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A Study of Application of Multimedia Virtual Simulation Teaching Method in Microbiology Experiments

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Abstract

In view of the problems existing in medical microbiology experiment teaching, the feasibility of applying virtual simulation technology to medical microbiology experiment teaching was discussed in this paper. Virtual technology and reality teaching can be effectively combined to give full play to the advantages of virtual platform, so as to continuously deepen the reform of medical microbiology experimental teaching, enrich the hands of basic medical education, advocate innovative experimental reform with students as the main body, mobilize students' initiative, enthusiasm and creativity, and stimulate students' innovative thinking and innovative consciousness, which can lay a solid foundation for training high-quality and high-skilled innovative medical professionals in colleges and universities.

Keywords: Medical Microbiology; Experimental Teaching; Virtual Simulation

1. INTRODUCTION

Medical microbiology is an important subject of basic medicine. It has the characteristics of strong specialization, scattered knowledge points and close combination with clinical practice. Experimental teaching is an important part of medical microbiology teaching, but traditional experimental teaching only repeats theoretical knowledge mechanically. Students operate and observe experimental results according to standard experimental procedures, and the teaching effect can not be guaranteed. With the rapid development of social science and technology, especially the continuous innovation of information technology, such as cloud computing, big data and Internet+, there are new opportunities and challenges for basic medical education. The effective combination of medical education and information technology is the development trend of modern medical education. At present, high-level medical education institutions at home and abroad attach great importance to the construction of informationization of medical education. In 2013, the Ministry of Education made a further deployment to build a national virtual simulation experimental teaching center. Many medical colleges and universities have carried out the construction of virtual simulation laboratories and achieved good teaching results.

2. CURRENT SITUATION OF MEDICAL MICROBIOLOGY EXPERIMENT TEACHING UNDER TRADITIONAL MODE

2.1 "Passive following" experimental teaching method

The "passive following" experimental teaching method is not conducive to mobilizing students' enthusiasm for learning. At present, the teaching of medical microbiology experiment in colleges and universities mainly adopts the traditional mode. This mode mostly adopts the procedural mode of teacher-centered and students' passive acceptance. Teachers set up the experiment contents and steps in advance, and students passively accept it, so knowledge is basically in a one-way transmission state [1]. The experimental teaching contents arranged by the school are mostly simple demonstration and confirmation experiments within the scope of the syllabus. There are few comprehensive and research experiments designed by students independently. The disadvantage of this kind of

teaching mode is that students can mechanically complete experimental projects in limited time under the guidance of teachers, and lack the opportunity of active thinking and self-design. Students are unable to integrate the knowledge they have come into contact with the knowledge they have learned in their theoretical classes, which severely limits their subjective initiative and creativity. Students can not experience the unique research ideas and pleasures of life science through the experimental course, and their ability to analyze and solve problems is difficult to improve. Students' long-term acceptance of this training mode will cause many serious consequences, such as the decline of students' interests in learning [2]. Teaching effect will be greatly reduced, and students' ability to solve practical problems in future work and in the process of further education can be seriously inadequate.

2.2 Restrictions on teaching experiments

The development of teaching experiment project is limited by many aspects such as sites, funds and biological safety. In recent years, as the enrollment scale of higher education is expanding year by year, the shortage of teaching experimental sites, teaching funds and resource shortage has become a common problem in college teaching. The contents and class hours of medical microbiology experiment course have been cut down repeatedly. At present, the experimental contents are only a part of representative, easy-to-operate, economical and commonly used simple experiments. For those experiments which need expensive instruments and materials and are time-consuming, most of them only do teaching demonstration, and students lack practical operation opportunities. All of these are not conducive to the improvement of students' practical ability and corresponding learning [3]. In addition, many microorganisms in medical microbiology research are harmful to human body, but the teaching laboratory does not have the conditions to carry out relevant experiments, so students can only passively accept the contents of teachers' lectures in theory class, which leads to their intuitive understanding of the biological characteristics, pathogenesis, prevention, diagnosis and treatment of these pathogenic microorganisms. These problems seriously restrict the experimental teaching level of medical microbiology, which is not conducive to the cultivation of students' experimental skills and the expansion of students' professional vision.

3. CHARACTERISTICS OF MEDICAL MICROBIOLOGY VIRTUAL SIMULATION EXPERIMENT

3.1 Combination of virtual and real in experimental operation

Medical microbiology experiment is a medical teaching link which combines basic theory with operational skills, and its aim is to cultivate students' comprehensive experimental skills, scientific research thinking and innovative ability [43/]. Traditional experimental operation process has trained students' practical operation ability, but it is limited by many factors, such as experimental site, teaching cost, ethical limitations of experimental animals and students' inadequate experimental operation ability, which results in the unsatisfactory effect of experimental training in the process of real learning. Using virtual simulation experiment platform to carry out simulation experiment can enable students to practice repeatedly in the virtual environment. At ordinary times, some large-scale comprehensive experiments that can not be carried out can be designed and operated by students themselves in the mode of virtual experiment, and the conclusions can be drawn by analyzing the experimental results [5]. This kind of teaching mode can expand learning contents and expand students' professional visions. Virtual simulation experiment platform can break the time limit. Students can log on to the network platform at any time, carry out experimental projects and study independently according to their own interests, and effectively exert their subjective initiative in learning. Through the open learning and repeated practice of the experimental platform, students can better strengthen their basic experimental skills and enhance their professional literacy. Virtual simulation experiment can assist experiment teaching, but traditional experiment operation is irreplaceable.

