European Journal of Mechanical Engineering Research, 10 (2),19-25, 2023
Print ISSN: 2055-6551(Print)
Online ISSN: 2055-656X(Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

Impact of Virtual Reality on Education

Krishna Sharma
Bachelors of Engineering, Chandigarh University
Mohali, Punjab

doi: https://doi.org/10.37745/ejmer.2014/vol10n21925 Published December 7, 2023

Citation: Sharma K. (2023) Impact of Virtual Reality on Education, *European Journal of Mechanical Engineering Research*, 10 (2),19-25

ABSTRACT: *More and more in the classroom, virtual reality is being utilised to teach, explore, and help students learn more about themselves. Virtual reality (VR) has quickly become recognised as a technology that has the potential to improve educational opportunities. Numerous educational facilities have started implementing VR technology recently in an effort to increase student retention, motivation, and engagement. This review paper gives a general summary of VR's effects on education, as well as some of its possible advantages and drawbacks. It specifically looks at VR's beneficial effects in a range of educational contexts, such as STEM education, medical education, and language acquisition. The study also evaluates case studies of institutions and schools that have included VR into their curricula and offers suggestions for educators and politicians interested I implementing VR technology. The paper concludes by discussing future paths for VR in education and highlighting obstacles that need to be removed in order to realise this technology's potential to revolutionise how we teach and learn. Overall, this review paper offers a thorough examination of how virtual reality (VR) is affecting education and how it might improve learning for students of all ages and educational backgrounds.*

KEYWORDS: Virtual reality, education, technology, immersive learning, student engagement, student motivation, student retention, STEM education, medical education,

INTRODUCTION

Virtual reality (VR) technology has recently made exciting new possibilities for improving educational experiences possible due to its rapid development. The use of virtual reality (VR) technology may immerse students in lifelike recreations of real-world settings, resulting in interactive learning experiences that have the potential to revolutionise the way we teach and learn. As a result, a lot of educational organisations and institutions are starting to look into using VR in their curriculum. The impact of VR on education, as well as its possible advantages and drawbacks, are examined in this paper. The introduction of the paper provides an overview of VR technology and its advancement in education. After that, it looks at VR's beneficial effects on education, such as better student engagement, motivation,

and retention, as well as its potential advantages in a range of academic contexts, including STEM education, medical education, and language learning [2]. The study also evaluates case studies of institutions and schools that have included VR into their curricula and offers suggestions for educators and politicians

Interested in implementing VR technology.

The paper also analyses potential future paths for VR in education and discusses the drawbacks of VR technology in the classroom, such as technical difficulties, high costs, and access problems. This paper makes the case that, with proper planning and implementation, VR may improve the learning experience for students of all ages and backgrounds. Despite the difficulties, the potential of VR to revolutionise the educational experience is substantial.

Overall, this review paper provides a comprehensive analysis of the impact of VR on education, highlighting its potential benefits and limitations, and providing insights for educators and policymakers seeking to incorporate VR technology into their educational programs [3].

VIRTUAL REALITY

Using a technique called virtual reality, individuals can experience immersive digital environments that stimulate real-world experiences. Users of virtual reality (VR) technology can immerse themselves in digital settings that replicate real-world situations. A headgear or other piece of equipment that tracks the user's motions and reacts to their activities is often used in VR technology to give the user a sensation of presence in the virtual environment. This technology has been employed in a number of industries, suchas entertainment, gaming, and healthcare, and its potential uses in education are increasingly being investigated [4].

To provide some realistic pictures, sounds, and other sensations that imitate a user's physical presence in a virtual environment, current standard virtual reality systems either use virtual reality headsets or multi-projected environments. A user can see around the virtual world, move around in it, and interact with virtual features or objects while utilising virtual reality technology. The impression can also be produced by specially built rooms with numerous large screens, although it is most frequently produced by VR headsets that have a head-mounted display with a small screen in front of the eyes. Virtual reality normally includes audio and visual feedback, but haptic technology may also enable additional types of sensory and force feedback [5].

Virtual Reality in the Education

The technological revolution has made it possible for new teaching and learning techniques. Virtual reality is one of the technologies that is conducive to the creation of new educational tools because it provides Tri dimensional computer worlds with sophisticated forms of interaction that can increase learning motivation [6].

