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VIRTUAL REALITY TRENDS IN EDUCATIONAL SIMULATION: PERSPECTIVES, CHALLENGES, AND CURRENT PRACTICES

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Abstract

Virtual Reality (VR) provides an immersive and interactive experience, allowing students to engage more deeply in the learning process. This experience can improve understanding and retention of information because students can feel and interact directly with learning material. VR technology enables personalized learning according to each student's needs and learning pace. This helps accommodate a variety of learning styles and abilities, providing a more inclusive experience. Virtual Reality has great potential to revolutionize education through immersive and interactive simulations. However, challenges such as cost, availability of quality content, and health concerns need to be overcome for this technology to be adopted more widely and effectively. Current practice shows that with the right approach, Students in a range of academic areas can benefit from creative and relevant learning experiences that virtual reality can offer. Virtual reality (VR) has demonstrated significant promise in enhancing student comprehension and learning. VR can be a useful tool for developing creative and interesting learning experiences for students if current techniques are put into practice and present problems are overcome.

Keywords: virtual reality, educational simulation, perspectives, challenges, current practices

INTRODUCTION

Education has undergone major changes in recent years, especially thanks to advances in technology. One of the most interesting innovations that has brought significant changes in education is image source Input Technology. VR not only offers immersive and engaging learning experiences, but also opens the door to more effective and creative teaching (Cook et al., 2019). Virtual Reality (VR) in education has opened a new dimension in the world of education, offering immersive and interactive learning experiences that were previously impossible to realize. This technology allows students to explore the world, conduct scientific experiments, or even visit ancient civilizations in a safe and controlled 3D environment.

Liu et al., (2017) stated that virtual reality (VR) or also known as Through the use of virtual reality technology, people can engage with a digitally produced three-dimensional environment. This technology allows lesson teachers and users to interact in a three-dimensional space. With Virtual Reality, learning can still be closely supervised but with a more interesting perspective so that learning becomes more effective.

According to Marougkas et al., (2023) the use of VR in education has brought learning from traditional textbooks and blackboards to a more interactive world. In a VR environment, students can experience lessons rather than simply reading them. For example, history students can feel as if they are in the midst of significant historical events, while natural science students can explore atomic structure at the molecular level. This ability to interact with learning content can improve understanding and retention of information.

The development of VR technology has had a significant impact on education. In particular, this technology has helped course teachers to create interactive learning spaces and provide learning experiences that allow students to interact with the space and materials in a more immersive way. This technology has expanded the scope of learning spaces to the outdoors and also outside the school. VR has given schools the opportunity to approach learning material with children on a broader level, by observing the environment to understand geographical processes and natural processes for example. Due to this, children can learn more effectively, with a higher degree of flexibility, while maintaining a safe and open learning platform (Martín-Gutiérrez et al., 2017).

VR can also be used to increase students' access to different curricula; allows students to see, feel, and share learning experiences with visualization tools. These visualization tools can help students to understand complex concepts as well as practice material across various types of tests from different levels. In addition, there are many features of VR technology that enable the quality of learning to be improved. Thanks to this technology, virtual video and audio can be played in high quality. VR also allows students to move engagingly within the learning space and control multiple viewing perspectives. This technology can also help students to share learning experiences around the world in a more interactive way (Wei et al., 2023).

VR also allows educators to use interactive tools for learning. For example, VR can help teachers engage in learning simulations where they can decide how material should be taught and memorized. Teachers can also use

this technology to develop amazing practice experiences, helping students to practice the material they have learned. Virtual Reality technology has also enabled educators to increase the continuity of learning (Daniela, 2020). Previously, instructors had to take students to a laboratory or facility to ensure that they had the best learning experience. Now, teachers can move the learning space to a place where students can study as if they were in their homes, providing a student experience with greater flexibility and access.

