Design and Implementation of Teachers' Distance Training System Based on Virtual Reality

Dongxing Yu[1*], Guang Li[2]

[1*]Corresponding author e-mail: yudongxing@sandau.edu.cn

[1]School of Education, Sanda University, Shanghai, China

[2]The Department of Planning, Science and Technolog, Sanda University, Shanghai, China

Abstract—At present, the development of education in our country is at a critical period, which requires adapting to the development trend of the economic era and allowing education to develop in a high-quality direction. This also means that we must carry out quality education in an all-round way, and ultimately we must focus on strengthening the construction of the teaching team. Among them, the quality of teachers has become the key to educational reform and development, so we must fully improve the quality of teachers. Then we must carry out practical and effective teacher training and build a team of high-quality and high-quality teachers, so as to improve teachers' professional cultural literacy and teaching level. Among them, remote training is an important part. At the same time, with the rapid development of virtual reality(VR) technology, it has been involved in more and more industries, and it has also shown infinite vitality and broad development prospects to people. VR also provides a different possibility for teachers to conduct remote training, and presents the virtual training environment to teachers without being restricted by time and space. This article mainly uses experimental analysis and questionnaire survey methods to study the design of a VR-based teacher remote training system. It is intended to explore the advantages of VR, reduce the problems in teacher training, and further enable remote training based on VR. The design and realization of the system becomes possible. According to the survey results, when 1100 people visit at the same time, the response time is 3.81 seconds, and the server utilization rate of the system continues to rise with the increase in the number of concurrent users; most of the interviewees are satisfied with the design of the teacher remote training system.

Keywords—Teacher Training, Remote Training, Virtual Reality, System Design

1 INTRODUCTION

Teachers are an important factor in the development of education in our country. Teachers' knowledge renewal determines the level and quality of education. Teachers can greatly improve teaching effects through continuous learning. Therefore, it is necessary to provide better resources and methods for teachers' lifelong learning. With the rapid development and transformation of information technology means, the country has popularized modern distance education on a large scale and used the Internet to carry out large-scale, and high-level teacher training. At the same time, the main means of teacher training has changed from the traditional training method to the Internet as a platform. From a development perspective, vigorously developing and promoting teacher remote training has become a necessary measure for teacher training,

and the modern remote training model has gradually Become an idealized means to meet actual training needs. As an emerging technology, VR has also attracted more and more attention from the public. With its excellent immersion and good user experience, it is constantly changing people's lives.

At present, there are many related researches on the application of VR to training systems for various purposes, but the research related to the remote training of teachers still needs to be improved. For example, Jiang Long believes that virtual scenes make training methods more vivid and vivid, thereby improving the effectiveness of training [1]. Chen Jie proposed to simulate dance training in real scenes by wearing VR equipment and provide corresponding action feedback [2]. Liu Jin believes that the use of VR technology can simulate an infinite space environment in a limited space, and it can also perfectly restore various environments to enable the experiencer to have an immersive interactive experience [3]. Therefore, the research on the design and implementation of the teacher remote training system based on VR in this article still has certain practical significance and practical value.

This article focuses on the research of the teacher's remote training system based on VR, which mainly includes these aspects: introduces the teacher training, the advantages of teacher's remote training, and what is VR.

2 TEACHER REMOTE TRAINING AND VIRTUAL REALITY

2.1 Teacher Training

Teacher training mainly includes two contents: pre-service training and on-the-job teacher training. It particularly emphasizes on-the-job teacher training. Teacher training aims to adapt to social development trends, to meet the needs of education and curriculum reform for teacher training, so that in-service teachers can organize themselves to know whether they are professional [4-5]. And distance teacher training is one of the applications of online and distance learning in the field of teacher training. Teachers use network information technology to enter the designated network platform, and they can learn the learning resources provided above by self-study [6-7].

2.2 The Necessity and Advantages of Distance Training for Teachers

Teachers' remote training can be free from time and place restrictions, training resources are more abundant, and learning methods are more diversified. Teachers can use the distance learning platform, freely choose learning content, develop personalized learning plans, and can also use multimedia teaching methods to increase their interest in learning [8-9]. The advantages of distance training for teachers include the following aspects.

