Deep Application and Development Prospect of Virtual Classroom System

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Abstract. Virtual classroom system, also known as virtual classroom, is a learning environment constructed by using multimedia communication technology on computer network, which allows teachers and students in different places to carry out most teaching activities, and can realize real-time video on demand teaching, real-time video broadcasting teaching, virtual classroom teaching monitoring, multimedia lesson preparation and teaching, multimedia individualized interactive network learning. It can also achieve synchronous counseling, synchronous testing, problem analysis, BBS discussion, distance teaching, etc. Virtual classroom is the product of computer technology, multimedia technology, digital compression technology, network communication technology and other information technology, multi-disciplinary, multi field integration. It is different from the general multi-functional classroom, and solves the problems that can not be solved in today's multimedia classroom and electronic reading room. It is the representative of classroom revolution. The development vision of the virtual classroom system is to rely on the network training institute, constantly improve the function and performance, gradually try independent operation and maintenance, adopt the idea of software service, expand the practical scope, and finally form a unified, separable and practical new teaching and communication platform. Through the further analysis of the application of the virtual classroom system, the virtual classroom can become a window for groups, institutions, education systems or organizations to inspect the training, so as to understand the first-hand information and promote the training effect and achievement transformation. With the continuous maturity of computer virtual technology and virtual technology operation closer to the popularization, the application of virtual classroom in Colleges and universities and enterprise universities is bound to be more extensive, more flexible and more intelligent. It will play a greater role in promoting today's education system reform and vocational personnel training. How to determine a complete set of virtual classroom application solutions (technology, service, security, management and maintenance mechanism, etc.) will be a topic that needs to be summarized and improved in practice.

Keywords: Virtual Classroom · Virtual Reality · Cloud Infrastructure

C. F. Peng et al. (Eds.): EIMT 2022, AHSSEH 3, pp. 797–809, 2023.
https://doi.org/10.2991/978-94-6463-012-1_87

1 Introduction

In the industrial age, human beings need a unified large-scale production to improve the efficiency of social development. Traditional classroom is the embodiment and continuation of this mode in the field of education. But in the Internet age, information exchange, all kinds of knowledge is easier to obtain, people can not be limited by time and space, receive more convenient, efficient and high-quality education. With the advent of the Internet, human beings have more choices. In the industrial age and the Internet age, the social demand for people is not the same, and the education mode is not the same. The core of Internet thinking is people-oriented. Through technological innovation, we can effectively and efficiently change people's life and make people's life better. For education, virtual school is the embodiment and continuation of the Internet era in the field of education.

2 Virtual School Has Gradually Become a New Trend of Internet Education

2.1 Virtual School Breaks the Limitation of Time and Space, Promotes Personalized Education, and Improves Students' Learning Experience and Interest

Students with different learning ability and acceptance ability have no way to carry out personalized learning according to their own rhythm. Students not only like the interactive and cooperative learning style, but also like the personalized learning style of "self-determined progress". In the United States, some students can complete a four-year course in only three years, while others may take five years. Everyone's learning habits and learning rhythm are different. Virtual schools provide students with more flexibility and more choices. Students can adjust their learning progress according to their own actual situation and manage their time reasonably. Individualized teaching can satisfy every student's needs to the greatest extent. At the same time, virtual school develops a teaching mode that combines online courses and teacher guidance through technology and Internet. Teachers can check the progress of students' learning through the monitoring system, master the specific situation of students' learning, and then give students personalized guidance and suggestions. Through online learning, and offline communication, improve the efficiency and quality of learning. Moreover, science and technology also make learning more interesting. Most of the online courses in virtual schools implement interactive teaching mode. Students' learning is like playing games through customs. The form of points also greatly improves students' learning initiative and interest.

2.2 Virtual School Realizes Resource Sharing, Facilitates Knowledge Dissemination and Promotes Educational Equity

The imbalance of educational resources is a problem that every country will face, but through the virtual school, good teachers and resources can be gathered together and

shared through the network, so that children everywhere can enjoy high-quality educational resources. At the same time, virtual schools also create learning opportunities for many problem children. Some disabled children and autistic children are inconvenient to go to school and are unwilling to go to school in the face of pressure from their peers. If they can only teach in the traditional classroom, they will be deprived of the opportunity of education. But the emergence of virtual schools allows them to be educated at home, accompanied by their parents. Virtual schools make educational resources more equitably distributed to every child.

