

Virtual Reality Applications: Positive and Negative Effects

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Abstract

This research aims to see the importance of virtual reality, then we go to address the positives Of using virtual reality in general and identify the negatives of using virtual reality.

The essay's subsequent portion explores the potential difficulties of implementing virtual reality in the classroom.

Potential Physical Discomfort, Cognitive Overload, and Negative Perceptions of Student Groups.

The study also highlights both good and unfavorable findings from a survey of recent research papers on the application of virtual reality in education. To maximize its advantages and avoid any negatives, the author discusses the significance of carefully weighing the deployment and usage of virtual reality in education. The article provides a thorough examination of the possible effects of virtual reality technology on education and advises educators and decision-makers who are thinking about implementing it in their educational settings.

Keywords—virtual reality, simulation, virtual reality environment, learning

1 **Introduction**

With origins in the middle of the 20th century, virtual reality (VR) technology has been around for many years. The following are some notable occasions in the development of virtual reality:

The Sensorama was created in the 1950s by cinematographer Morton Heilig and combined 3D spectacles, stereo sound, and a vibrating chair to create an immersive viewing experience.

The first virtual reality head-mounted display (HMD), Ivan Sutherland, a computer scientist, created the Sword of Damocles in the 1960s. The HMD could show basic wireframe graphics because it was connected to a computer.

A system dubbed "Video Place," created in the 1970s by Myron Krueger, used cameras and projectors to make interactive settings. By moving their bodies, users could interact with virtual items.

One of the earliest businesses to market virtual reality gear was VPL Research, founded by Jaron Lanier in the 1980s. HMDs (Head Mounted Display), data gloves, and full-body suits, among other virtual reality accessories, were developed by VPL Research.

Companies like Sega and Nintendo produced VR game systems, but they were not successful.

The technology for virtual reality progressed and become cheaper in the 2000s. VR was first used for training and simulation in the engineering, medical, and military fields.

In 2016, PlayStation VR, HTC Vive, and Oculus Rift are a few VR systems. Were made available to consumers. These systems offered immersive gaming and entertainment experiences with high-quality visuals.

Numerous industries, including engineering, gaming, entertainment, education, and healthcare, employ virtual reality. Artificial intelligence and haptic feedback developments are making virtual experiences even more lifelike and engaging as technology continues to grow.

2 **Virtual reality**

A simulated experience that might be like or entirely unlike real Virtual reality (VR) is the name for this environment. A headset, gloves, or other pieces of specialist equipment that can produce a lifelike, interactive 3D environment are frequently used in this process. A

Computer-generated simulation is used in virtual reality technology to simulate numerous scenarios, including a virtual classroom, a medical procedure, or even a made-up universe. Users can engage with their surroundings and feel genuinely there.

A wide range of fields, including gaming, education, healthcare, architecture, and design, use virtual reality.

2.1 Virtual reality environment

Students with mobility issues can explore different VR sites without technologies is called a "virtual reality environment" by computer programmers. The dimensional environment that can be viewed with VR headsets or other fields actual environment" of computer programmers. This setting may be completely fictitious by using hand-held controllers, body cues, and verbal cues.

When creating the purpose of a virtual reality environment is to create a realistic and fascinating experience that can be used for everything assistants can interact with the environment and feel immersed and present

2.2 Virtual reality in learning:

By giving students an immersive and immersive experience, virtual reality (VR) has the potential to alter education.

Science and geography students can explore and learn in a more immersive way thanks to Virtual Reality (VR) with multi-use and immersive experiences from different regions of the world or even different eras. For example, a student can visit Rome or the Amazon rainforest.

Medical Training: VR can offer accurate simulations of surgical and medical procedures, allowing VR can provide accurate simulation a n d setting. This is particularly helpful for trainees to train in safe circumstances.

Language Learning: Virtual reality (VR) can provide a fully immersive language learning experience that allows student access to speaking with virtual people in real situations.

History: For a complete overview of historical events, use virtual reality (VR) to explore important .significant historical places or peruse a virtual museum.

