Research on Physiology Teaching Model Based on Virtual Reality

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Abstract: With the development of "Internet+" and artificial intelligence, the application of information technology in the field of education continues to strengthen, and more and more information based teaching methods have been used in teaching and training. Among them, VR(Virtual Reality) has been widely used in physiology teaching and training projects as a new information teaching method. Various applied studies show that classroom virtual reality technology can clearly display teaching content, establish an effective learning environment with the development of technology and improve students' ability to master knowledge and skills. In fact, it makes it easier for teachers to express their ideas and contents, thus making it easier for learners to understand the ideas and contents of teaching. The VR technology is introduced into the physiology classroom teaching, and the teaching mode of question inquiry learning is adopted. Integrate reality teaching and simulation teaching organically, take the advantages of VR technology and online learning, and promote the reform of traditional teaching mode through mixing.

1. Introduction

Physiology is an important basic medical course in medical colleges and universities. It is a subject to study the normal functional activity laws of organisms and their components, and it is an experimental subject[1]. All knowledge comes from clinical practice and experimental research, which is complex, abstract and practical[2]. Using the technical advantages of VR technology, by building a virtual simulation teaching platform for Physiology, this paper discusses the application strategy of VR technology combined with physiology teaching in the field of medical education, and provides ideas and means for medical colleges to carry out medical physiology teaching research[3]. Build an information-based virtual simulation experiment teaching platform through computer technology and network platform[4]. This teaching method helps to realize the idealization of teaching and the high efficiency of learning. Specifically, it can promote the improvement of the teaching effect of physiology from the aspects of improving the teaching method, optimizing the training mode, and strengthening the combination of basic and clinical teaching[5]. In the next stage, further research is still needed to improve the existing technology, optimize the combination of VR technology and traditional classroom teaching, so as to achieve the optimization of teaching effect[6].

2. Virtual Reality Technology and Teaching

VR specifically refers to putting users into a computer generated 3D virtual scene and using specific interactive tools to simulate the software and hardware environment for real operation[7]. It enables the user to obtain the relevant information in the virtual scene in an all-round way, bringing the user a sense of immersion in vision, hearing, touch and other aspects[8]. It integrates computer, intelligent technology and other sciences, and has the characteristics of simple structure, low price and easy promotion (see Figure 1). It turns the digital information processed by computer into multi-dimensional information with various manifestations that people can feel[9]. At present, the shared VR system can be mature and used for physiological experiment simulation, including VRML and JAVA technology, which can be based on the simple VR system[10]. The above technologies are used to build the physiological experiment scene and process, so that the physiological experiment simulation is full of three-dimensional stereoscopic feeling, so that students have a more real and direct experience, which is conducive to the training of experimental skills[11].
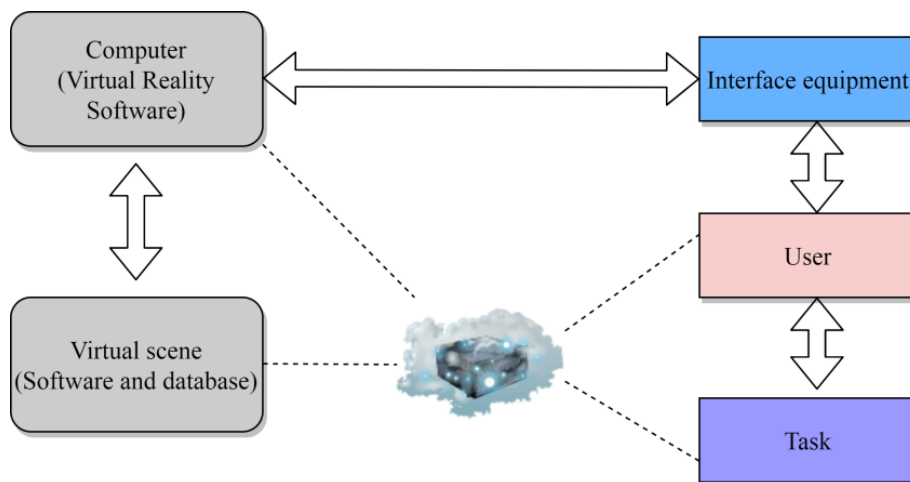
Figure 1: Basic Framework of VR System