2.3 Virtual Schools Integrate Global Resources to Promote International Education

International education is not only to study foreign courses, but also to cultivate talents with basic information society literacy (communication, cooperation, problem solving, critical thinking and Information Literacy) from a global perspective, and to adapt to globalization. Learning in virtual schools is not only the inhalation of knowledge, but also a social activity. Students take the interactive and cooperative learning way, cross time and space, and communicate with people from all over the world. Compared with traditional schools, virtual schools use the characteristics of Internet technology to cross time and space, making their school running scale, communication objects and information sources much larger than traditional schools, making learning communication without borders and broadening the scope and depth of learning. But the virtual school is still in its infancy, which also faces a lot of problems, by a lot of doubt, there are still a lot to improve. But any innovation and change needs time to improve. Social acceptance of innovation and change is also a long process. Human beings have gradually moved away from the industrial age. In the Internet age, when knowledge is readily available, our traditional classroom based on knowledge transmission needs to be further innovated. In the future, the virtual school may partially replace the traditional classroom. In the future, we will find a compatible virtual classroom and traditional classroom teaching mode and improve it.

3 Development of Virtual Schools in Other Countries

3.1 Virtual School Practice in the United States

In 2001, about one-third of the states in the United States set up virtual schools based on the Internet, providing students of different levels with corresponding out of class learning opportunities. Nowadays, virtual school has gradually penetrated into the field of basic education from the pure network adult education and higher education. Like physical schools, most virtual schools can get financial support from public finance. There is a school in the United States called Virtual Learning Academy Charter School. Founded in 2007, it is the first online virtual public school in New Hampshire. The school covers junior high school and senior high school. Students can learn anytime and anywhere according to their own rhythm. Students in New Hampshire also have access to the school's free education. The mission of VLACS is to provide students with the

most suitable personalized education through the most cutting-edge technology, so that students can learn in the present and achieve tomorrow. VLACS now has more than 125 faculty members, providing students with various courses for their free choice. Students can choose to study all day or half day, depending on their individual situation. VLACS will also provide students with one-to-one tutors. Students can get in touch with tutors by email, telephone, interview, etc. Students can communicate with their tutors anytime and anywhere when they encounter any problems in their life and study. The tutor should contact the students at least once a month to understand the situation of the students and help them solve the problems they are facing. Through online hard knowledge learning and offline personalized guidance, the mode of VLACS is more and more recognized.

3.2 Virtual School Practice in Japan

In 2019, the first Japanese network high school, Mingsheng network learning country, was set up in the distance education high school, located in Central District of Chiba City, Japan. With the slogan "smart phones are your classroom", 300° are offered. As long as there is a computer or smartphone, after opening the special software, you can register with the real name, you can control the "virtual image" you choose to go to the classroom, and the homework will be corrected by the teacher on the Internet. According to the regulations, students must attend four interviews in person in a year, and in the rest of the time, students will listen to the class online as game players. If you complete all the courses, you can get a high school diploma in three years. The students of the network high school can set their own image on the network. There are more than 200 kinds of hairstyles and clothes to choose from. This will be the incarnation of students in the network high school. Students can choose their favorite time to go to school. In the classroom and campus of the network school, they can also communicate with students through text dialogue. Teachers will also come and go to this virtual campus. There is a question box in front of the "teacher's office", where you can talk about your study and life troubles with teachers. According to the school authorities, after students sit in the classroom and start class, they need to watch 20–30 min of video teaching, and then test their understanding through a quiz. A class usually takes 50 min, including tests. In order to improve the students' learning enthusiasm, every class students will get "learning points". Some Chinese character games or English word games can also increase points, and the use of points can buy virtual character clothing and furniture.

3.3 Practice of Virtual School in UK

Acklam Grange middle school in Middlesbrough, UK, has set up a virtual school in the "second life" virtual world, which allows teachers and students to use the virtual school for teaching and learning. Similar to Mingsheng high school in Japan, this teaching project allows students to create their own virtual characters in the virtual school. Virtual characters can move around in the virtual school, meet with students and have classes in the virtual school. The virtual characters representing students can travel through time and space to another place in another era to "experience" the stories of historical characters, or watch the three-dimensional dynamic picture of human heart. The principal of the school said, "If you are studying a play by Shakespeare, you can actually enter

the scene of that play and talk to the characters in it. In such a three-dimensional world, students are more impressed with the contents of the classroom. The classroom is like a student's home. Through virtual experience, students can remember who lives next door.