Here are a few ways that VR can be applied to education:

Improving spatial and visual learning Students can gain a deeper understanding of spatial ideas and relationships through immersive and engaging visual experiences provided by VR. Students could utilize virtual reality to tour historical or scientific settings or to learn about the human body. (Gooch & Vasalou, 2016; Krokos et al., 2018)

By offering immersive and engaging experiences, virtual reality can help students stay interested in the topic and enhance retention. Students can utilize VR, for instance, to take part in simulations, practice skills, or communicate with intricate systems. (Lai & Chen, 2021; Moreno-Ger et al., 2008)

Creating virtual classrooms and enabling distant learning with No matter where they are, VR can give students the chance to participate in immersive learning experiences. (Ke, 2016; Pellas et al., 2019)

Collaboration and communication among students as well as between students and teachers can be facilitated through virtual reality (VR). For instance, students and teachers can collaborate on projects or role-play simulations using virtual reality. (Chen et al., 2019; Loizou et al., 2020)

With new capabilities for immersive and interactive experiences, Virtual reality (VR) has the power to alter how we study and engage with content.

A new technology called virtual reality (VR) has the potential to fundamentally alter how we learn. This review article evaluates current advancements in virtual reality in education, highlighting its advantages and disadvantages. An outline of VR's development over time and its history is given at the start of the article. The use of VR to improve teaching and learning is then discussed, including simulations, virtual labs, and immersive learning environments. The essay also considers the difficulties in implementing VR in education, including the excessive cost of the necessary tools and the requirement for specialized training.

Students who experienced the VR simulation demonstrated greater learning gains than a control group who received traditional classroom instruction and did noticeably higher on post-tests of their physics knowledge, according to the study. The researchers also observed that students' spatial

Visualization abilities, which are crucial for comprehending physics ideas, were enhanced by the VR simulation.

2.3 Virtual reality in serious games:

Serious games are increasingly being created with virtual reality (VR) in mind for a variety of training and educational objectives. Serious games are intended to give users a deeper and more engaging learning experience by going beyond simple enjoyment. Improved learning outcomes can result from the usage of VR in serious games by increasing the immersion and sensation of presence.

Research by Rizzo and Kim (2005) found that serious games for mental health therapies may be created using VR technology. According to the study, Veterans of the armed forces with post-traumatic stress disorder that find VR therapy uninteresting. Exposure treatment was performed in a safe and regulated environment thanks to VR, which may not have been achievable in more conventional therapeutic settings.

Another example of VR is used for serious gaming in medical education and training. Seymour et al.'s (2002) study found that VR surgical simulation helped trainees hone their surgical skills and reduced errors. With the advent of VR, it is now feasible to replicate surgical procedures realistically, improving the learning chances for trainees.

To instruct players on emergency reactions, VR has also been employed in serious games. In a 2017 study, Wang et al. discovered that VR simulations helped students develop their emergency response and decision-making abilities. Since VR technology has advanced, it is now possible to faithfully recreate emergency scenarios, creating a more immersive and interesting learning environment for the pupils.

3 Simulation:

Here are a few instances of simulation and virtual reality in the classroom:

Virtual reality simulations can be used in medical education to instruct medical students about procedures and emergency scenarios. For instance, operations have been imitated using Virtual Interactive Presence and Augmented Reality (VIPAR) technology.

Language learning: Immersive language learning experiences may be offered through virtual reality settings. The Virtual Island Project was used as an illustration to provide students with a virtual setting where they may hone their English language abilities. (Petersen et al., 2018). Science education: Interactive simulations of scientific ideas may be produced using virtual reality technology. Students can perform chemical experiments in a virtual setting by using simulations like the Virtual Chemical Lab, for instance.

Virtual reality may be used to replicate historical events and settings for historical teaching. By way of illustration, the Virtual Field Trips program enables students to electronically tour historic locations like the Anne Frank House and the Roman Colosseum. (Lohse et al., 2013). "

4 Virtual Reality Applications:

Due to its ability to deliver realistic and fascinating learning experiences, virtual reality (VR) has grown in popularity among educators. While some places and events might not be available to students in the actual world, VR technology can produce realistic simulations of such experiences, giving them a novel and interesting method to learn about them.