Ultimately, Virtual Reality technology has provided new methods for educators to create effective and enjoyable learning experiences. With this technology, course teachers, students, and instructors can now enjoy the learning experience in a more effective and more interesting way (Rojas-Sánchez et al., 2023). In other words, this technology has increased learning efficiency so that students can learn in a more effective way. However, with the advantages offered by VR technology in education, there are also some risks that sometimes exceed the limits of justification. VR can act as an "anesthetic" that relaxes students' thinking abilities more than using tools that lead them to think autonomously, such as traditional tools. In other words, modern technology can also have a negative impact on learning if not controlled properly. However, in the right way, VR technology can be used to create effective courses and help students to learn more effectively and have fun. VR has made learning more interactive and allows for better strategies to ensure that lessons are captured and absorbed by students. Thus, this technology can be used to empower education worldwide and ensure that students receive excellent learning (Rashid et al., 2021).

Virtual Reality technology has opened up great potential in the world of education. It changes the way we teach and learn by providing immersive, interactive, and practical learning experiences. For educators, it is a powerful tool for creating motivating learning experiences, and for students, it is an opportunity to explore the world of knowledge in a way they have never experienced before. With more development and adoption of VR in education, we can anticipate greater transformations in the way we seek, teach, and receive education (Aczel, 2017).

RESEARCH METHOD

This research uses a descriptive method by collecting data from various trusted sources, including literature studies and recent publications. A descriptive approach is used to comprehensively describe virtual reality trends in educational simulation: perspectives, challenges, and current practices. The

first stage in this research method is collecting literature that is relevant to the research topic. A literature search was conducted through academic databases, scientific journals, and related publications that discuss virtual reality trends in educational simulations. The selected literature must be of good quality and relevant to the research objectives. After collecting literature, analysis and synthesis of the information found was carried out. Relevant data and information about virtual reality trends in educational simulation: perspectives, challenges, and current practices are comprehensively analyzed to identify virtual reality perspectives and practices in educational simulation, challenges of implementing virtual reality in education, and the role of virtual reality technology in related learning with research topics.

RESULT AND DISCUSSION

Perspectives and Practices of Virtual Reality in Educational Simulations

Virtual reality is being used more and more in education, however the pedagogy employed in this setting is rarely stated or made apparent. Ke, F., & Xu, X. (2020) examine the development of virtual reality environments within an educational framework and evaluate the state of the discussion on virtual reality learning. Keskitalo, T. (2011) classified common learning theories into five categories:

1. Direct instruction

   In the pedagogical concept of direct instruction, knowledge and skills are gained through instruction and reinforcement. Learning objectives are accomplished through lessons that are organized and supplemented with tutorials for review and reinforcement. Participants can practice fundamental skills in a safe and cost-effective setting while working in this hands-on learning environment.
2. Experiential learning

   In both real-world and virtual environments, participants gain knowledge from their own experiences. To aid in learning, these experiences can be included into instances of handling, thinking, seeing, experiencing, and doing. Through his interactions with the environment, a participant in this type of active learning contributes to the production of knowledge (Santos & Carvaho, 2013). This method works well for creating virtual reality information modeling. Accidents can be decreased and on-site efficiency raised by delivering information in an interactive environment.
3. Discovery learning

This form of instruction is built around the questions that come up when individuals who have received theoretical training acquire fresh experiences and apply them to comprehend and investigate novel ideas. If students participate in well thought-out learning activities and possess the required information, they have a better chance of succeeding in a discovery learning setting.

4. Situated cognition

   The relationship between knowledge and its physical, social, and cultural surroundings is clarified by the theory of situated cognition. All instances of experiential learning would seem to be the same as types of situated cognition. Actually, there are already a number of examples of structured learning opportunities in virtual reality environments from scientific study.

5. Constructivist learning

   According to social constructivist theory, students socially build their knowledge in response to external stimuli, meaning that learning happens more than only through information acquisition. As a result, in constructivist learning, students make sense of what they already know by drawing on their prior experiences to create own understanding. Self-efficacy and problem-solving skills are just two examples of how self-esteem affects students' academic success.