4 Virtual Classroom Cloud Infrastructure

4.1 Distributed Server Cluster

Virtual Classroom server, which exists as resource in cloud infrastructure, mainly provides shared client connection resources, virtual classroom space resources, shared data resources, preset network bandwidth resources, etc. The resource management server is responsible for the management and scheduling of the above resources. The virtual classroom server can be added to the cloud resources for unified management, and shared to the network for unified resource scheduling. The resource management server is responsible for monitoring the resources of the servers that join the cloud. The servers that work normally are marked as available in the resource list, the servers that fail will be marked as unavailable from the resource list, and the servers that resume operation can be marked as available again.

4.2 Cross Regional Virtual Classroom

Administrators can freely use the available server resources in the cloud to create virtual classrooms. The virtual classroom can be cross domain, that is, a virtual classroom created by using multiple server resources. The creation of virtual classroom can use any number of server resources logically. A logical virtual classroom can cross server. The virtual classrooms with the same ID between different servers are synchronized through audio and video and data information forwarding. Multiple server resources used in virtual classroom can achieve load balancing. If the server resource used by a virtual classroom resource is not available, the system will automatically switch to use the available server resource.

4.3 Intelligent Resource Scheduling

Real time monitoring of server resource status. Resource detection service provides regular server status data, including CPU utilization, memory utilization, network utilization, virtual classroom service status, virtual classroom communication port status, virtual classroom connection number, virtual classroom data port status, etc. According to the above server status information, the evaluation results may be: available, limited and unavailable. The evaluation method is based on a predefined evaluation standard (algorithm), which can be updated and modified (XML).

Virtual classroom reservation protocol (algorithm). Virtual classroom reservation protocol (algorithm) is the key algorithm of classroom virtualization. The algorithm is based on the infrastructure resource information (available server resource distribution, limited situation, network resource status, etc.), and determines the server resource and mode occupied by the virtual classroom according to the information of the classroom to be reserved (scale, time, user distribution, etc.). Virtual classroom reservation protocol (algorithm) can be updated and modified.

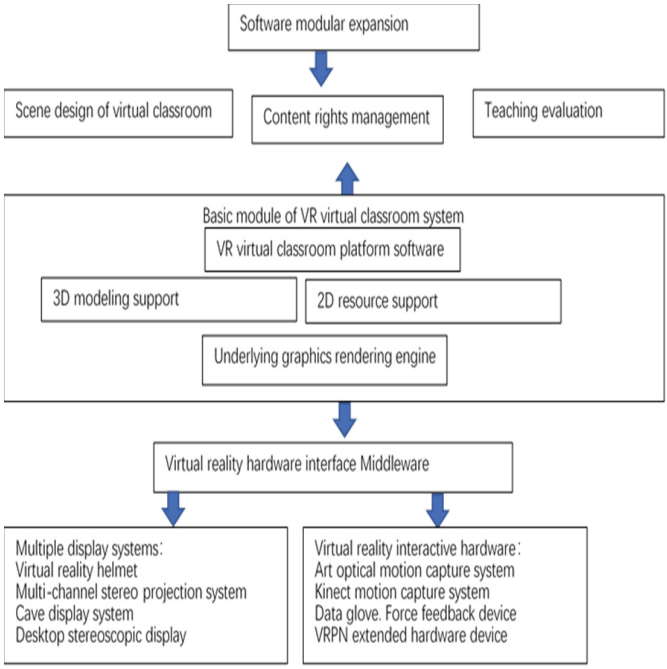
Dynamic resource routing protocol. Dynamic resource routing protocol (algorithm) is firstly to solve the problem of user login nearby, secondly to select the appropriate login server when the nearby server is not available, and finally to solve the problem of system load balancing. Dynamic resource routing protocol (algorithm) is based on the infrastructure resource information (available server resource distribution, limited situation, network resource status, etc.), and according to the user's current location information (such as IP address or gateway information), determines the primary server and standby server of the user, and notifies the user when the user logs in to the server. Routing information will change with the change of infrastructure resources.

4.4 Load Balancing in Virtual Classroom

Dynamic resource routing algorithm. According to the user's IP address or gateway address, the preferred server address and alternate server address are determined, and the priority login routing table is formed. When the user logs in, download the corresponding priority login routing table. First, try to log in to the priority server address. If it is not available or the server is busy, choose to log in to the standby server. Dynamic resource routing algorithm can ensure that users can log on to the most economical server, and maintain the low energy consumption and stability of the system.

