Proceedings of the 4th International Conference on Educational Innovation and Philosophical Inquiries
DOI: 10.54254/2753-7048/13/20230840

The Impact of Virtual Reality on Online Education

Yuanfei He[1,a,*]

[1]*North China University of Technology, Beijing, 10144, China*
a. 15210825112@sina.com
**corresponding author*

Abstract: Virtual reality technology was proposed and developed by Mr. Jaron Lanier, founder of VPL in the United States, in 1984, which is the first popular virtual reality device in the world. However, due to equipment, functions, etc., the technology has been in a slow development stage. Especially when the epidemic breaks out, many students were forced to study online at home, at which time, software such as classic Zoom burst out one after another, but students are isolated from each other and only face a computer when they have classes at home. Therefore, students cannot timely communicate with teachers about their doubts in the class, at the same time, teachers cannot get feedback from students in time. For this reason, this paper makes a specific analysis of the impact of virtual reality technology, on online education through using eye tracking technology to judge whether the virtual reality classroom is conducive to students' learning by comparing students' concentration and immersion. This study finds that there are still some shortcomings in virtual reality education, and it is not feasible to completely replace offline education. However, as an auxiliary tool for reality education, it is currently the main development direction. The significance of this study lies in discovering the advantages and disadvantages of current virtual reality education and providing direction for the development of virtual reality education in the future.

Keywords: HCI, virtual reality, online education, unity, causality

1. Introduction

Online education has been the focus of attention since the 21st century, especially after the epidemic in 2020, many primary and secondary students were forced to study at home, and the development of online education has been greatly accelerated. At present, the relatively mainstream online education software is Zoom, ClassIn, etc., but most teachers feedback that only through a computer screen cannot know the students' class situation very well. So, developed a virtual classroom for testing. The virtual classroom is built based on unity3d. This paper has added some functions that cannot be realized in the Zoom class to make it more inclined to the real classroom environment. To obtain the feedback of students on the virtual classroom, this study used eye tracking to determine whether the students' attention is focused on the virtual classroom by the time the eyeball stays at the position indicated by the teacher. Because the cognitive levels of different ages are different, to avoid this, some additional tests were conducted in this experiment to determine whether the virtual classroom learning method is suitable for young beginners. And because of technical reasons, most virtual reality devices need to wear some devices at present (because the device itself is very heavy), so measure whether the impact of the device on people will trigger the rejection reaction of the human

DOI: 10.54254/2753-7048/13/20230840

body itself, that is, "weariness of learning". Therefore, at the end of this experiment, suggestions are made for the future development of virtual reality education. With the development of the Internet, the emergence of 5G technology, the network resources required for online learning at home have been solved, and in the future people may still suffer from a crisis similar to the new coronavirus (forcing students to go to class at home), so the development of online learning is indispensable, and in online learning, as Zoom and ClassIn have been used by students for more than two years, their problems have gradually been discovered. For example, students are easily distracted in class, and virtual reality classrooms can effectively solve these problems. The inefficient learning experience that comes with ClassIn. This research may help the future development of virtual reality education.

2. The Background of VR Technology

Virtual reality technology is a new practical technology developed in the 20th century. Virtual reality technology includes computer, electronic information, and simulation technology. Its basic realization is to simulate the virtual environment by computer to give people a sense of environmental immersion. With the continuous development of social productivity and science and technology, the demand for VR technology from all walks of life is increasingly strong. VR technology has also made great progress and has gradually become a new scientific and technological field. In the years after the outbreak of the epidemic, online learning has developed rapidly, and excellent softwares, such as Zoom, ClassIn has been launched. However, this software inevitably has some shortcomings that cannot be solved. For example, students will be lazy when online learning, the attractiveness of the class will become low, and the actual operation class cannot be taught. The emergence of virtual classrooms may solve these problems. Therefore, this experiment focuses on studying whether virtual reality is helpful for human learning and draws conclusions.

3. Methodology

This paper compares the advantages and disadvantages of virtual reality and current online education, using students' attention to the two learning modes to determine which method is more suitable for learning. In order to optimize experimental data for judgment, this study uses eye tracking technology to quantify attention data for comparison and draw conclusions.

3.1. Relevant Definitions

3.1.1. Zoom

Zoom is a software for online 2d simulation conference. It has high-quality audio and video interaction. Single meeting can support up to 500 people. It also has many functions, such as desktop sharing/program sharing, integrating electronic whiteboard, which can write on screen and multi-party real-time labeling. Also, it can conference recording function, local recording/cloud recording (MP4 video file).

3.1.2. ClassIn

ClassIn is an application about online classroom. It is an excellent online teaching software with powerful functions, such as live broadcast, cloud disk, class notes, and intelligent analysis of teaching data. Here students can search online for the required subject videos, watch, and learn online at any time.