As is known, The use of virtual reality in education is still very new. Learning continues through abstract conceptualization, active exploration, and reflective observation after experience is gathered (Daniela, 2020). In this sense, a classroom that solely employs direct instruction deprives pupils of the chance to apply newly acquired information and make connections between it and what they already know. Teachers and participants lose out on these possibilities. In order to use their technical knowledge in an evolving, complicated, and globalized work world, professionals need to cultivate soft skills, such as communication skills, in addition to being experts in the technical parts of their area.

The study's findings offer a chance to evaluate how participants' presentation skills are affected by a non-traditional virtual reality technique. The findings offer insightful analysis and useful feedback on the use of alternative pedagogical teaching strategies that blend learners' developmental skills with technical knowledge. Changing the organizational approach to teacher training is highly relevant nowadays. The practical component receives particular attention in a competency-based approach (Real et al., 2017). It is important to take into account that important communication roles in

educational interactions are occurring under the effect of the growing transformation of digital learning environments (Dai et al., 2023).

The pedagogical process and the several pedagogical scenarios that participants may face in their future teaching practice can be authentically recreated using virtual reality simulators. Errors and mistakes are not serious in virtual reality. They operate as a guide for behavioral tactics that will be useful in resolving issues during the actual teaching process. When learning communication skills, participants in traditional methodologies encounter psychological obstacles. They frequently experience uneasiness and confusion. With virtual training, however, this is not the case (Salvetti, F., & Bertagni, 2019).

Participants feel more relaxed and comfortable. Virtual reality reduces their psychological stress, while maintaining educational benefits. In summary, implementing virtual reality simulators into educator training is expected to produce (Qiao, J., Xu, J., Li, L., & Ouyang, 2021):

1. Practical involvement in online conflict scenarios that are modeled after actual cases
2. The acquisition of reflexive and diagnostic abilities that support the planning of fruitful cooperative activities
3. The acquisition of abilities to settle disputes during the learning process
4. The growth of the capacity to plan, simulate, and anticipate your own actions and behavior while accounting for learning tasks that come up in difficult conflict scenarios
5. The creation of a communication culture, which serves as the foundation for establishing personal connections
6. The practicum fosters the development of decision-making and fast reaction in actual conflict situations.

Challenges of Implementing Virtual Reality in Education

The implementation of Virtual Reality (VR) technology in education has certain challenges that need to be overcome. The following are some of the challenges often faced in implementing VR in educational contexts (Lege, R., & Bonner, 2020):

1. Cost: One of the biggest challenges is the cost of purchasing hardware and developing quality VR content. High-quality VR devices are still expensive and difficult for many schools to access.
2. Technological Limitations: Although VR offers an immersive and interactive learning experience, there are still technological limitations that need to be

overcome. For example, high-quality VR headsets are still limited and difficult to access for many schools.

3. Lack of Teacher Training: The use of VR in education requires special training for teachers so that they can use this technology effectively and creatively. Lack of teacher training is one of the obstacles in adopting VR in learning.
4. Quality Content: Developing quality VR content requires time, resources and specialized skills. Quality content will ensure an optimal learning experience for students.
5. Space and Infrastructure Limitations: Implementing VR in education requires adequate space and supporting infrastructure, such as a stable internet network and sufficient speed to access VR content

While there are challenges in implementing VR in education, innovative solutions and collaboration between schools, technology developers, and the educational community can help overcome these challenges. In several studies, the use of VR in education has shown improvements in learning, understanding of material, and student motivation to learn. VR can provide an impressive learning method and make it easier for teachers to convey complex material. However, it is important to remember that according to Kavanagh et al. (2017), study is still needed to properly understand the impact and prospective applications of virtual reality (VR) in education, as the technology is still in its early stages of development.