Load balancing algorithm. Load balancing algorithm is a part of dynamic resource routing algorithm. The algorithm sets an early warning threshold for server login resources and backbone network bandwidth resources. When the early warning threshold is reached, a lower selection weight is set for the related server resources and bandwidth resources, so as to modify the server optimization principle of dynamic routing algorithm and achieve the purpose of load balancing. Load balancing algorithm can help the system balance the server and network load, improve the reliability and stability of the system (Table 1).

Table 1. VR virtual classroom teaching platform system module function example



5 Promote the Double Classroom Teaching of the Organic Integration of "Virtual Classroom" and "Real Classroom"

Making full use of the advantages of Internet and on-site teaching can effectively reconstruct the teaching ecology, optimize the teaching and learning process, and build a more efficient teaching and learning mode. Educators can supplement the existing courses through virtual courses, especially in flipped classroom or blended learning. Virtual education method promotes inclusive learning by providing accessibility to students with different abilities or who can't actually attend classes. Without sacrificing the interactivity or collaboration of synchronous courses, the scope of teaching materials is expanded. In the face of school suspension, especially for a long time, the implementation of virtual learning infrastructure can maintain the continuity of education.

5.1 Starting from the Characteristics of the Discipline, the Optimization Direction of On-The-Spot Learning Should Be Clarified

Before using network information technology to optimize the on-site classroom teaching, teachers of each discipline should first be familiar with what direction they need to optimize, and what points must be optimized and can be optimized. Only by being familiar with the characteristics of the disciplines we teach can students be truly organized to carry out effective and meaningful "Online + offline" hybrid learning. One of

the challenges of digital learning is that pre recorded materials naturally make the curriculum more teacher centered. Moreover, although standardized textbooks (such as text and video) are convenient and easy to teach on a large scale, they are difficult to adapt to the needs of individual students. Virtual Classroom (especially the field classroom) has the agility and response ability of face-to-face education.

5.2 From the Teaching Practice, Simplify the Application of Information Technology

Just like the interactive whiteboard in the classroom, the virtual classroom can be easily presented by various media, and students can view and consolidate the teaching materials. Through links, documents and embedded media, teachers can take advantage of a wider range of educational content and thus interact more widely with students with a wide range of interests and abilities. The integration of virtual classroom and real classroom needs to be clear that the use of network information technology to optimize classroom teaching does not mean that subject teachers need to master particularly complex technology and be familiar with particularly complex operations. Only when the application of network information technology forms a concise basic mode, can the majority of teachers and students be willing to actively participate in the daily teaching and learning which integrates Internet learning and on-site learning.

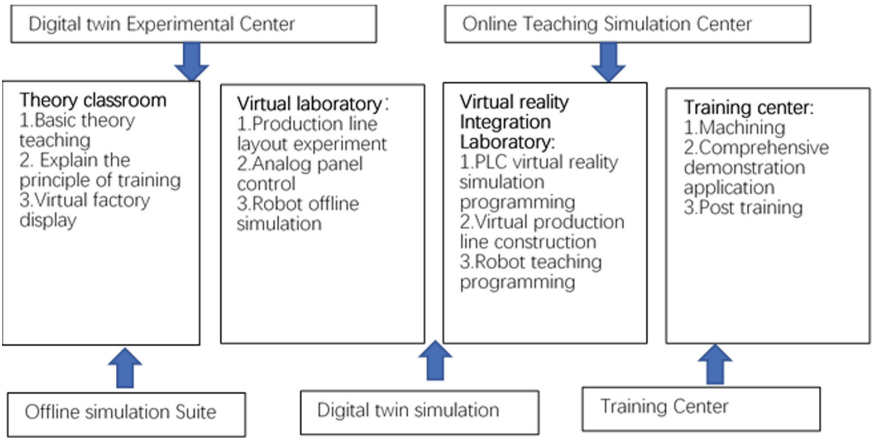
5.3 Starting from the Students' Independent and Personalized Learning, Design the Application Focus

Double classroom teaching is not to use technology for the sake of using technology. In the process of excavating the advantages of information technology and designing virtual classroom teaching, teachers should closely focus on the teaching purpose, take students' independent cooperation and personalized learning as the core, and innovatively and detailly design the application of Internet function. Related to interactivity is the collaborative capabilities of virtual classrooms, which are usually real-time. Through shared chats, files and digital whiteboards, students can work together to solve problems and supplement course materials. In order to simulate group work, group discussion room enables students to work in pairs or in groups, which is similar to group work in physics classroom. Effective virtual classroom will have multiple communication channels. This will include instant messaging, voice chat and video conferencing. Ideally, students and teachers can also use shared workspaces to maintain interaction with course materials. For example, there are video assisted learning options.