The modernization of education is inseparable from information technology, and educational reform needs the support of modern educational technology. Modern educational technology requires the comprehensive application and introduction of multimedia technology, VR technology, network technology and control technology into the classroom, showing the teaching process that can't be realized in the traditional teaching mode, and virtual various experimental equipment and training environment. Give full play to the integration, control and interaction of modern information technology, and vividly show the teaching content. Comprehensive processing of multimedia information such as hypertext, graphics, images, animation, video, sound, etc., the information of various media acts on students' various sensory organs at the same time, which is helpful to improve students' understanding ability and practical ability. For this reason, we combine virtual technology with teaching to construct an intelligent teaching mode (as shown in Figure 2).
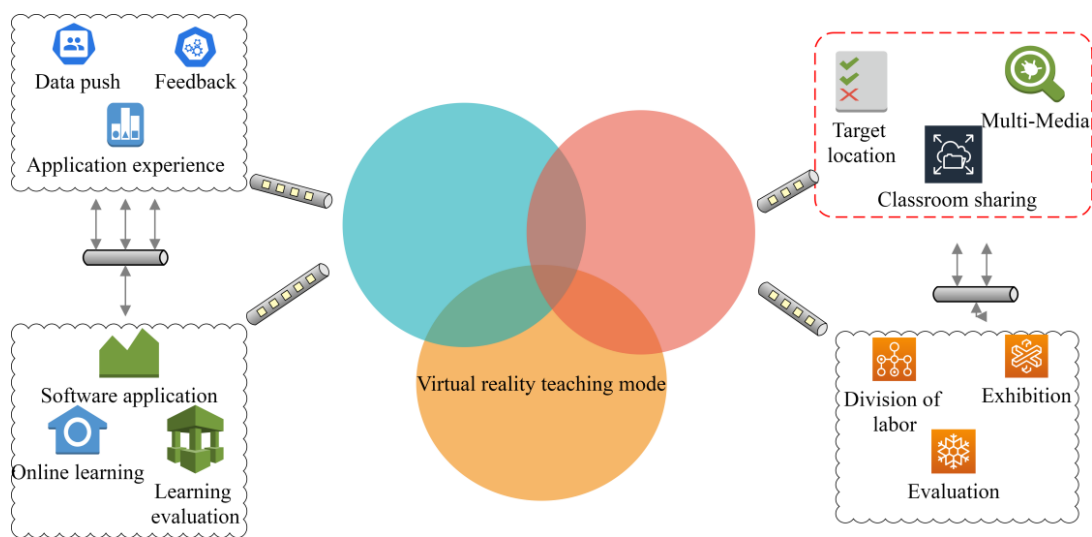
Figure 2: Intelligent Teaching Mode Based on VR

The application of VR in teaching can make learning resources diversified. VR teaching can constantly update database information, apply cutting-edge theories, excellent courses and advanced methods to actual teaching, and allow learners to maximize access to quality education and resources. In addition, it can personalize the learning progress. The cognitive level and learning ability of each student are different. The VR teaching system can record the learning progress of each learner, and set up personalized teaching plans according to the learning needs, to make up for the shortcomings that the teaching progress and lesson plan are difficult to balance in teaching activities.

3. Advantages of VR Technology in Teaching Physiology

The immersion of VR and the visual and experiential impact it brings to people are enough to attract the attention of medical educators. This sense of immersion "as close as possible to the real experience" is exactly the core requirement of modern simulated medical education. The course of human physiology has many teaching contents and involves complex human structure, which requires strong spatial imagination. It is hard for non-medical college students to perceive the structure and physiological function of human body. VR technology can visualize abstract medical concepts, help students deeply understand, establish a sense of three-dimensional and hierarchical complexity, help students remember, improve learning efficiency, stimulate students' enthusiasm for learning, and cultivate students' practical innovation and independent learning ability. So as to better ensure the teaching effect and adapt to the teaching needs under the new situation. Its advantages mainly change in the following aspects.

(1) The simulation effect is realistic. VR technology can give people a visual and realistic three-dimensional environment. With auxiliary equipment such as touch, hearing and smell, it can create a realistic environment and give people an immersive feeling. Such abstract life activity phenomena and laws as cardiovascular response at high altitude, spinal cord semi transection injury, and heart pumping process directly and vividly interact with students. Based on the real experimental data, the virtual physiological experimental environment and model are constructed to simulate the experimental operation process and restore the experimental results and students' operation scores. As a teaching method in many occasions, such as routine experiments, training and assessment, and teaching competitions, it is close to solving the important and difficult problems in physiology.