These two apps are very rich in functions, but with the development of the epidemic, human dependence on such software has gradually increased, and most teachers and students have reflected the problem: because of the functional limitations of online learning software, many courses requiring

DOI: 10.54254/2753-7048/13/20230840

students' hands-on operation cannot be carried out on it, and many teachers have reported that many students are not focused on listening to such software for a long time. To solve these problems and explore whether online learning can replace offline education as the mainstream form of education, this paper conducted the following research.

3.1.3. Unity 3D

Unity 3D is a multi-platform comprehensive software development tool developed by Unity Technologies that allows players to easily create interactive content such as 3D video games, building visualization, real-time 3D animation and other types of interactive content. In this experiment, this software is the main tool for building virtual reality classrooms. In order to improve the use experience of the laboratory personnel as much as possible, this experiment uses Unity to add many small programs (components) for the virtual reality classroom, so that the laboratory personnel can better immerse themselves in this experiment.

3.1.4. Eye Tracking

Eye tracking is a very effective technology. It can determine whether the tester's attention is focused by capturing the focus position and dwell time of the eyes on the computer screen. The exact means of how to monitor eye movements has changed considerably over the past years. Today, video-based systems using computer vision techniques are dominant. [1] In this experiment, to compare the attention of students using virtual reality classroom with that of students using Zoom and classic software, we use this technology to quantify the model, which is helpful to judge the interests.

3.1.5. Virtual Reality

Compared with traditional teaching, the experiential learning process promoted by virtual reality has more reality and potential value [2]. In addition, the immersion brought by virtual reality technology can improve the classroom experience and improve the classroom practice conceptually (let students create scenes and objects that do not exist in the real world) [3]. The most attractive aspect of virtual reality is that it has four unique properties: interactivity, conceptualization, immersion, and holography. It can make users immerse in learning and improve their innovation ability [4].

3.1.6. VR Glasses

VR glasses or other types of head worn displays, often used together with corresponding earphones, can easily create a visceral feeling that truly exists in the simulated world. Completely immersed in the virtual world, all five of our senses should be involved. Most virtual reality environments today do not actually address all these issues, but typically focus on two issues: visual and auditory. In some studies, it has been pointed out that "vision is considered the most important sensory organ" [5]. Therefore, to immerse researchers as much as possible in the virtual classroom, this experiment used VR glasses and matching earphones to assist.

3.2. Research Design

With the development of the Internet, the emergence of 5G technology, the network resources required for online learning at home have been solved, and in the future we may still suffer from a crisis similar to the new coronavirus (forcing students to go to class at home), so the development of online learning is indispensable [6]. In online learning, the current Zoom/ClassIn is not very effective, and the development of virtual reality classrooms is not only an aid to real education, but also can solve Zoom issue, the inefficient learning experience that comes with ClassIn. That's why this

DOI: 10.54254/2753-7048/13/20230840

research is made to help the future development of virtual reality education, so this study has created a virtual reality classroom to try to find the future direction of online education. The virtual reality classroom built is based on unity3d. In the classroom, students need to bring specific equipment, such as “Oculus Quest2”, each student will have his/her own account password, and the teacher will create a specific room number. Only when the student has permission can he/she enter the virtual classroom through the room number. Some open classes will limit the number of students in order to avoid the phenomenon that the server will be paralyzed due to too many students. And in the future, many interesting functions will be added to the virtual classroom. For example, the University of North Carolina has developed a chemical virtual reality system that allows students to manipulate molecular motion by hand. Molecules can be bound together in some way. This has greatly increased students' understanding of the micro world [7]. Moreover, virtual reality can also trigger empathy among students. Currently, many studies have found that the third person may obtain more movement, expression, and environmental information, which will enable participants to understand the situation of the other person more comprehensively, thereby triggering empathy [8]. Therefore, virtual reality is better than watching videos and reading classics to arouse students' sympathy. To avoid errors caused by too vague experimental data for determining whether attention is focused, this study specially selects two groups of students for different ages to carry out the experiment (one at university and one at high school) and divide them two groups. Determine whether their attention is focused on the class by eye tracking, and the selected teaching knowledge is also something they have never been exposed to, to avoid interest interference with the experimental results. In the experiment, the experimental personnel were divided into two groups. Set the members using class and Zoom to Group A and set the members of the virtual reality class to Group B.

3.3. Data Collection and Data Processing

This experiment uses eye tracking technology to quantify the researchers' concentration in the experiment to determine which education method has a better experience for the educated. Through comparative experiments, it can be concluded that education method is the development direction of future education.

