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THE ROLE OF VIRTUAL REALITY (VR) IN EDUCATION: A NARRATIVE INQUIRY STUDY

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Abstract

Virtual reality promotes students' learning abilities, skills, experiences and interests by actively participating in technological programs to learn technological and computational skills as well as immersive and traditional learning. The nature of study was narrative inquiry in which participants of different fields in both social and pure sciences were interviewed in University of Lakki Marwat, Khyber Pakhtunkhwa Pakistan, to probe the importance and effectiveness of virtual reality in education. The interviews of the participants were properly recorded as a result and finally the conclusions were drawn in which it was revealed that virtual reality was found to be quite significant and effective in quality teaching and students' learning efficiency, their motivation towards learning, creativity development, enhancing new skills, educational constructionism, and advanced teaching-learning process etc. After the results drawn, it was recommended that the government of the time and

education department may apply virtual reality in all educational institutions to ensure quality education in Pakistan.

Keywords: Virtual Learning (VR); Teaching-Learning; immersive and traditional Learning; Computational skills; Pakistan.

Introduction

Virtual reality (VR)

Virtual reality (VR) can be defined as a computer-generated environment that is delivered to the user in a way that is designed to suspend reality through immersing the senses in this environment. A VR headset device called a Head Mounted Display (HMD) that covers the eyes. Visuals are shown to the user via screens inside the HMD and sensors track the movement of the head, so that moving your head produces the same movement in the artificial environment. This enables you to look around the virtual world in the same way you would in the real world. Additional hardware like headphones, sensors that track movement of the body and tactile devices can all be incorporated to increase the realism and immersion of the experience (O'Connor & Domingo, 2017)

The term VR has been used to describe a lot of different technologies, such as online virtual worlds, massive multiplayer online games (MMOs), simulations, flight or surgery simulators, Cave Automatic Virtual Environment (CAVE) systems, as well as a wide range of Head-Mounted Displays (HMDs), (Jensen & Konradsen, 2018). Generally, VR involves full immersion by using the HMD and a six-degree-of-freedom (6-DOF) input controller to manipulate the environment (Robertson, Card, & Mackinlay, 1993).

VR in education

The use of information and communication technologies (ICT) in educational contexts modified the learning environments dramatically, providing a significant challenge and continuous changes in learning approaches and instruction (Spector, 2014). Recent innovations in the field of virtual technologies have facilitated the access to virtual reality (VR) and augmented reality (AR) to everyone, which opened up numerous opportunities for using these technologies in educational sector in order to improve the efficacy of learning (Martín-Gutiérrez, Mora, Añorbe-Díaz, González-Marrero, & Education, 2017). Virtual reality (VR) technology is being used increasingly in educational institutions with the use of VR set to grow in the education sector by around 59% between 2018 and 2022 (Technavio, 2018). According to research, 96% of universities and 79% of colleges in the UK are now utilizing augmented or virtual reality in some capacity (UK Authority, 2019).

VR has the potential to revolutionize education. For instance, making students feeling more committed and motivated (Kerawalla, Luckin, Seljeflot, & Woolard, 2006)); research on these technologies opens new paths for teaching and learning (Chen, Tsai, & Education, 2012). There are numerous case studies that investigate this area when using virtual technologies in educational environments (Di Serio, Ibáñez, Kloos, & Education, 2013; Harris & Reid, 2005; Martín-Gutiérrez et al., 2010). The argument is that VR can be used for simulation-based education, where students and learners can practice new

skills in a simulated environment that enables correction, repetition and non-dangerous failure and at the same time offers access to interaction with expensive or far-away environments (Jensen & Konradsen, 2018). However, Spector (2014) pointed out that the simple use of a new technology to replace prior practice may not be beneficial and described a smart educational technology as one that accomplishes effective, efficient, and engaging use, often in an innovative, flexible, and adaptive manner.

Immersion and presence.

Two key concepts of VR theory are *immersion* and *presence*. They are sometimes used interchangeably, but formally immersion describes the experience of using immersive technology. This technology works by exchanging sensory input from reality with digitally generated sensory input, such as images and sounds (Freina & Ott, 2015). Subjectively, react to being immersed in a virtual environment in a way where your brain and nervous system behave in a way similar to being in the same situation in the real world, then you are experiencing presence (Slater, 2003). Often researchers make a distinction between *immersive virtual reality*, where the virtual environment surrounds you (as is the case with HMD), and *non-immersive virtual reality*, where you look into the virtual environment from the outside, typically accessed through a traditional display of a desktop computer (Freina & Ott, 2015).

