Emerging of Virtual Reality (VR) Technology in Education and Training

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ABSTRACT

This study comprehensively explores the incorporation of virtual reality (VR) technology into the teaching and training realm. In general, the research investigates and presents the effectiveness of this modern technology in education in relation to the learning process. Besides presenting the multiple benefits of VR in education, the study also highlights the issues that the education department is experiencing while implementing VR as a modern tool of learning. This study will surely help the scholars to get a better insight into different VR aspects in relation to education and will provide them with a future-thinking to resolve the issues to make it a better tool for the education and training sphere.

Keywords: Virtual Reality, Education, Educational Technology

INTRODUCTION

Education is considered as the basic foundation of a civilized society, and the flow of knowledge has been a hallmark of civilization from the beginning of history. People are always looking to find good ways to make information flow easier, quicker, and more reliable. Digital devices have provided an opportunity to allow for better technical learning. In the age of digital technology, education is changing dramatically and strategies, techniques and tools of teaching as well as learning, are changing from conventional to modern. Today learning has been shift from conventional textbooks and blackboards to smartphones and smartboards where different listening and viewing programs take place rather than reading and learning. Virtual Reality (VR) in this regard seems to be the future of learning and education (Helsel, 1992).

REVIEW OF LITERATURE

Students' learning habits have not changed much throughout history. Teaching the truth has long been a common practice in learning. Preparing for exams, staying in lessons, and doing an effort to see history through the prism of a conventional textbook creates a bore experience. While on other hand, the emergence of VR has made students able to get knowledge and education in more amazing, effective and engaging way. VR can take students on a virtual tour of the ruins of Rome, allowing them to see the old historical place in best possible form and architecture (Wickens, 1992).

Researchers report that when a kid read about any new thing, he tends to want to hear and touch it. VR offer to be not restricted to meanings or word pictures but explore the

topic in depth and view how different things are joined to make the picture complete. It is a well-known fact that doing or practicing is the best way of learning. But looking at modern education makes it clear that how learning is accomplished by practice. Learners focus on learning the instructions instead of using them in practical way. VR in the field of learning provides a strong anchor for self-discipline in instruction. Through VR education, students are encouraged to rediscover their abilities and strengths. Now, students have the great opportunity to get knowledge by doing instead of doing nothing. Many educators and researchers believe that information technology can be a powerful force for good in ordinary education. The use of modern VR technology and games in education, science (exploration), economics, and business is an urgent task in the context of rapid knowledge development (Freina & Ott, 2015). Studies have revealed that VR technology presents significant benefits when implemented in educational sphere. For example, it assists helps students and researchers to participate in real-world exploration. By displaying objects near real objects, it helps to visualize events that cannot be easily seen with the power of human eye alone. Therefore, it enhances students' courage and assists them to develop improved investigative skills. According to researchers, VR's main advantage is "its unique ability to create complex multidisciplinary learning environments that integrate digital and physical objects, thus facilitating the development of critical thinking skills such as critical thinking, problem solving, and communication through interactive interaction tests." Recent research has shown that VR technology both improves the skills to work in laboratory and helps the researchers to develop constructive attitudes related to the work of the physics laboratory. The entrenched nature of the non-reality introduces the new depth of educational data by attracting the powerful senses and offering great exploration to a higher level which can be hard to replicate in the boundary of classroom, making it a good source of curiosity and true learning (Martirosov & Kopecek, 2017).

A good systematic review based on the benefits of Virtual reality implementation in education has reported that most researchers use factual reality to increase students' inner motivation, and bring up to a limited extent of features like constructivist teaching, collaboration, and gamification in the construction of their experiences. Similarly, various educational institutions make up the bulk of the application of the visual teaching facts identified in this analysis. Other research-based findings on the benefits and disadvantages of non-virtual education have shown a great boost in the number of VR researches over the past few years. The most reported benefit of VR, according to these researches, is the improved learning success. Other reported challenges posed by VR are issues related to its use and common technical issues (Kavanagh et al., 2017). Some researchers through their researches have highlighted some limitations of Virtual Reality. For example, it is said that learners find it complex, and that they encounter great technical problems during its use. In absence of well-designed interactions and student guides, VR technology can be very difficult for them to comprehend. Multiple devices which are used to deliver VR applications may lead to complex technical issues. In addition, it has been suggested that large VR technologies like HMDs are quite hard to understand and complex to operate. So it is suggested that this technology must be translate to be simpler, easier, and faster enough to present images. Without technical limitations research has shown that more study time is needed for effective AR in education (Chimakurthi, 2017a).