3.4. Results

The test results show that whether it is visual experience, classroom participation and attention, the feedback data of group B is always far greater than that of group A. The problems that cannot be solved by popular apps on the market can be well optimized in the virtual reality classroom. To deeply study the feasibility of virtual reality classroom, this paper puts forward the second point of view, whether virtual reality classroom can replace the current offline classroom as the mainstream education mode.

4. Analysis of the Advantages of VR Technology

Compared with reality education, virtual reality has better expansibility, which allows students to immerse in classroom learning without leaving home. Even some pictures that could only exist in video records can be presented in front of participants in the virtual classroom, such as volcanic eruptions, metal melting, and some dangerous chemical reactions. One of the participants explained: “I think the VR is a good way of experiencing things you don’t have the capability to, like astronomy or other science fields, atoms or things you could not see with naked eyes” [9]. Virtual reality classroom can promote transnational cultural exchange, for example, it can allow students from other countries to participate in the classroom and lecture at a distance, and it can also allow students to take classes anytime and anywhere (where there is a network), so that learning is not limited to the

DOI: 10.54254/2753-7048/13/20230840

classroom. Through experiments, it can draw a conclusion that with the help of the eye tracking system, comparing two sets of experimental data, it can be found that students in virtual reality classrooms have a much higher degree of focus on learning than in Zoom and ClassIn. Moreover, domestic research has pointed out that learners in virtual reality learning environments have higher cognitive input and are more focused [10]. Therefore, the effect of learning in virtual reality for students is much higher than the current learning environment, and virtual reality also has the potential to replace display education as the mainstream education model. But, after a period of testing, the members of the two groups also fed back several existing problems at the same time. The test is often conducted for 2 hours, and the test members have uncomfortable symptoms, such as dizziness, etc. The reason for this situation is the problem of test equipment, which is also an urgent breakthrough of virtual reality technology, and this technology also has shortcomings, which is very unfriendly to students with virtual reality sickness.

5. Conclusion

With the development of the times and the progress of society, the application of virtual reality technology in the field of education is bound to be wider and wider, showing a trend of diversified development. Virtual reality for the development of education is promising, but the current physical equipment cannot make a breakthrough, resulting in many current ideas cannot be realized, but it is undeniable that virtual reality education will become one of the excellent tools to assist real education, compared to the current mainstream online education (Zoom/ClassIn), virtual reality classroom will gradually replace these two education models in the future. However, it is indispensable that how to break through the limitations of physical devices is still the main direction of attack at present. How to make VR devices lighter, and how to make it easier for users to use devices in virtual reality are the directions that can be developed in the future. And educators should give full play to the advantages of virtual reality technology groups in teaching design and build an interactive and multi-sensory teaching environment, organize students' multi-dimensional perception of the virtual environment and the real world, establish new insights into the learning, application, and research of professional knowledge, and utilize virtual reality technology groups to enhance the interest of product art design teaching and promote students to learn more in-depth theoretical knowledge and design skills.

References

[1] *Clay V., König P., König S. (2019) Eye Tracking in Virtual Reality. [J] Eye Mov Res. Apr 5;12(1). doi: 10.16910/jemr.12.1.3. PMID: 33828721; PMCID: PMC7903250.*

[2] *Sam Kavanagh, Andrew Luxton-Reilly, Burkhard Wuensche. (2017) [A] systematic review of Virtual Reality in education. Themes in Science & Technology Education, 10(2), pp.85-119.*

[3] *Xiaohong Ling. (2022) Research on the application of virtual reality technology in education and teaching practice. [C] China Academic Journal Electronic Publishing House, pp.2659-2663.*

[4] *Xun Feng. (2007) Application and prospect of virtual reality technology in education. [C] China Academic Journal Electronic Publishing House, pp. 118-123.*

[5] *Classen, C. (1997). Foundations for an anthropology of the senses. [J] International Social Science Journal, 49(153),401-412.*

[6] *Yajun Ding, Zhiguo Ying, Yimin Chen. (2022) Online and offline hybrid teaching based on augmented reality.Research and development of learning systems [J] Computer Applications and Software, 39 (7): 128-133.*

[7] *Weihong Hu, Daoguang Liu, Qian Wang, Meng Li. (2007) Application and Research of Virtual Reality Technology in Education and Teaching, pp.139-141.*

[8] *Hao Wang, Aimin Tang. (2023) Can virtual reality more arouse students' empathy? [C] China Academic Journal Electronic Publishing House, pp.60-69.*

[9] *Hussein, Mustafa and Carl Nätterdal. (2015) The Benefits of Virtual Reality in Education- A comparison Study. [D] University of Gothenburg, June.*

DOI: 10.54254/2753-7048/13/20230840

[10] Cuiru Wang, Peipei Xu, Yongbin Hu. (2021) Learning in desktop virtual reality learning environment. The impact of learning engagement and academic achievement - based on multimodal data [J] Open Education Research, 27(3):112-120.