5.4 From the Perspective of Research, This Paper Summarizes and Optimizes the Application Mode to Help the Reform and Development of Education

Under the background of curriculum reform, core literacy training and comprehensive quality evaluation are the focus of modern education, and teaching itself is a process of continuous exploration, optimization and development. Therefore, in the process of double classroom teaching, we should start from the perspective of research. On the one

Table 2. An example of demonstrative virtual simulation training base for Vocational Education



hand, we should carry out data and case analysis, optimize and precipitate the application mode, and lead the reform of education and teaching. On the other hand, we should also analyze the application needs, and effectively feedback the optimization of educational technology. Imagine a world where learning takes place not only in our school, but also outside school, when we travel and explore the world, even in our own comfortable and safe homes. Virtual classroom is an ideal way to get real-time contact from anywhere in the world.

For example, with the development of information technology, the construction of vocational education virtual simulation training base is not only an urgent need to reform the traditional teaching methods and promote the innovation of talent training mode, but also an important measure to strengthen the integration of teaching, learning and training. Through the combination of virtual reality and simulation technology, learners can enter the virtual laboratory and operate the virtual instrument personally. The operation results can be displayed by the instrument and fed back to students to judge whether the operation is correct. This kind of experiment does not consume equipment and is not limited by external conditions. It can be operated repeatedly until satisfactory results are obtained (Table 2).

6 Deep Application of Virtual Teaching

6.1 Distributed Server Cluster

At present, many colleges and universities are actively studying virtual reality technology and its application, and have successively established virtual reality and system simulation research laboratories to rapidly transform scientific research achievements into practical technologies. Some research laboratories even have the strength to undertake large-scale virtual reality projects independently. Virtual learning environment virtual reality technology can provide students with vivid and lifelike learning environment,

such as the construction of human models, computer space travel, compound molecular structure display, etc., and provide unlimited virtual experience in a wide range of subjects, so as to accelerate and consolidate the process of students' learning knowledge. Personal experience and experience are more convincing than empty and abstract preaching. There is an essential difference between active interaction and passive indoctrination. Virtual experiment uses virtual reality technology to establish various virtual laboratories, such as geography, physics, chemistry, biology and so on, which has incomparable advantages over traditional laboratories.

First of all, many experiments can not be carried out because of the limitation of equipment, space, funds and other hardware. Using the virtual reality system, students can do all kinds of experiments at home and get the same experience as real experiments. Under the premise of ensuring the teaching effect, the cost is greatly saved. Secondly, to avoid risks, real experiments or operations often bring all kinds of dangers. Using virtual reality technology for virtual experiments, students can safely do all kinds of dangerous experiments in the virtual experimental environment. For example, the virtual flight teaching system can avoid the serious accident of aircraft crash caused by students' operation errors. Finally, breaking the limitation of space and time, using virtual reality technology can completely break the limitation of time and space. Students can enter the interior of objects as large as celestial bodies and as small as atomic particles. Some changes that need decades or even hundreds of years to observe can be presented to students in a very short time through virtual reality technology. For example, the Mendelian law of heredity in biology, experiments with fruit flies often take several months, and virtual technology can be realized in one class.

6.2 Virtual Training Base

The "equipment" and "parts" of the virtual training base based on virtual reality technology are mostly virtual, which can generate new equipment at any time. The teaching content can be constantly updated, so that the practical training can keep up with the development of technology in time. At the same time, the immersion and interaction of virtual reality enable students to play a role in the virtual learning environment and devote themselves to the learning environment, which is very conducive to students' skill training. It includes military combat skills, surgical skills, teaching skills, sports skills, automobile driving skills, fruit tree cultivation skills, electrical maintenance skills and other vocational skills training. Because the virtual training system has no danger, students can practice repeatedly until they master the operation skills. For example, in the virtual flight training system, students can repeatedly operate the control equipment, learn to take off and land in various weather conditions, and master the driving skills through repeated training.