Despite many challenges researchers predicted the better future of Virtual Reality in education and training sphere. Researches have revealed that in time of pandemic VR have proved really productive and effective to provide education and training which was not possible otherwise. Medical training, special education and distant learning were prime

benefits which VR offered. In future, with better planning and resources this technology will help the education department to be benefited in various ways (Passig, 2010).

WHAT IS VIRTUAL REALITY?

The physical reality may seem confusing but it can be understood as the generation of the physical world and the animation that can be worked on in the real world as if we were part of that physical realm. Technically the term virtual reality refers to the use of computer and device technologies to create visual simulations (figure 1). This puts the viewer in the same setting so that they not only see the image but also feel it happening before their eyes, as in 3D techniques. What else is part of something that is not real? With that technology embedded with the specific devices needed users can use their senses up and down and see everything as if they are truly part of the physical world. The most common example of understanding something that is not real would be a 3 Dimensional movie. By using special glasses the viewer can see everything as if it were happening right before his eyes. Similarly, lights and sound effects are considered to ensure a sense of what is happening right before our eyes even though there is no reality. Advances in technology play an important role in understanding and becoming part of the VR world as there are earphones users wear on their heads while playing any such popular game of tennis, and are used along the way to do so. They believe they are on the tennis court and yet they move their character in the course of the game. Currently, virtual reality is being used in many ways in the entertainment, sports, and health care, military and educational fields as well (Sherman & Craig, 2003).
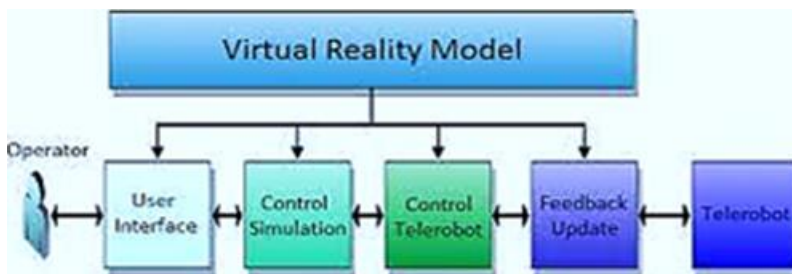

Figure 1: VR model

The future of education:

In the present age of digitalization, more and more people are now realizing the benefits of an online learning platform and online mode of education is greatly in demand. With this big change, it also seems acceptable that technology use can enhance the capacity of the whole educational environment.

Student wellbeing:

With the emergency closures of the businesses around the world, all educational institutes are also facing closures. This epidemic has forced the world to become acquainted with and modify the way of living as well as learning, in ways like mixed reading into a habit. It is quite possible that this new type of reading will stay even after the ending of epidemic, because it provides learners with a comfortable and flexible method of learning. However, the principal problem faced by students is lack of social interaction, and, limiting to home all day which is not very encouraging. According to a survey conducted by the National Bureau of Statistics, more than 50% of university graduates showed dissatisfaction with their communication skills by the fall of 2020, and 57% reported that their mood was worse.

Public VR:

VR room from ClassVR, a VR tool, is providing a visual space to engage students. This forum permits the educators to control the class of more than 30 students at a time in a variety of fun and learning areas. One of the best attribute of VR headsets is the propensity to communicate with other students or group members as if they were in close proximity. Such chat rooms and other social networks can prevent the chance of disconnecting of social media between group members. All these platforms in excellent way of repeating classes as well as playgrounds, while the sense of presence among classmates does not compare to video conference tools (Hedberg & Alexander, 1994).

TECHNOLOGY ENHANCED LEARNING

Advanced Learning Teaching (TEL) is a quite wide terminology that covers multiple forms of education that merge with technology effectively (figure 2). TEL is not a novel idea, as computers based teaching was introduced in 1980s. Now it just gets advanced and serving in following ways

• **Mobile learning**- it is a type of primary learning. It is a method to reach educational data through a cellular phone or any other mobile device. This reading enables you to read as flexibly as it is movable and can range from a simple podcasts to complete course.