Virtual reality (VR) technology can provide students fun, interactive learning experiences that can help them better understand and retain complicated ideas. Students can study and interact

with things and phenomena that might be challenging or impossible to access in a regular classroom setting by using VR to imitate real-world surroundings [7]. Additionally, VR enables design adaptive and personalised learning experiences that are tailored to the needs and learning preferences of certain students. Although virtual reality (VR) technology in education is still very young, it has already showed promise in terms of increasing student engagement, motivation, and retention and has the potential to revolutionise both teaching and learning. Therefore, it is crucial to investigate VR's effects on education, as well as its possible advantages and drawbacks [8].

By enabling immersive and engaging educational experiences, virtual reality (VR) technology has the potential to completely transform how we teach and learn. Virtual reality (VR) can give students the chance to explore abstract ideas and real-world situations that are difficult or impossible to replicate in a typical classroom setting. For instance, VR in science classes can give students a more participatory and interesting approach to understand complicated scientific topics like the human body or the operation of the solar system [9].

The Effectiveness of Virtual Reality in teaching STEM subjects

Science, technology, engineering, and math (STEM) subjects can be taught and learned in better ways thanks to virtual reality (VR) technology. Through immersive and interactive learning experiences that mirror real-world situations, virtual reality (VR) can provide students the chance to explore and interact with complicated ideas in a way that is more fun and memorable.

In STEM topics, virtual reality (VR) can help students visualise and engage with abstract ideas that could be challenging to understand through conventional teaching approaches [10]. For instance, VR can help students learn about the characteristics of electromagnetic fields or the behaviour of subatomic particles in physics. Students in engineering can create and test prototypes in a virtual environment using virtual reality (VR), which allows them to iterate and improve their designs more quickly and effectively than in a physical laboratory.

Additionally, VR can foster collaborative learning by allowing students to cooperate virtually to complete tasks or solve challenging problems. In order to succeed in STEM disciplines, students need to have strong communication and teamwork abilities [11].

According to studies, using VR to teach STEM courses can enhance student motivation, engagement, and learning results. For instance, students who learned about the circulatory system through a VR experience performed better on a post-test than those who learned using conventional techniques, according to a study by researchers at the

University of British Columbia. Researchers at Purdue University discovered in another study that students who learned about the solar system's structure through a VR experience remembered the information better than those who acquired it through a lecture [12].

Overall, VR technology has the potential to improve STEM teaching and learning by giving students engaging, immersive learning opportunities that can help them comprehend and retain difficult concepts. As a result, it is critical that educators and policymakers investigate the use of VR in STEM education and determine the best methods for integrating this technology into their curricula [13].

VR and Student well-being

The immersive and engaging experiences hat virtual reality (VR) technology may offer can assist to lessen stress and anxiety, fight social isolation, and boost mental wellness among students.

By offering immersive and compelling experiences that help ease stress and anxiety, prevent social isolation, and support mental health, the use of VR in education has the potential to have a positive impact on students' well-being. As a result, it is crucial for educators and decision-makers to investigate the use of virtual reality (VR) as a tool for enhancing student wellbeing and to find best practises for integrating this technology into their curricula [14].

Virtual Reality and Immersive Learning

The immersive aspect of VR offers students a highly dynamic and engaging learning environment that can improve learning outcomes. VR can help to establish a sense of presence and immersion by immersing pupils in a realistic and immersive environment, which can enhance memory recall and knowledge retention. Additionally, VR can help students practise and apply topics in a simulated setting, enabling them to gain knowledge and practical skills [15]. VR simulations, for instance, can allow students to practise surgical operations in a secure and controlled setting during medical training, assisting them in developing the skills required for real-world application. It is crucial to take the learning objectives into account while creating efficient VR experiences and to match the latter with the former. Students should have the chance to practise and apply topics in a realistic and immersive setting as part of the VR experience [16].