The Role of Virtual Reality Technology in Learning

Virtual Reality (VR) technology is being introduced to all fields, including education. Virtual reality has real applications in education that can enhance the learning process. As a learning tool, technology actually provides a solution for educators and learners (Alshammari, 2019). In October 2020, the World Economic Forum (WEF) released a research stating that by 2025, 70 percent of schools would require Virtual Reality equipment. It is asserted that virtual reality affects student accomplishment in a variety of ways, including critical thinking abilities, positive feeling enhancement, and content comprehension.

Chavez, B., & Bayona, S. (2018) stated that The term virtual reality is a compound phrase made up of the English terms "virtual," which has a close meaning, and "reality," which refers to the actual things that we, as humans, experience. Thus, virtual reality is a technology that uses all five human senses to simulate the real world in a computer-generated setting. Because this

technology creates three-dimensional effects, people can experience conditions that look real.

According to Maghool et al., (2018) The ability to improve one's knowledge and abilities without having to do so in real life is one of virtual reality's benefits. This is typically utilized for instructional purposes. Virtual reality has now permeated the educational field, mostly to facilitate students' comprehension of the material being taught.

The application of Virtual Reality technology in learning aims to increase the absorption of information received by students. With VR, complicated and boring subjects will be more interesting and imaginative, compared to just listening to a teacher lecture. The following are the benefits of Virtual Reality for learning, both for students and teachers (Marks, B., & Thomas, 2022):

1. Boost interest in and zeal for learning

   When virtual reality is used in the classroom, pupils are not simply captivated on images from books or other audio-visual materials when acquiring information. Because virtual reality creates a three-dimensional visual representation of real items, it fosters curiosity and critical thinking in addition to helping pupils comprehend the topics being taught. High levels of curiosity lead to high levels of passion for learning. Furthermore, compared to traditional schooling, virtual reality technology permits more involvement.

2. Motivate pupils to use critical and creative thought

   VR technology in the classroom can help students become more enthusiastic about learning and overcome boredom during the process. This is a result of the increased creativity and interest in virtual reality-based teaching and learning activities. in order to offer a fresh environment for more contemporary teaching and learning activities. Additionally, this technology promotes student participation. They can engage with virtual items at will. Students are able to investigate, evaluate, and acquire experiences that improve their learning as a consequence.

3. Make it simpler for educators to present content

   The use of virtual reality in the classroom enhances the enjoyment of learning activities. Teachers can also utilize this as a way to disseminate materials and streamline the teaching and learning process. Thanks to VR technology, teachers no longer have to cover a lot of material in their lectures. The use of virtual reality (VR) in content delivery has the potential to improve efficacy and maximize student learning results.

The utilization of virtual reality in education has promise for raising educational standards in the long run. Taking into account that, in contrast to traditional learning, generation Z is today more interested in learning materials that integrate technology. The application of virtual reality in education has started. Multimedia and three-dimensional concepts can be employed to promote education and increase the effectiveness of student learning, according to Hu-Au, E., & Lee, J. J. (2017). Here is an illustration of how virtual reality can be used to enhance learning.

1. Biology's Digestive System
   Since much of the information regarding the human digestive system is contained inside the body, it is challenging to observe firsthand. Since visual aids cannot show blood flow, heart rate, or other organs when functioning inside the body, they are still regarded as traditional. Consequently, one way to get around these challenges could be to use virtual reality in biology classes. Virtual reality presents the human digestive system in a way that can pique students' interest in learning more about it.
2. Mathematics with Geometry
   Virtual reality can also be used for math classes. One of them is the geometry material, which covers the nature of space, as well as the shape, size, and relative positions of images. Students can study cones, spheres, cylinders, and polyhedra curves in three dimensions, for instance, by using spatial figures.
3. The Geographic Surface of the Earth
   VR can be used in geography classes as well. For instance, in content pertaining to Earth's surface. Students typically just focus on the images in books or films. Students can see clearly in forms that mimic the actual world thanks to educational technologies like virtual reality. Additionally, one benefit of VR for geography education is its capacity to depict nature across a large region.
4. Historical Artifacts and Temples
   This technique can also be used to study the past. The only ways to observe historical artifacts or temples are through drab photos or movies. Students can view historical social and environmental situations, as well as artifacts from the past, when virtual reality is used in history classes. This promotes conversation among students and critical analysis of previous lifetimes.
5. Astronomy's view of space
   Schools typically visit the Planetarium and Observatory buildings to study the universe directly. There is a recreation of the night sky there, along with