6.3 Virtual Simulation Campus

In a series of related documents, the Ministry of education has referred to virtual campus for many times, and clarified the status and role of virtual campus. Virtual campus is also the earliest specific application of virtual reality technology in education and training. It has three application levels from shallow to deep, which respectively adapt to the

needs of different degrees of schools: simple virtual campus environment for tourists to browse. Based on teaching, educational administration, campus life, the relatively complete three-dimensional visualization virtual campus. Taking students as the center, adding a series of humanized functions, taking virtual reality technology as the basic platform of distance education Virtual distance education virtual reality can provide a mobile electronic teaching place for the branch schools and teaching points of distance education set up after the expansion of college enrollment. Through the interactive course directory and website of distance education, and the link of campus website by LAN tools, it can provide open and long-distance continuous education for each terminal, and provide new technology and higher vocational training for the society Opportunities for training. With the continuous development and improvement of virtual reality technology, as well as the continuous reduction of hardware equipment prices, we believe that virtual reality technology with its own strong teaching advantages and potential, will gradually be valued and favored by educators, and finally widely used in the field of education and training and play an important role.

6.4 Promote the Development of Campus Cloud Classroom

Network classroom cloud classroom is an application platform based on network classroom and distance education. It uses advanced information network classroom application software, uses grid transmission technology to transmit audio and video resources and various teaching application data, and uses the existing network classroom in Colleges and universities to receive presentation. Students can log in to relevant websites to enter real-time classroom and realize online learning. It is generally suitable Vocational training and distance education. Network classroom cloud classroom can provide video and audio interaction, Web Sharing and text interaction. In addition to watching the live courses of teachers, it can also be on demand at any time to enhance students' learning autonomy. Each student can also discuss by applying for a speech, and can also specify students to post for interaction, so as to realize real-time interaction in online Q & A. The E-Book Package cloud classroom mode breaks the traditional classroom teaching, using the popular laptops or mobile tablet computers and other terminals of college students, and using the school cloud computing network classroom application platform, it realizes the paperless, no desk, no classroom teaching mode. Students no longer need to go to the classroom or carry textbooks. They only need to use the mobile communication terminal in their hands to listen to the class, communicate and do homework. Cloud classroom can observe students' learning and homework at the first time, check their homework process and implement personalized teaching. The rapid development of network technology provides technical support for the teaching reform in Colleges and universities. The increasing popularity of scientific and technological products and modern communication products makes the modernization of education more realistic. It is an inevitable trend for classroom teaching reform to keep pace with the development of the times and realize the integration with science and technology. Cloud classroom is not only the embodiment of digital classroom teaching, but also the concentrated embodiment of modern educational technology and teaching mode innovation. Cloud classroom can give full play to students' subjective initiative, maximize the mobilization of students' enthusiasm and creativity, and cultivate high-quality talents.

7 Conclusion

With the gradual use of virtual reality and other technologies, virtual classroom, virtual experiment and virtual examination room are used more and more, classroom teaching methods are being "Reconstructed", and pre class preparation and after class homework are gradually becoming information-based and intelligent. In recent years, the application of virtual reality technology has become more diversified and more in-depth, and the fields of civil military integration, medical services, education services and so on have begun to rise. "Virtual reality+education" can provide students with vivid and lifelike learning environment, such as building human body models, simulating space travel, displaying the molecular structure of compounds, etc. it can also save the cost of education and avoid the risk of practical operation. In the future, virtual reality devices can be integrated into classroom teaching like teaching aids. Virtual reality technology helps to improve students' interest and accuracy of knowledge dissemination. The immersion of virtual reality equipment can help students to study deeply and enhance their impression, especially the study of geography knowledge, human history or micro scene. we will sum up the experience of cooperation between information technology enterprises and left behind children's schools, and explore a new model of floating population education combined with virtual reality and other technologies. Industry insiders believe that the use of information technology equipment will leave data traces, and the development of these data traces can also help teachers understand the learning progress and status of students. The advantage of virtual reality technology is immersion and interaction. In the field of education, immersion has become more prominent, and interaction should be strengthened. The integration of virtual reality and other equipment into the education scene should also build a long-term and stable cooperation mode between schools and enterprises. Relevant equipment must ensure eye health and personal safety. Virtual reality and other technologies will not solve all the educational problems. We should also clarify the specific positioning of virtual reality equipment in teaching, and avoid homogenization of related services. Virtual reality education is still in its infancy, which requires education authorities, schools and enterprises to define their respective roles and jointly promote market development.

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