• **Flexible reading**- this is a methodology of teaching which enables educators to prioritize different academic activities during lectures by giving students with building materials, data and well-structured presentations for later use. Converted reading performs best with real-world learning and mobile reading.
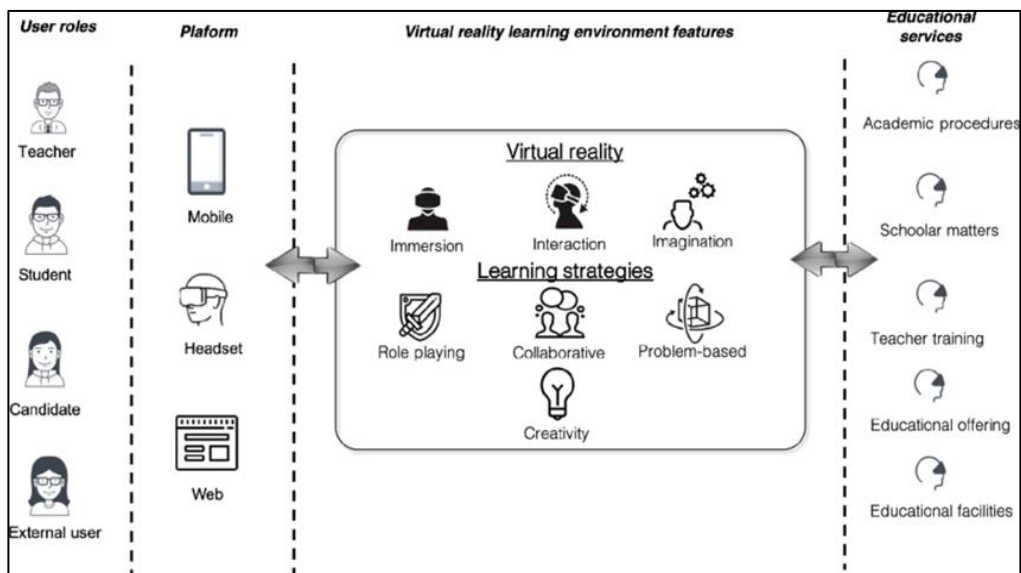

Figure 2: Learning strategies of VR

• **Practical learning environments-** in education institutes, these online programs are commonly used and permits students to gain access to a variety of learning resources and deliver work easily. They also provide comfort to teachers regarding sharing their stuff and interact with students. Moodle is one major example of such visual learning environments.

• **Digital apps and games-** these are quite effective in academics, and are accessible to those having smartphones. Digital apps can generate a good and memorable learning experience that is more appealing than traditional methods (Christou, 2010).

VR IN LEARNING AND TRAINING

No advanced technology may completely take the position of human interaction even though they can only improve it. The realities of learning are accepted by almost all learners. Virtual reality as an effective tool gives students a new insight and better knowledge of their learning without being present there. This may also permits learners to visualize historical happenings while sitting in classrooms. Moreover, through this, students can get a realistic idea of their careers and become more creative and competent by improving skills, knowledge and values. Many tools have been introduced to make all this possible for young learners (Pantelidis, 2010) figure 3.

Figure 3: Benefits of virtual reality incorporation in education

1. Increase Student Engagement

The class based on virtual reality offers enough methods to make academic activities more attractive and interactive which can assist to improve student attention and engagement. If classes are very interactive, participants will really enjoy learning. Conventional methods of learning may not be of interest to all learners but the setting of virtual reality is inclusive as well as fun where students can easily learn many things by just looking at them. They read, they can see 3-dimensional images (figure 4) thus it can be made simply much more technologically advanced, attractive and effective.

2. Experience-Based Learning

Reading or writing something, depending on the imaginary future and imagining items while wondering how they actually feel, and learning by this process is a completely different experience. Visual reality allows for the latest. This provides experience-based learning by providing refreshed visuals that make students feel part of the visual setting, these experiences can be greatly enhanced by integrating devices and sensors using non-tracking student movements and demonstrations. Switch accordingly to VR screen, users

can view all things as they really exist and make a long-lasting memory in their minds which enable them to continue to remember what they are learning, through experience.
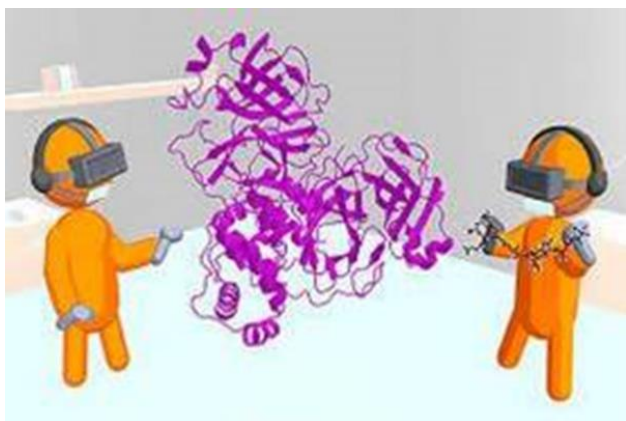

Figure 4: VR enabling students to view Virtual images of protein structure

3. Virtual Field Tours

Field trip is quite important part of the educational activities and often provides great exposure to young learners. Nevertheless, during recent times of pandemic, field tours do not occur as educational institutions are closed. In some other cases, a trip may be expensive. Virtual reality can help as it creates the trip without visiting a place. Students can view realistic pictures and may gain better idea for the place and even review the different aspects and views of the place. All of this is possible without even leaving the classroom.