props representing planets and other celestial things. But this is less effective, particularly in the event of a pandemic. Students can learn about the universe in the classroom and even at home thanks to the use of virtual reality technologies. Learning about planets and other space objects is made easier with the 3D notion displayed than it is with images from books or videos.

6. Surgical operations practicum in medical school
   Prospective medical school students learning how to execute surgical procedures also benefit from this technology. VR is a more cost-effective way to train doctors than using a doll or real body since it allows for detailed analysis of the training outcomes.
7. Pilot education through training
   It is possible for even aspiring pilots to practice flying a plane without actually operating one. This lowers the possibility of accidents and is also effective. In addition, students enrolled in fighter pilot school can practice shooting without wasting real ammunition because virtual reality technology replicates real-world settings accurately.

Virtual Reality technology provides extraordinary benefits in life, including in the learning process. It is hoped that with this technology, it can be used as a new breakthrough in teaching and learning activities, as well as a way to raise the standard of education going forward.

CONCLUSION

Virtual Reality (VR) has become a significant trend in educational simulation. In an educational context, VR creates immersive and interactive learning experiences, allowing students to experience and interact with simulated digital worlds.

Perspective: The use of VR in education has great potential to improve student learning and understanding. With VR, students can experience realistic and immersive learning experiences, which can help them understand complex and abstract concepts.

Challenges: However, there are several challenges that need to be overcome in implementing VR in education. Some of these challenges include:

1. Cost: The cost of high-quality VR hardware and development of quality VR content remains a major challenge. High-quality VR devices are still expensive and difficult for many schools to access.
2. Technological Limitations: Although VR offers an immersive learning experience, there are still technological limitations that need to be

overcome. For example, limitations in terms of graphics resolution, processing speed, and limitations on available VR hardware.

3. Lack of Teacher Training: The use of VR in education requires special training for teachers so that they can use this technology effectively and creatively. Lack of teacher training is one of the obstacles in adopting VR in learning.
4. Quality Content: Developing quality VR content requires time, resources and specialized skills. Quality content will ensure an optimal learning experience for students.
5. Space and Infrastructure Limitations: Implementing VR in education requires adequate space and supporting infrastructure, such as a stable internet network and sufficient speed to access VR content

Current Practices: Although there are challenges in implementing VR in education, several current practices have emerged to overcome these challenges. Some of these practices include:

1. Collaboration between schools, technology developers and the educational community can help overcome the challenges of implementing VR in education. By working together, they can share resources, knowledge, and experience to create a quality VR learning experience.
2. Providing teachers with specialized training in the use of VR in learning can help them integrate this technology effectively in the classroom. This training may include use of VR hardware, development of VR content, and effective teaching strategies using VR.
3. Developing VR content that is diverse and relevant to the curriculum can increase student interest and motivation in learning. High-quality and engaging VR content will provide a better learning experience for students.
4. Continuing research and innovation in the use of VR in education can help overcome challenges and improve student learning experiences. This research could involve developing better VR technology, developing effective teaching methods, and evaluating the impact of using VR in learning

Although VR in education is still in its infancy, the use of this technology has shown great potential in improving student learning and understanding. By overcoming existing challenges and implementing current practices, VR can be an effective tool in creating innovative and engaging learning experiences for students.

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