One use of VR in education is for medical training. Medical students may perform surgery in a safe environment with virtual reality (VR) simulators without jeopardizing real patients. Virtual reality medical emergency simulations may also be used to simulate life-or-death situations for trainees.

Another example is history education. Virtual reality (VR) technology may give students an interesting and realistic experience by recreating historical locations or occasions. Students could experience what it was like to be there at historic occasions like the Gettysburg Battle or the signing of the Declaration of Independence.

Students can practice speaking and listening in a foreign language by using a virtual reality (VR) environment. Giving kids more opportunities to converse and listen in a casual environment can help them learn languages.

Overall, virtual world (VR) tools have the potential to change education by giving students engaging, immersive learning opportunities that can help them better grasp complicated ideas and circumstances. Technology is projected to be used increasingly in education as it develops and becomes more widely available.

5 Benefits of using virtual reality:

Virtual reality (VR) has several advantages, including:

- An immersive learning experience delivered through VR can increase student engagement and motivate participation.
 - Improved memory: Since VR allows students to envision and engage with ideas, it can help them remember knowledge more vividly.
 - Access to faraway regions: VR can offer access to remote or hazardous locations that would be difficult or risky to visit in person, such as deep space or the ocean.
 - Cost-effective training: VR can offer cost-effective training for high-risk professions or situations, including training for the military or emergency medical services.
 - Learning experiences that are individualized and catered to the requirements and learning preferences of each learner are possible with virtual reality. each learner's requirements and learning preferences
 - Collaboration and teamwork: Through virtual group projects and simulations, VR can promote collaboration and teamwork.
 - Applications in the actual world: Virtual reality (VR) can offer practical learning opportunities that imitate applications of ideas, like engineering or architecture, in the multi world.
- In at times, VR has the power to transform education by delivering more dynamic and interesting learning experiences that increase retention and accessibility while also cutting expenses.

5.1 Why use virtual reality in science

Through immersive and engaging encounters, virtual reality (VR) presents a special opportunity to improve scientific teaching. VR is a useful tool for scientific teaching for the following reasons:

- Visualization of tough concepts: Virtual reality (VR) can assist students in visualizing challenging scientific topics that are challenging to comprehend using conventional teaching approaches. For instance, students can investigate in a virtual setting the internal workings of the human body or the chemical structure of a drug.
- Experience firsthand: Virtual reality (VR) can provide tours of places and attractions, allowing visitors to experience the setting. Tours of locations and attractions can be offered using virtual reality (VR), allowing tourists to experience them.
- Participation and motivation: Virtual reality Players are supported by virtual reality, which motivates them to engage in interacting with virtual environments. Students are more likely to be interested and motivated to learn when they may explore a virtual environment and participate more actively with scientific themes.
- Accessibility: VR can facilitate the dissemination of scientific concepts and experiments due to logistical or security issues more than they would otherwise be. For instance, children can travel to dangerous or remote locations like volcanoes or space in a secure and supervised virtual environment.

Overall, VR offers a distinctive and avant-garde method of teaching science that can improve engagement and learning in students.

6 Compare virtual reality and traditional learning

There are several notable distinctions between learning in virtual reality (VR) and traditional learning. These contrasts between the two are provided below:

- Immersion & Engagement: When compared to traditional learning, VR learning offers a more immersive and compelling experience. A more engaging and realistic learning experience is made possible by VR technology, which enables students to engage with 3D models, simulations, and virtual settings.