Realize the Fairness of Urban and Rural Teacher Training.Due to the different regions and economic development levels between urban and rural areas, the quantity and quality of continuing education and training of rural primary and secondary school teachers in China are far less than those of urban teachers. This unfairness of training and education of urban and rural teachers will lead to unfairness of education. With the help of advanced network technology, the distance training of modern rural primary and secondary school teachers can overcome the differences between urban and rural areas, and rural teachers can share

high-quality educational resources with urban teachers simultaneously. Distance training is an effective way to break the differences between urban and rural areas, realize the fairness of teacher training, and then realize the balanced development of education equity and education.

Improve the Education Level of Schools.Fundamentally speaking, the development of school education level depends on the improvement of the overall quality of teachers. Because the information resources in the distance training are available to all participating teachers, they understand the advanced education and teaching theories, educational skills, and advanced ideas, and then use these advanced knowledge in their own teaching practices and pass them to their daily teaching classrooms. And with the help of the remote training platform, even after the training is over, teachers can still communicate with education experts, well-known scholars, and outstanding teachers from other regions at any time to solve their own learning and work problems immediately, and ultimately further improve the school's education level.

Reduce the Contradiction Between Work and Study in Teacher Training.If the teacher must complete the specified learning content at a fixed time and at a fixed place under the unified arrangement of the superior, it will increase the burden of the teacher, may take up his spare time, and affect the teacher's work, rest and other daily life. Distance training is not limited by time and space. Teachers can arrange learning independently according to the actual situation of the individual without being restricted by the training time and location. They can independently choose the course content and learning form of learning. They can also interrupt or interrupt at will according to their own time arrangements. What's more is to conduct more targeted learning from one's own actual needs. To a certain extent, reduce the contradiction between work and study in teacher training.

Save Training Costs.The development of online courses, construction of teaching resources, technical input, and the cost of hiring training lecturers required for remote teacher training are all used once and for many times. In the remote training, teachers' learning autonomy allows participating teachers to pay no additional fees. The information of distance training is spread on the Internet, and the information can be copied simply and quickly, thus avoiding the expenditure on books and materials in traditional training.

Improve Teachers' Job Satisfaction.With the help of the remote training platform and service support system, teachers can improve their overall quality more quickly and achieve their own professional development. After the improvement of their own quality, teacher-related welfare benefits will also be improved over time, such as salary increases, training bonuses, and status upgrades, which greatly increase the satisfaction of rural teachers with their own work [10-11].

2.3 Virtual Reality

Virtual Reality (VR) is a comprehensive information technology that emerged at the end of the 20th century. At present, there is no unified definition of VR technology at home and abroad. Through literature review, it is found that VR technology is a kind of comprehensive utilization of computer graphics technology, multimedia technology, artificial intelligence technology and other technologies to simulate the 3d virtual environment that users want. Through the virtual reality system, users can not be restricted by time and space, completely place themselves in the virtual environment, and truly feel the realistic experience that cannot be experienced in the real world.

Modern teaching means are based on modern information technology and new teaching means based on network technology. With the development of science and technology, people's life has been inseparable from mobile phones, the Internet and other information technology. In the field of education, traditional teaching methods can no longer meet the needs of students in the era of rapid development of science and technology. The use of modern teaching means is the sublation of the traditional "blackboard + chalk" teaching method, and the comprehensive surpasses the traditional teaching means. It is the enrichment and supplement of teaching means. The traditional teaching means and modern teaching means complement each other and serve education together. The use of modern teaching means the current informatization has become a hot issue at educators, represented by VR technology of modern teaching means to break the bondage of traditional teaching methods to some extent, helps to solve the difficult point of traditional teaching method is difficult to solve problems, cultivate can change requires people to adapt to the era development. VR technology as a product of the rapid development of information technology, as one of the cutting-edge technology, its application in education and teaching has become a general trend. VR technology has three characteristics: Immersion, Interaction and Imagination.

VR system can be summarized into four types, including immersive VR system, desktop VR system, enhanced VR system and distributed VR system. Immersive VR systems have the best effect, allowing users to be completely immersed. There are three common devices in immersive VR system: mobile terminal display device, all-in-one head display device and external device.