4. Advanced Training

Virtual Reality technology can be applied to provide advanced and better training and to educate people about the realities of murder. They create a seemingly realistic scenario so that subscribers can exercise to get a better experience. By using a virtual reality landscape integrated with devices that can be used in a real-time environment connected to a wireless system that appears to be moving on a VR training screen as it moves in real life. In military this can be applied to practice a combat, or do virtual before a real training. Similarly this technology offers the chance of medical training to new medical students and performs a real-time surgery through 3D imaging. Moreover, this technology can effectively be used in other professional trainings including disaster management, and visual laboratories (Chimakurthi, 2017a).

5. Distance based learning

Multiple educational apps and resources are available which are easily accessible through a smartphone and good, stable internet/WiFi connection. Educational institutes apply various modern digital methods to create a site which students can visit for learning objectives. These applications help students to remain connected and assist them to communicate with fellow learners. This advantage allows them to be not making physical presence necessary at their institution to be active part of their academic curriculum. Indeed, this removes the obstacle of space, time and physical presence so that student can be well educated. And if there are plenty of pre-recorded lessons anyone intending to

learn can be benefited by the app to learn according to their own comfort. All learners can assess these pre-recorded lessons or images several through the own digital devices. Virtual reality works well only in the vastness of technology incorporated in advanced reality to make distance learning and distance professional training possible and effective, this works by connecting multiple students with their distant educators and teachers to get knowledge, share their ideas and communicate virtually.

6. Better collaboration

Virtual reality possesses great potential to significantly improve interaction of teachers and their pupils, both in distance as well as classroom learning. VR increases student motivation and spirit of sharing and collaboration with class fellows for the purpose of knowledge building. One groundbreaking research project named Second Life has enabled teachers to create and implement different collaborative activities to introduce new language or culture before traveling to a foreign land. Young students showed great improvement in various key areas when practicing the social skills like language and better social interaction with other students of same and different cultures.
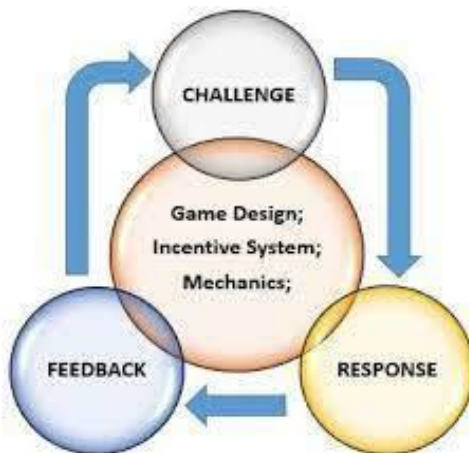

Figure 5: model of game based learning

7. Game and fun based education

The visual reality may completely alter the way games or other recreational activities can be used for learning and knowledge building. This method of learning works well due to its effectivity to boost interaction and motivation. Visual reality can take this effectiveness to the greater level. Teachers who used drama and drama in their studies, observes that while virtual reality activities and games are not the simply provide entertainment but also boost involvement of students in the academic activities so that they can hit the learning targets. Personally, learning through this method is encouraging as it's an ultimate fun. Ground is equal for every player and his gender, age, weight or race does not affect his caliber and acceptance in game by other players of the game. He is only judged by his play quality. There is much that can be accomplished in the physical realm that is impossible in practical life. And it is quite amazing and memorable experiences that effectively contribute to students' ability and potential to learn new things with greater memory figure 5.

SUBJECTS THAT CAN BE BENEFITED FROM VR

• **Geography** - Instead of using the old conventional l way of learning about facts of this world through textbooks and paper, VR offers new learners to enter each nick and corner of the world. Immersion on the other side of our planet is rich, and it is very exciting.

• **History** - Going back in time to catch a glimpse of what things were like is an imagination for many. VR helps you to do that without any difficulty. There is a lot of data available that shows significant historical events, places and situations. It even allows chatting with any renowned historical figure or great personality.