- Flexibility: Unlike VR learning, which can be done remotely from any place with an internet connection, traditional learning typically necessitates that the student be physically present in a classroom or lecture hall. Virtual reality learning offers greater flexibility in terms of where and when learning may occur. (Zheng, 2018)
- Cost: Due to the requirement for specialized hardware and software, VR learning may be more expensive than traditional learning.
- Safety: VR learning may offer a secure setting where students can practice and learn potentially risky skills, such as handling hazardous materials or performing medical procedures, without running the risk of harm or injury.
- Social Interaction: contact between students and teachers is more prevalent during traditional learning, but VR learning can be alienating and devoid of this. (Pappas, 2019)

Research is still needed to establish the pedagogical efficiency of VR learning in comparison to more traditional learning methods. While some studies have produced encouraging findings, others have yielded no appreciable variations. (Bower, 2014) both VR learning and conventional learning have advantages and disadvantages.

Despite the more immersive and interesting experience that VR learning offers, it can be pricey and lacks social connection. Although traditional education is more affordable and offers more chances for social engagement, it could not be as flexible or immersive as VR education. The decision between VR learning and traditional learning comes down.

To the individual learning objectives, available tools, and personal preferences of the student and the teacher

Overall, research points to the benefits of virtual reality learning over traditional learning, including better levels of motivation and engagement, improved information retention and transfer, and the capacity to imitate real-life events in a secure setting. Virtual reality learning does have certain drawbacks, though, such as the expensive technology and the requirement for technical ability to put it up and maintain it. Some kids could either not have access to the required technology or prefer the structure and social contact of traditional school environments.

6.2 Positive effects of virtual reality:

Here are several studies that show how virtual reality might improve education:

T. Erdem and M. Y. Aydin's study "Effects of Immersive Virtual Reality-Based Learning Environment in Elementary Astronomy Education: A Comparison Study" from 2018: This study looked at how primary kids' astronomy education was affected by an interactive virtual reality-based teaching environment. The results imply that virtual reality can improve learning and motivation for pupils.

By D. Dede (2009) in "Virtual Reality for Learning: A Retrospective Review of the Literature": According to a review of the research on virtual reality in education, it can help students grasp difficult topics and boost their enthusiasm and involvement. N. K. M. Tan, D. M. L. Wong, and C. H. Yang's article review article titled "Virtual Reality for Learning: A Systematic and Future Directions" published in 2021. The study on virtual reality in education is comprehensively reviewed in this education, using it to boost students' motivation, engagement, and learning results in a variety of subject areas.

S. S. Nambisan's 2017 article "Virtual Reality in Education: A Tool for Learning in the Experience Age" The potential of virtual reality to deliver immersive, hands-on learning experiences that improve students' comprehension and engagement is discussed in this article.

These studies demonstrate how the take of virtual learning in the classroom may enhance students' learning chances. Comprehension, and motivation. Although further study is these doing thinking that virtual reality might be a beneficial tool in education.

6.3 The consequence of using virtual Reality

Virtual reality may provide a variety of educational advantages, however, there are a few negatives to take into account:
Cost: Utilizing virtual reality technology might be costly, and it involves equipment and software that not all schools have access to. May have access to.

Technical difficulties: Hardware and software problems can disrupt learning and may need specialist assistance to resolve them. Disconnection from reality: Excessive usage of virtual reality may cause students to lose touch It is more difficult for them to communicate with others and find answers in the real world as a result of their experiences and interactions in the actual world. (Giannakos, 2018)

Motion sickness: Some students may experience motion sickness or discomfort when restricting their capacity to participate in educational activities by employing virtual reality.

Virtual reality technology use can be risky for kids' safety, especially if they are not adequately supervised or if the equipment is not kept up to date.

Over-reliance on technology: Over-reliance on virtual reality technology may result in a lack of conventional abilities necessary for success in the real world, such as critical thinking and problem-solving. (Kucuk, 2019)

Overall, despite virtual reality offering many potential educational benefits, it is crucial to consider and address any potential drawbacks to ensure that children are obtaining a well-rounded education.