At first, virtual reality was just an idea, but now, virtual reality has shown its charm in many fields. Virtual reality has four important characteristics: immersion, multi perception, interaction and autonomy. Map teachers' operations in the real world to the virtual training environment, and make corresponding feedback to the virtual training environment, so that teachers can be exposed to the virtual scene and carry out corresponding training. Finally, all their actions in the actual scene will be completely mapped to the virtual world. At the same time, teachers' actions or operations in the real world will have a certain impact on the virtual scene, and they will also have an immersive feeling. The user's actions in the real world will generally be restored to the virtual world, giving the user an immersive feeling. Define R(y) as the selection transformation function to collect the user's specific operations in the real world. The expression is shown in Equation 1.

$$A_O = R(P) \tag{1}$$

Among them, O is the state collection of all user's operations in the real world, and A_0 is related data collected based on user's operations.

In order to facilitate the transmission of A_0, the data A_0 is deformed, as shown in Equation 2.

$$A_1 = G_0(A_0) \tag{2}$$

A_1 is the transformed user operation data, as shown in Equation 3.

$$A_2 = G_1(A_1) \tag{3}$$

3 EXPERIMENTAL RESEARCH ON TEACHER REMOTE TRAINING SYSTEM BASED ON VIRTUAL REALITY

3.1 Experimental Environment

The teacher's remote training system will run on the wide area network and adopt the Internet or Intranet based on the TCP/IP network protocol. The client can use various versions of the Windows operating system. The current operating system of the database server will use Windows Server 2008. The code development is completed in the Eclipse integrated environment, and the database uses SQLite for management operations.

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3.3 Experimental Process

In this experiment, the system performance test mainly includes the system's concurrency, carrying capacity, response time, server utilization, etc. to simulate the concurrent operation behavior of actual users and real-time performance monitoring. In this test of the system performance, it was decided to pass 1100 people to visit at the same time, and then get the required test results, and finally analyze the data to understand the performance of the system.

4 EXPERIMENTAL INVESTIGATION AND ANALYSIS OF TEACHER REMOTE TRAINING SYSTEM BASED ON VIRTUAL REALITY

4.1 System Performance Test Results

When the network environment is normal and all data are at standard values, set 1100 people to enter and use the system at the same time, test the system's carrying capacity, response time, and server utilization, and get the corresponding data results to understand this system performance. The analysis result is shown in Table 1.

Table 1. Analysis of System Performance Test Results

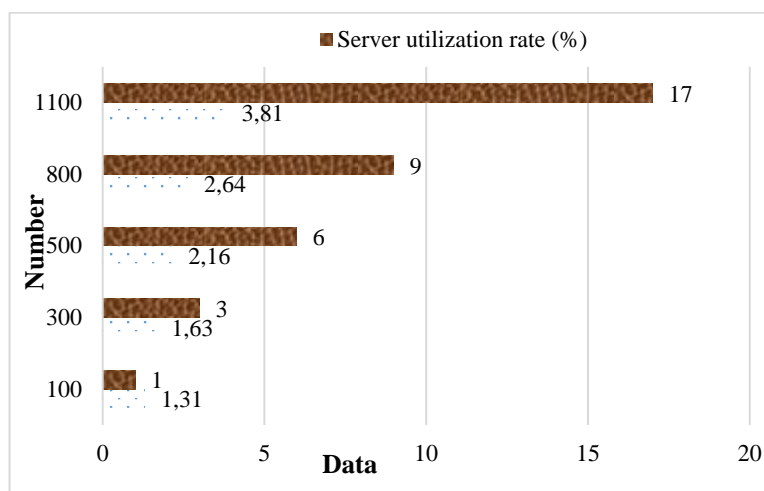| Number of concurrent users	Response time (seconds)	Server utilization rate (%)
100	1.31	1
300	1.63	3
500	2.16	6
800	2.64	9
1100	3.81	17

Figure 1. Analysis of System Performance Test Results

It can be seen from Figure 1 that when 100 people access the teacher remote training system at the same time, the system response time is 1.31 seconds, and when 1100 people access at the same time, the response time is 3.81 seconds, and the server utilization rate has also increased from 1% to 17%. It can be seen that the response time of the system increases with the increase in the number of visitors, and the server utilization rate is also rising.

4.2 Investigation and Analysis of Satisfaction with the Design of Distance Training System by Teachers of Different Ages

A questionnaire survey was conducted on 120 teachers in City D. There were 40 young teachers, middle-aged teachers, and old teachers each, and analyzed their satisfaction with the design of the remote training system according to different ages. The analysis results are shown in Table 2 shown.