Virtual Reality and Assessment

Through the provision of unique and immersive assessment experiences, virtual reality (VR) has the potential to completely change the evaluation practises utilised in education. Written exams and multiple-choice exams are two common examples of traditional assessment methods that frequently fall short of accurately assessing a student's knowledge and skills. By recreating real-world settings and enabling students to exhibit their skills in a practical and interactive way, VR can provide a more accurate and thorough assessment environment [17]. When evaluating practical or hands-on skills, VR evaluation might be especially helpful. VR simulations, for instance, can be used to evaluate students' proficiency with complex procedures or the resolution of real-world issues in professions like engineering or medical. Teachers can assess their students' problem-solving, critical thinking, and decision-making abilities in a secure and controlled atmosphere by placing them in realistic virtual worlds.

Virtual Reality and the Future of Education

By offering immersive and compelling experiences that can improve learning outcomes, virtual reality (VR) has the potential to revolutionise education. In the future, VR might be used to provide individualised learning experiences that take into account the preferences and needs of each learner. Additionally, VR

can be used to give students access to previously unattainable chances for subject exploration and engagement. Additionally, VR can give students the chance to collaborate on projects and engage in collaborative learning in a virtual setting [18]. This can help students improve their communication and teamwork skills and encourage cross-cultural and global learning opportunities.

Challenges and Opportunities

There are several difficulties that must be overcome if the potential of VR in education is to be completely realised. These include obstacles of setting up and maintaining VR systems can be complicated and call for a high level of technical knowledge. The learning process might also be hampered by technical issues. Due to the high cost of virtual reality technology, many colleges and institutions might not have the funds to purchase the required hardware and software. Virtual reality lessons can be challenging to incorporate into current curricula, especially if teachers are unfamiliar with the technology. The use of VR technology in education raises significant ethical and privacy concerns, particularly with relation to data collection and student privacy [19].

The use of VR in teaching has a lot of potential, despite these obstacles. VR can be utilised, for instance, to provide pupils virtual field trips to far-off places and historic monuments. Students can explore and conduct experiments in a virtual laboratory setting using VR to provide them hands-on experiences in engineering and science. By allowing students to engage with virtual worlds and objects, VR can promote experiential learning and help students better understand difficult ideas. By giving students with impairments, mental health issues, or social anxiety a safe and supportive learning environment, virtual reality can enhance inclusivity.

CONCLUSION

By offering immersive and compelling experiences that can improve learning outcomes, virtual reality (VR) has the potential to revolutionise education. In four critical areas—including the teaching of STEM subjects, student safety, immersive learning, and the future of education—we investigated the effects of VR on education. All things considered, utilising VR in education has the potential to give students more interactive, personalised, and engaging learning experiences while also fostering diversity and accessibility. It will be fascinating to watch how educators use VR's advantages to equip students with the knowledge and abilities they need to succeed in a world that is changing quickly as technology continues to improve.

References

[1] K. Ghai and J. Singh, "ClusterinAlgorithms in Gene Expression: Data Analysis," in 2021 9th InternationalConference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), IEEE, Sep. 2021, pp. 1–4. doi:10.1109/ICRITO51393.2021.959659.

[2] J. Singh and K. Ghai, "Security andPrivacy Mechanisms for the New Generation Healthcare Applications Using Blockchain Technology," in2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and FutureDirections) (ICRITO), 2021, pp. 1–6. doi:10.1109/ICRITO51393.2021.9596107.

[3] J. Singh and K. Ghai, "ComparingNew Relic with other Performance Monitoring Tools," in 2022 10thInternational Conference on Reliability, Infocom Technologies and Optimization (Trends and FutureDirections) (ICRITO), 2022, pp. 1–5. doi: 10.1109/ICRITO56286.2022.9964706.

[4] K. Ghai and S. K. Malik, "Proximity measurement technique for gene expression data," Int. J. Mod. Educ.Comput. Sci., vol. 7, no. 10, p. 40, 2015.

[5] J. Singh and K. Kaur, "Dynamic FaultTolerance Job Allocation Mechanism to Conserve Resources in Vehicular Cloud," Int. J. Comput. Sci. Eng., vol. 7, pp. 538547, 2019, doi:10.26438/ijcse/v7i5.538547.