(2) Reduce the learning cost. VR technology can complete the construction of experimental model and experimental environment at one time, and students can repeat the operation of the experimental process, effectively control the risk of the experiment, and avoid the possible failure of experimental animals such as death and infection in traditional experiments. It can obviously save the cost, and the virtual simulation software platform can be recycled for a long time after one-time development, thus reducing the preparation time and consumables of experiments.

(3) Improve teaching methods. VR technology has greatly overcome the limitations of traditional teaching environment, can create realistic scenes, provide efficient dynamic interaction, can effectively stimulate students' curiosity, realize situational learning and knowledge transfer, and enhance learning experience.

4. Teaching Implementation

4.1 Assessment of Teaching Application

First of all, in order to make users immerse themselves in the virtual environment, the virtual experiment instruments generated must be realistic and natural enough. Therefore, the modeling of virtual instruments is the basis for the establishment of the entire virtual experiment system. Human perception of information is mainly obtained through vision, hearing, touch, smell and gravity. A good virtual scene must provide these senses with stimuli similar to the display environment. Secondly, we should pay attention to the design of the curriculum system of Physiology based on VR technology. On the basis of respecting the advantages of traditional teaching models, we should closely combine the advantages of VR technology, strengthen the teaching model of combining reality with fiction, and develop strengths and avoid weaknesses. Finally, we pay attention to the establishment of physiological model resources and the development of simulation system based on real data and clear rules. The accuracy of the model and the accuracy of the system is the key to determine the simulation experiment teaching.

This paper integrates clinical simulation system, multimedia broadcast system, virtual simulation experiment and network resource database, designs experimental content around simulated clinical, enriches teaching content, expands experimental field, and organically integrates knowledge learning with the cultivation of experimental hands-on ability. After several cycles of VR teaching, 150 students from 33 classes of a clinical medicine major were investigated by questionnaire. The survey includes: whether the application of VR technology is conducive to improving teaching efficiency, whether it is conducive to cultivating students' autonomous learning ability, and the satisfaction and acceptance of its application in physiology classroom. From the results of classroom teaching evaluation, it can be seen that the teaching reform based on VR technology has basically achieved the intended effect. The survey results are as follows (Table 1).

Table 1: Satisfaction Survey Results of Physiological Courses

Evaluating indicator	1	2	3	4	5
Satisfaction	0.11	0.22	0.54	0.55	0.11
Improvement of learning ability	0.75	0.26	0.33	0.11	0.28
Recognition of innovation	0.39	0.05	0.89	0.63	0.85
Acceptance of teaching methods	0.89	0.67	0.62	0.28	0.56

According to the survey results, 11% of the students are dissatisfied with the learning results of VR biology course, and most of them are satisfied with the study results. According to the improvement of learning ability, 68% of the students think their development ability has been greatly improved. From the perspective of the improvement of innovation ability, only 15% of

students think that the improvement of innovation ability is not enough. From the perspective of the acceptance of teaching methods, most students are satisfied with this teaching mode. In general, according to the above investigation, the teaching method based on intelligent learning is feasible and the teaching effect has been significantly improved.

4.2 Future Application Prospect

At present, there are two main types of medical education resources on the VR application platform: the first type takes science popularization as the main purpose, and its essence is the three-dimensional reconstruction of the original two-dimensional animation, which is characterized by vivid images and does not pursue details and accuracy. The other is based on a certain anatomical part or medical scene, which is generally 3D anatomy or surgical operation, combined with corresponding knowledge points, to show more professional details and accuracy. VR technology has been used in medical teaching, which can enhance students' interest in learning, cultivate students' creativity and imagination, improve teaching quality, and point out the direction for medical education reform. A qualified VR system should have the characteristics of high accuracy, high authenticity and good human-computer interaction, but most VR devices can not meet the above requirements at present. The upgrading of VR system hardware should be accelerated, the multi-mode data modeling and processing capabilities should be improved, and medical imaging and image processing technologies should be improved to make it more intelligent, open, visual and realistic.

5. Conclusions

As far as educational theory is concerned, VR realizes people's presence, and participants and virtual environment are two aspects of a whole that interact and influence each other. It has created an atmosphere of autonomous learning, which has changed from the traditional "teaching centered" learning mode to a new learning mode in which learners acquire knowledge and skills through their interaction with information and environment. With the rapid development of computer technology, VR technology is becoming more and more mature. The introduction of VR technology in the teaching process of human physiology can intuitively display the complex human body structure, leave a deep impression on students, and play a better role in assisting teaching. This role will be more important for non-medical college students to learn this course. We are convinced that in the future teaching of human physiology, more VR technologies will be introduced to turn the learning of this course into a happy experience.

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