Table 2. An Investigation and Analysis of the Satisfaction of Teachers of Different Ages on the Design of Distance Training System

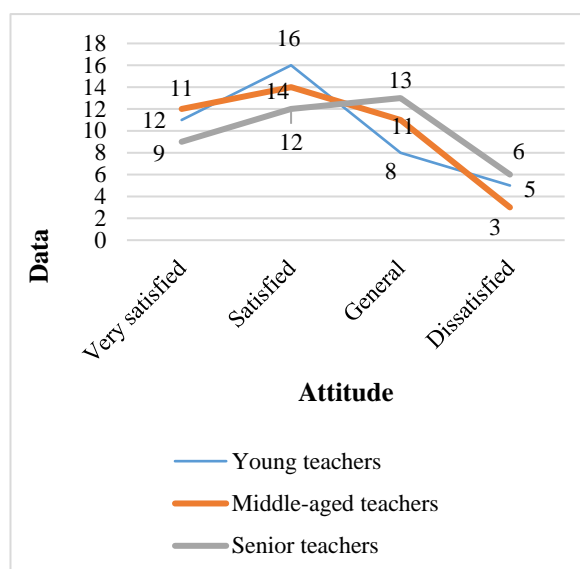| Project	Young teachers	Middle-aged teachers	Senior teachers
Very satisfied	11	12	9
Satisfied	16	14	12
General	8	11	13
Dissatisfied	5	3	6

Figure 2. An Investigation and Analysis of the Satisfaction of Teachers of Different Ages on the Design of Distance Training System

As shown in Figure 2, 16 of the young teachers are satisfied with the design of the teacher remote training system, 11 are very satisfied; 12 of the middle-aged teachers are very satisfied, 3 are dissatisfied; 13 of the elderly teachers said it was average and 12 people said they were satisfied. It can be seen that most of the interviewees are satisfied with the system.

5 CONCLUSIONS

With the continuous growth of our country's teacher team, the traditional teacher training model can no longer adapt to the requirements of the new era. In actual operation and application, the combination of VR technology and teacher remote training can not only break the restrictions brought by the venue, but also provide a wealth of learning resources, formulate personalized learning plans, and ultimately improve the overall teaching quality of teachers , Improve teaching level. VR brings users an immersive feeling and a brand-new experience. With its advantages, it is helpful to the design and realization of a teacher remote training system suitable for our country's national conditions and educational development goals.

REFERENCES

[1]Jiang Long, Zhang Degang, Li Zehe, et al. Design and implementation of immersive substation simulation training system based on virtual reality helmet[J]. Electrical Engineering Technology, 2017, 000(011): 43-45.

[2]Chen Jie, Tian Feng. Design and implementation of virtual dance training system based on Unity3D[J]. Industrial Control Computer, 2019, 032(012):49-51.

[3]Liu Jin, Zhang Pengwang. Design and implementation of training system based on VR technology[J]. Application of Electronic Technology, 2018, v.44; No.484(10):108-111.

[4]Wang Shuangwei, Lei Jianming. Design and implementation of a long-distance continuing education platform for professional and technical personnel based on Web Services[J]. Information System Engineering, 2018, 000(002):167-168,170.

[5]Li Wei. Process design of distance training for teachers of Chinese international education based on needs analysis[J]. Open Learning Research, 2017, 000(006): P.21-27.

[6]Liu Ming. Design and implementation of virtual campus system based on virtual reality technology[J]. China New Telecommunications, 2017, 19(022):61-62.

[7]Luo Yidan, Wang Nansong. Design and implementation of equipment virtual maintenance training system[J]. Computer Measurement and Control, 2019, 027(007):155-158.

[8]Wang Tinghuang, Jian Xuezhi, Liu Zijun, et al. Implementation and application of smart substation operation and maintenance training system based on virtual reality technology[J]. Southern Power Grid Technology, 2018, 012(010): 61-65.

[9]Du Yunlong, Zhang Yuansheng, Wang Jiaoyan, et al. Research on underground safety training system based on virtual reality[J]. Nonferrous Metals (Mining Section), 2018, 070(002):69-72.

[10]Chen Shujie, Qiu Xingyue, Ye Xindong. Design of microteaching system based on virtual reality technology[J]. Experimental Technology and Management, 2018, 035(004): 121-125.

[11]Ma Jingyi. Design of radar maintenance virtual training system based on 3D virtual reality technology[J]. Computer Measurement and Control, 2020, v.28; No.266(11):247-251.