[6] R. Villena-Taranilla, S. Tirado Olivares, R. Cózar-Gutiérrez, andA. González-Calero, "Effects of virtual reality on learning outcomes in K-6 education: A meta-analysis," *Educ. Res. Rev.*, vol. 35, no. June 2021, 2022, doi: 10.1016/j.edurev.2022.100434.

[7] S. L. Predescu, S. I. Caramihai, and M. A. Moisescu, "Impact of VR Application in an Academic Context," *Appl. Sci.*, vol. 13, no. 8, 2023, doi 10.3390/app13084748.

[8] S. Mystakidis and A.Christopoulos, "TeacherPerceptions on Virtual Reality Escape Rooms for STEM Education," *Inf.*, vol. 13, no. 3, pp.1–13, 2022, doi 10.3390/info13030136.

[9] J. Radianti, T. A. Majchrzak, J.Fromm, and I. Wohlgenannt, "A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda," *Comput. Educ.*, vol. 147, no. July 2019, p. 103778, 2020, doi:10.1016/j.compedu.2019.103778.

[10] A. Christopoulos, N. Pellas, and M.Laakso, "education sciences ALearning Analytics Theoretical Framework for," 2020

[11] I. S. Khukalenko, R. Kaplan-Rakowski, Y. An, and V. D.Iushina, "Teachers' perceptions of using virtual reality technology in classrooms: A large-scale survey,"*Educ. Inf. Technol.*, vol. 27, no. 8, pp. 11591–11613, 2022, doi: 10.1007/s10639-022-11061-

[12] D. Hamilton, J. McKechnie, E. Edgerton, and C. Wilson, *Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design*, vol. 8, no. 1. Springer Berlin Heidelberg, 2021. doi:10.1007/s40692-020-00169-2.

[13] Y. Chamekh and M. A. Hammami,"Impact of Virtual Reality on Modern Education," *Int. J. Sci. Basic Appl. Res.*, vol. 4531, pp. 1–8, 2020, [Online]. Available: http://gssrr.org/index.php?journal=Jo urnalOfBasicAndApplied

[14] J. A. Bennett and C. P. Saunders, "AVirtual Tour of the Cell: Impact of Virtual Reality on Student Learning and Engagement in the STEMClassroom," *J. Microbiol. Biol. Educ.*, vol. 20, no. 2, pp. 2–4, 2019, doi: 10.1128/jmbe. v20i2.1658.

[15] D. Bogusevschi, M. Bratu, I. Ghergulescu, C. H. Muntean, and G.-M. Muntean, "Primary School STEMEducation: Using 3D Computer-based Virtual Reality and Experimental Laboratory Simulation in a Physics Case Study," *Innov. Pedagog. Eff. Technol. Learn. Work.*, p. 5, 2018, [Online]. Available: http://www.virtlab.com/

[16] D. Allison and L. F. Hodges, "Virtual reality for education?," *Proc. ACM Symp. Virtual Real. Softw. Technol. VRST*, vol. Part F129135, pp. 160– 165, 2000, doi: 10.1145/502390.502420.

[17] M. Raja and G. G. L. Priya,"Conceptual Origins, TechnologicalAdvancements, and Impacts of Using Virtual Reality Technology in Education," *Webology*, vol. 18, no. 2,pp. 116–134, 2021, doi:10.14704/web/v18i2/web18311.

[18] [18] H. Howell, Y. Lai, and C. Lee, "Simulations of Practice for the Education of MathematicsTeachers," Proc. forty-first Annu. Meet. North Am. Chapter Int. Gr. Psychol. Math. Educ., no. 2017, pp. 1933–1939, 2019, [Online]. Available: https://login.ezproxy.lib.purdue.ed u/login?url=https://search.ebscoho st.com/login.aspx?direct=true&db =eric&AN=ED606890&site=ehost -live

[19] P. M. O'Shea, "Augmented Reality in Education," Int. J. Gaming Comput. Simulations, vol. 3, no. 1, pp. 91–93, 2011, doi:10.4018/jgcms.2011010108.[4]

European Journal of Mechanical Engineering Research, 10 (2),19-25, 2023
Print ISSN: 2055-6551(Print)
Online ISSN: 2055-656X(Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK