporate training and cultural education, they have a really broad spectrum of use. Although some of them resemble the current issues like costs or accessibility there are future investments and improvements that will make AR/VR a natural part of learning environments. However, if well managed, the potential of these technologies is that massive improvement of learning environments, accessibility and engagements that in turn produces members of society capable of meeting the challenges of the world. Every organization requires an accounting system to ensure that records of financial activities are properly kept, analysed and stored and can be retrieved whenever the need arises.

References

1. M Park, S Lee, Ki Seok Jeon, H Seol (2019) A Study on the Development Direction of Education and Training System based on AR/VR Technology. Journal of the KIMST 22: 545-554.
2. T N Fitria (2023) Augmented Reality (AR) and Virtual Reality (VR) Technology in Education: Media of Teaching and Learning: A Review. International Journal of Computer and Information System (IJCIS) 4: 14-25.
3. Y Zhou (2021) VR/AR Technology in Human Anatomy Teaching and Operation Training. Journal of Healthcare Engineering 2021: e9998427.
4. B Gan (1187) Design and Application Research of VR/AR Teaching Experience System. Journal of Physics: Conference Series 1187: 052079.