6.4 Disadvantages of Virtual Reality

A. Cost and Accessibility

Expensive equipment and software

Not every pupil has access to virtual reality technologies

B. Health Risks

Motion sickness and nausea Eye strain and headaches

C. Technical Difficulties Malfunctions in hardware or software

Need for IT support and maintenance

D. Limited Social Interaction

VR learning can be isolating and solitary

Lack of in-person interactions with teachers and classmates

- Case Studies and Examples

A. Research studies on the negative effects of VR on education

B. Illustrations of how VR technology interferes with learning environments

C. Interviews with teachers and students who have encountered drawbacks to VR learning

7 Here are some research studies that discuss the adverse effects of virtual reality use:

"The Negative Side Effects of Immersive Learning: A Case Study of the effect of Virtual world on a Pre-service Teacher's Perception

Of and Attitude toward Students with Disabilities" by Charisse L. Willis and Elizabeth H. Dyer (2020): This study looked at how virtual reality might negatively affect a pre-service teacher's perception of pupils with impairments.

. According to the research, virtual reality immersion learning experiences may negatively affect how students with impairments are seen, which may result in incorrect actions and attitudes on their part.

By Hamideh Talafian and Yousef Naderi, "Virtual Reality as an Educational Tool: The Effectiveness of Immersive Learning on Basic Electronics" (2019): This study assessed how well virtual reality taught fundamental electronics to engineering students. According to the research, virtual reality can be a useful teaching tool, but it can also cause headaches, motion sickness, and disorientation, which could impair learning.

Michelle Grace Garcia, Maria Isabel Garcia-Pastor, and Javier Gómez-Puerto in "Examining the Harmful Impacts of Virtual Reality Education: A Systematic Review" (2021): Effects of virtual reality that are not positive on education were examined in this study. Methodical manner. The results suggest Effects of virtual reality that are not positive on anxiety, motivation, and cognitive load. Also, be hindered by the lack of encounters with actual objects and social cues.

By Ying Guo and Qian Sun, "The Use of Virtual Reality in Education: A Review of Benefits and Drawbacks" (2020): The This study looked at the advantages and disadvantages of implementing virtual reality in the classroom. The study that reveals us can provide a compelling and immersive learning environment, can also cause motion sickness, confusion, and harmful effects on cognitive load.

These studies show the possible drawbacks of using virtual reality in the classroom, such as prejudice towards student groups, discomfort, and impeded learning. It is crucial to remember that depending on the exact use case and execution, virtual reality's efficacy in education might vary.

These papers examine the detrimental consequences of virtual reality in education.

William T. Cavanaugh's 2016 article "Virtual Reality in Education: A Tool for Teaching in the Experience Age?"

Journal of Educational Technology Development and Exchange. According to this study, when compared to regular classroom education, VR in the classroom resulted in lower levels of engagement and interest among students.

" Chanyah Dahsah and Abdulrahman Alshammari's article titled "The Impact of Virtual Reality on Teaching: A Meta-Analysis" was published in the article of Educational Computing Research in 2020. The usage of v virtual reality (VR) in learning has a little detrimental impact on learning outcomes, according to this meta-analysis of 48 research. Susan Sprentz Katz and Ross Perkins' article "The Effect of Virtual Reality on users learning in Different School Science Classrooms" was released in the Journal of Educational Technology Systems in 2019. This study discovered that although students loved using VR, they did not outperform students who learned using conventional techniques on tests.

In 2020, Andrea Carfi and Francesco Mainetti will publish their article "Virtual Reality in Education: The Risk of Being Fascinated by Technology" in the Journal of Educational Computing Research. According to this study, students who utilized VR in the classroom tended to pay more attention to the technology than to the course material, which harmed their learning results. Ping Zhang and Jingjing Lin's article "Virtual Reality in Education: Challenges and Opportunities" appeared in the Journal of learning tool Technology Development and Exchange in 2017.

8 Conclusion

In general, virtual reality is a distinctive method of learning that enhances students' participation methods. Virtual learning is supported more than traditional learning because of its impact on motivation and competition among learners. It also solves the problems of unsafe environments in traditional education.

However, some restrictions allow the spread and development of virtual learning further, including the cost and the need for programmers.

We recommend integrating learning by combining virtual education with traditional learning and following methods of integrating learning and learning by playing, as they have greater results for learners.

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