Creating a sense of presence through immersion is a main motivation for using immersive VR both for education and in other domains. In the included studies a number of different factors influencing immersion and presence were identified. Pan et al. (2016) found that shortcomings in the visual presentation of virtual patients, such as lagging graphics, was limiting the sense of presence felt by medical professionals during the VR experience. When evaluating an educational video game, Alves Fernandes et al. (2016) found that the awareness of people watching you while you were wearing the HMD was limiting the sense of presence. Another factor that was identified was that standing up, as opposed to sitting down, led to increased sense of presence (Reiners, Wood, Gregory, & Dunedin, 2014). In a study looking at correlations between personality traits and learner experience Janßen, Tummel, Richert, and Isenhardt (2016) found that people with more anxious or reserved personalities not only had a less positive experience in VR, but also felt less immersed. This led the researcher to conclude that learners with certain individual traits and characteristics will benefit less from learning in VR.

The motivation behind why educators are progressively adopting this technology comes from the potential pedagogical benefits. The adoption of immersive virtual reality (I-VR) as a pedagogical method in education has challenged the conceptual definition of what constitutes a learning environment. High fidelity graphics and immersive content using head-mounted-displays (HMD) have allowed students to explore complex subjects in a way that traditional teaching methods cannot (Hamilton, McKechnie, Edgerton, & Wilson, 2020).

The influence of immersion and presence on learning

Immersion has a positive influence on learning outcomes. Examples of this are Loup, Serna, Iksal, and George (2016) who found that learners with HMD were more engaged, or Reiners et al. (2014) who observed that their study participants took the more immersive VR simulations more seriously. This meant avoiding bumping into things in the virtual environment and approaching dangers with greater care. Furthermore, when comparing three VR systems, Alhalabi (2016) found that study participants in the most immersive system voluntarily spent more time on the learning task. Findings like these all point towards the affordances of immersive technologies such as HMDs. This however, is somewhat contrasted by Fernandes et al. (2016), who found that increasing immersion by adding 3D sounds and a graphical rendering of user's own hands to the virtual environment confused some study participants and distracted from the learning task.

Learner attitudes towards VR-HMD technology

Learner attitudes towards HMDs were in most cases based on the self-reported opinion of the study participants. Generally, studies examined if the experience is perceived to be useful for learning and if the experience is perceived to be exciting/interesting. Researchers found that study participants were very positive towards both of these aspects. When comparing HMDs to desktops they found a moderate preference for HMDs (Bharathi & Tucker, 2015; Kleven et al., 2014). Aside from the issues of physical discomfort study identified a number of less positive attitudes, namely a feeling of unsafety, because the HMD blocks out access to your actual surroundings, and a feeling of boredom and emptiness, because the user is alone in the VR simulation (Reiners et al., 2014). One study went beyond the self-reported attitudes and opinions and included observational methods to determine learner attitudes. This study found that the HMDs triggered emotions such as “joy, satisfaction, delight, and enthusiasm” (Alves Fernandes et al., 2016).

The motivation for using VR-HMDs in education is that it can expose learners to challenging or educational situations and allow them to repeatedly practice new skills in an environment that enables correction and non-dangerous failure. At first sight these affordances seem ideal for teaching almost any skill, and the increased immersion offered by new VR technology seems well suited for successful educational approaches and theories such as constructivism, active learning, or simulation-based learning. While the studies found that learners are generally very positive about using VR-HMDs there are still substantial barriers to the use, especially in regards to cyber sickness symptoms, lack of appropriate software, and technical limitations of peripheral devices (Jensen & Konradsen, 2018).