• **Art** – To pay to enter the famous art gallery is the event of past. With the advanced technology of VR, anyone can view the most enchanting art galleries of the world. In addition, there are impressive VR tools that allow the user to create his own visual art and unlock his creativity.

• **Science** - VR can be applied in multiple ways to teach different science subjects, but chemistry and biology can be presented as perfect illustrations. Multiple biological tools are present that allow learners to get closer and closer to the list of dangerous wildlife. Certain tools are also there that allow researchers to explore anatomy of both humans and animals. VR tools have also made chemistry experiments quite easy for students by helping them to use potentially hazardous chemicals in a safe and secure environment.

Not only these subjects are benefited by the implementation of VR in education; the world of possibilities is vast and endless. Multiple tools are there which can be part of the curriculum or used for general learning (Siddique & Ahmed, 2015).

NON-VIRTUAL OBJECT TRAINING

Implementation of immersion technology for learning is not restricted to young students - it seems useful to train professionals for their efficient work of variety of industries. In America VR has been introduced in pilot training sessions. It is even stated by them that they have seen the multiple benefits of giving the advanced training to their pilots. Advanced surgical implants are also available that give surgeons a completely immersive experience quite similar to the real surgical condition. Such tools are also there in medical training which implement haptic technology to provide the real feeling of touch of real tissues, bones, and muscles. This tool greatly helps surgeons to apply their good skills of surgery in a completely secure manner. Even, there is a complete VR training for researchers doing work in the animal kingdom that allows them to comprehensively explore the every bones and organ of any animal. Moreover, the construction industry also gets huge benefits from the virtual reality as it is used to make the whole training processes the safest one. It can also be used to show building design, structure and plan with more accurate and clear details thus they can be studied in greater depth. VR also allows employees to visualize their projects virtually even before starting work on them (Amin & Manavalan, 2017).

DISADVANTAGES OF VIRTUAL REALITY IN EDUCATION

Though VR offers multiple benefits in the field of education and training but there are certain disadvantages. VR as technology engulfs human interaction and induces social and communication issues in students. Moreover, it develops screen addiction that may lead to prolong use of screen and cause major health issues. As a mode of education it offers less flexibility and only specific users can use it effectively. Further implication of VR in

education needs high expenses that are no affordable for many students and teachers of developing and under developed countries. Even the academic institutes could not afford the financial burden of providing tools to its entire staff to assess this modern technology (Fadziso & Manavalan, 2017). A brief overview of Pros and Cons of VR is given in table 1.

Table 1: Advantages and disadvantages of VR in education

Advantages	Disadvantages
Enhanced visualization	Undermines human interaction
Improved education quality	Lacks flexibility
Collaborative learning	Causes addiction
Global outreach	Poses high expenditures
Better student appraisal	
Stimulated academic interest	
Improved research	

CHALLENGES EXPERIENCED BY VIRTUAL REALITY BASED EDUCATION

Though combination of virtual reality and education has penned many great successes, but some challenges are there which must be addressed.

Improving Content: The principal challenge facing VR based education is the sheer lack of data and content. Creating more content is greatly expensive, and not all educational institutions have the huge financial resources to hire an expert or some renowned software development company produce good content for them. With no formal education, it may be difficult to find a beginner. Thus, it is important for all investors and linked businesses to get completely engaged to provide support to develop good additional content.

Lack of VR headsets: Many young students cannot afford to buy a VR headset as they do not have the money. This deprivation prevents many capable students from using this advanced learning. The challenge that required to be addressed is to provide VR headsets to each deserving student.

Risk of Cyber-Sickness: It is something that most individuals do not even think about. It is quite similar to motion sickness and shows symptoms of nausea and disorientation. It negatively affects the student's ability of learning and understanding. Fortunately, online disease is declining with the advancement of technology (Chimakurthi, 2017).

CONCLUSION

By seeing the speed of world moving forward, it is not an exaggeration to say that VR is likely to be the most significant in the sphere of education. It is indeed a thing our great readers hope to see more. The reality has opened up a few ways in the field of education for students and teachers. Because the existence of technology is so broad and functional in many ways that its advantages are truly admirable, the reality enhances the significance of education and learning as compared to the conventional methods. This is also greatly enriched with the great power to make learning more cohesive and usable. Training sessions and live shows are now safer for professionals rather than actual training in various cases. This can surely help to keep them safe from getting hurt and wasting resources on actual training and repetitive practice. This works with smartphone and

internet connections, which are hard to afford for many. But, in the material world, there are endless opportunities existed which can be explored and learn with better management and technique.

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