Methodology

Riessman (2008), the system of discussion was a narrative inquiry that is thought to be a true method of comprehending what takes place in particular circumstances and affects the growth of the mortal mind. According to Creswell and Miller (2000), the narrative technique gave the researcher the ability to interact with the actors while reading and editing the story descriptions in the disquisition program as well as verifying the veracity of the full disquisition analysis. Maxwell (2005), the field and the players identified in this study were chosen based on a set of standards similar to those for party access

and data collection, such as eligibility and moral business practices. Creswell (2007), University of Lakki Marwat (ULM), a renowned public sector university was selected as the ideal study location. As per Creswell (2007), the party served as the study's introduction; their selection criteria and number were crucial to the study's narrative inquiry. A few actors were used in a fictional investigation to obtain the requested objects. So according to Maxwell (2005), the deliberate percentage was utilized to handpick locations and characters in order to provide distinctive opportunities for in-depth discussion. The sample was created based on a certain actor selection criterion. Creswell (2009), conditional Selection is compatible with narrative inquiry since it requires concluding players who have undergone a particular life experience. The primary requirements for the selection of actors were that they (a) be faculty members and (b) and a Ph.D. degree holder while data was being collected. This choice provided the researcher with subjects with similar backgrounds. A group of four faculty members who have high-caliber publishing were the subjects of the study. Participants in the survey were all faculty members at the same university, and they varied in age, gender, and area of specialization. (See Table 1).

Table 1

Demographic Detail of Participants

S. No	Name	Gender	Status	Discipline	Job Duration
1	P-1	Male	Asst. Prof	Physics	2 Years
2	P-2	Male	Asst. Prof	Zoology	2 Years
3	P-3	Female	Asst. Prof	Education	2 Years
4	P-4	Male	Lecturer	English	2 Years

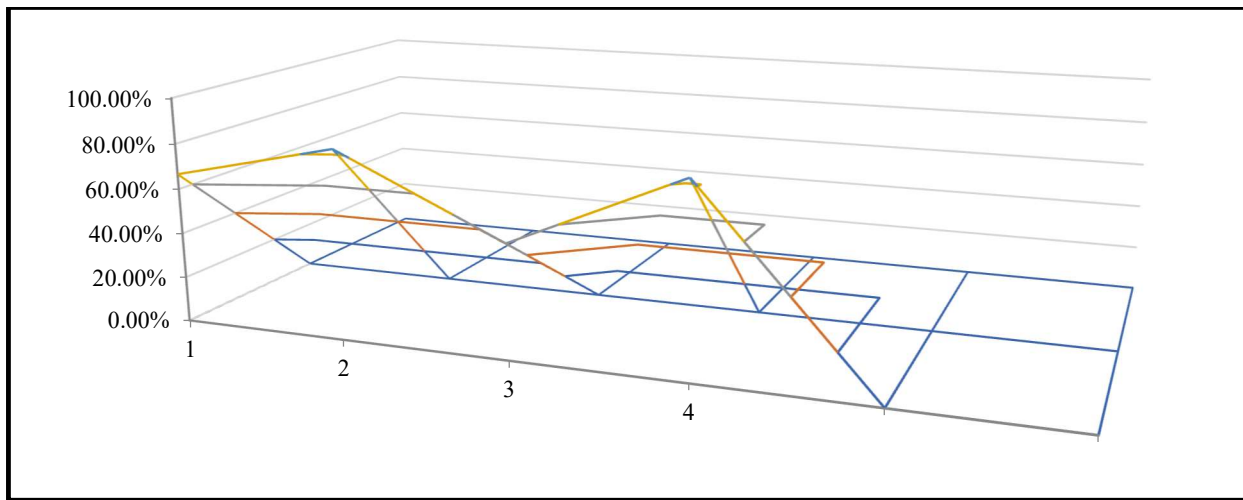
The most popular research method in social science, a semi-structured interview, was used, according to Riessman (2008). It enables the researcher to speak with individuals more extensively and learn more about their prior experiences. As per Creswell (2007), each interview lasted about 30 to 40 minutes, and the data were properly tracked. To ensure data quality and prevent missing any information, the interviews were properly documented in the following stages. The researcher skillfully inserted new information to the replies to make them more comprehensible, but at the time this was written, no cuts or edits had been done to the responses of the factual players. Open-ended interview questions and a shared language of communication were used to ensure enjoyable communication with performers. Using manual coding technique, the interview textbook was continuously encrypted to regulate themes. According to Braun and Clarke (2006), interview data was analyzed using a summary analysis approach. Thematic analysis is a basic approach for evaluating high-quality data from the social sciences that enables experienced experimenters to choose the most appropriate theoretical framework. Contextual analysis includes guidelines for relating, assessing, and pressing themes. It is clear and unyielding in its interpretation of the colorful aspects of the exploration content.

Results

Table

Virtual Reality (VR) in Education

S.No	Themes	Respondents	Percentage
1	Students' learning efficiency and virtual reality (VR).	4	66.6%
2	Revolution in students' feelings and motivation via virtual reality (VR).	5	83.3%
3	New skills in learning environment via virtual reality (VR).	3	50%
4	Effectiveness of virtual reality (VR) in students' Creativity Development.	5	83.3%



Source: Participants VS Virtual Reality (VR) in Education

The results of the current study revealed that different participants were interviewed regarding virtual reality (VR) and its effectiveness in Education. According to the results of the study, the interviews of 66.60% participants were recorded that virtual reality (VR) has an effective role in improving students' learning efficiency. Students' learning can be promoted and enhanced via virtual reality (VR) in education in this modern world of science and technology whereas all educational activities are directly and indirectly performed with the helpful of latest and updated technological resources particularly students related to science fields (Botany, Zoology, Physics and Chemistry) are more technologically dependent upon using virtual reality (VR) in this modern world as compared to arts and humanities students.

Moreover, the 83.3% participants were noted who responded that virtual reality (VR) is that

technological facility which is very helpful in revolutionizing students' feelings, and their interests towards learning. Virtual reality (VR) is quite helpful in promoting students' interest towards learning and other educational activities due to which the quality and standard of their education may be enhanced. The responses of 50% participants were recorded by interpreting that virtual reality (VR) has been observed more effective to promote students' learning and new skills due to which they could be able to achieve quality education in poor area like district Lakki Marwat.

According to the interviews were noted, the participants were also of the opinions that virtual reality (VR) is quite helpful in promoting educational and literature skills by using VR images and sounds to compete the modern world. The participants further urged that virtual reality (VR) was quite constructive in students' educational careers in this modern world of Science and Technology and virtual reality (VR) is highly effective in students' learning and teachers' teaching in district Lakki Marwat.

Overall, the concept of the virtual reality (VR) was not too much developed in district Lakki Marwat due to which limited use and knowledge of VR in district Lakki Marwat. Despite, backward area, technologically aware and matured students and people valued virtual reality (VR) and they were found to give first priority and importance by utilizing virtual reality (VR) in education in district Lakki Marwat.

Discussion

In the light of the results of the study about virtual reality (VR) and its use in education, the researcher revealed that district Lakki Marwat is the backward and poor area of Khyber Pakhtunkhwa Pakistan where there is no too much use of latest technology in education. The researcher narrated that most of the participants were in favor to use virtual reality (VR) in educational activities so that students' learning efficiency may be improved. Virtual reality (VR) was the best technological sources to revolutionize students' feelings and interest towards their learning and education. Virtual reality (VR) was the only technological tool that was found to motivate students towards learning and other educational activities essential for them. The researcher urged in perspectives of the results of the current study that virtual reality (VR) promotes new skills on students' learning environment and its very effective in creativity development of students. Virtual reality (VR) has been pondered as the most effective factor in educational reconstructionism and the results further illustrated that virtual reality (VR) has a vital role in students' learning and teachers teaching in district Lakki Marwat.

According to the previous studies by Braun and Clarke (2006) virtual reality enhances students learning experiences and enables them to actively participate in all educational activities with virtual reality. Virtual reality boosts the knowledge retention of students, and promote students' learning outcomes by developing their social skills, and support learning. R2 narrated that virtual reality develops students' technological and computational skills as well as immersive group and traditional learning.

Conclusions

It was concluded by keeping in view the results and discussion of the study that virtual reality (VR) was highly effective in developing students' learning efficiency and performance. Virtual reality was noted to be the most effective technological tool to maximize students' interest towards their learning. Students were motivated towards learning and their feelings as well as interests were found to be more inclined towards learning via using virtual reality (VR) in their educational activities due to which their creativity, practicality, quality education, standard of learning, and confidence etc. are all developed to compete the modern world of science and technology.

The researcher further concluded the study by narrating that virtual reality was among the key technological resources to promote students' learning experiences, and enhanced their knowledge retention. Virtual reality was noted to enhance students' social skills and learning due to which they were able to adjust everywhere in society.

Declarations

Authors' Contribution Statement

The authors listed in this article have significant contributions to the enhancement and writing of this manuscript.

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Competing Interest Statement

The authors declare no conflict of interest.

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