3.2 Operation safety and cost saving

Traditional medical microbial experiments have uncertain risks such as being bitten by experimental animals, pathogenic microbial infection, poisoning by highly toxic drugs, radioactive contamination and so on [6]. At the same time, the cost of purchasing laboratory animals and reagents has been rising, and the cost of purchasing, operating and maintaining large-scale experimental instruments and equipment has resulted in the shortage of funds

for teaching operation in colleges and universities. These problems also exist in many basic medicine disciplines, which has always troubled the experimental teaching of basic medicine in some universities. The application of virtual simulation experiment technology can solve these problems to a certain extent, and build a low-cost, windless environment for students. The dangerous and adjustable experimental skill training platforms can realize the transformation of the new model of experimental teaching of basic medicine.

4. Construction of Virtual Simulation Experiment Platform for Medical Microbiology

4.1 Construction of virtual experiment model

Generating virtual model is the basis of constructing virtual simulation experiment, and it can show the main experimental instruments, experimental instruments and other experimental facilities in the form of virtual models, such as Petri dishes, alcohol lamps, inoculation rings and other experimental instruments [7]. Ultra-clean workbench, electrophoresis instrument, enzyme label instrument and cell culture room, laboratory platform, drug cabinet and other experimental facilities need to be dealt with virtual three-dimensional construction. In order to make the virtual experiment more realistic, it is necessary to tailor a virtual experiment scene for each experiment. On the basis of the virtual experiment model, Flash, 3D Max and other animation production software can be used to integrate animation, audio and other elements to complete the construction of the virtual experiment model.

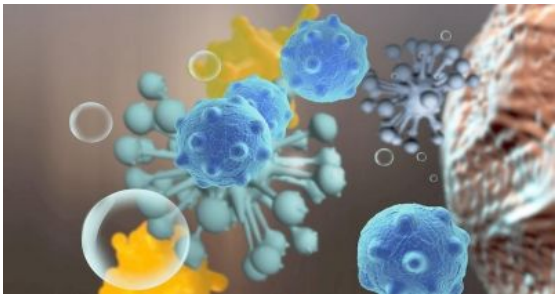

FIG. 1 VIRTUAL SIMULATION OF MEDICAL MICROBIOLOGY

4.2 Integration of basic experimental teaching resources

According to the basic experimental contents and standardized experimental operation methods required by the syllabus (such as bacterial morphology and commonly used bacterial staining method, bacterial infection inspection method and prevention principle, microbial culture in vitro and the use of microscopy etc.), the integration of the teaching contents into the virtual simulation experimental platform allows students to operate repeatedly. In real classroom teaching, students can master the prescribed learning content more skillfully and thoroughly to ensure the learning effect. Digital 3D scanning technology is used to process medical microorganism teaching film and general specimen, and the establishment of digital slice library is convenient for students to access at any time [8]. The advantage of digital slice is that it does not depend on the microscope. The whole slice is observed and learned through the network. The whole slice is clear and vivid in color. It can be observed at any position and at any rate by mouse operation and simulate the observation mode of microscope. Virtual simulation experiment platform can integrate three-dimensional pictures, teachers' multimedia courseware, teaching video, audio and other contents. Establishing cross-links between the experiments can effectively complement each other's contents, which facilitates the experimenters to search for the content they need in each experiment. In view of students' weak safety awareness, teachers can set up safety education modules, including biological safety knowledge, fire disposal methods, the use of dangerous chemicals and standardized operation methods of pressure vessels, and add some virtual scenes of safety accidents, so as to improve students' safety awareness and ability to deal with emergencies.

4.3 Comprehensive and designable experimental simulation platform

Comprehensive experiments with high risk, complex operation and long experiment cycle can be integrated into the virtual simulation experiment platform and presented to students, which can make up for the experiment that can not

be carried out due to the limitations of site, class hours, teachers and other conditions. Students can participate in all the processes of the experiment through virtual space. From the design experiment to the result analysis, it is concluded that students can exercise their logical thinking and scientific research innovation thinking ability [9]. Students can freely design experiments on the virtual experimental platform according to their own ideas, use experimental instruments and equipment according to their own needs, and complete virtual experiments according to the designed experimental steps. The experimental results obtained by the virtual experiment platform can be used as a reference. As a new thing, virtual simulation experiment platform can cultivate students' practical and innovative ability, guide students to explore scientifically, give full play to students' subjective initiative, and stimulate students' interests in learning.

4.4 Learning effect tracking and teacher-Student communication platform

Virtual simulation experiment platform can integrate a large number of experimental teaching resources. With the combination of Internet resources, laboratory resources can be shared and utilized, which can greatly increase the amount of information for students, and facilitate better communication between teachers and students, and among students. The virtual simulation experiment platform provides the possibility for teachers to trace the learning effect of students [10]. Teachers can regularly check, monitor and track the click frequency and learning time of students in their classes, submit experimental reports online understand the situation of students' autonomous learning, and can answer all kinds of questions that students encounter in the learning process in real time. The platform is convenient for both teachers and students. The timely exchange of communication has improved the application effect of virtual resources.

5. CONCLUSION

The innovative teaching mode for students to carry out experiments in virtual environment is the core content of the experimental teaching reform of medical microbiology. Virtual simulation experiment technology can be fully utilized to carry out medical microbiology experiments limited by space, time and teachers, which can improve students' practical ability and innovative consciousness, and make a significant contribution to the cultivation of innovative talents of medical specialty in colleges and universities. In the experimental teaching activities of medical microbiology undergraduate course, virtual simulation experiment can effectively improve the quality of teaching, so it is the future direction of experimental teaching reform. It has a very bright future in the field of medical education and brings opportunities to the development and reform of medical education. As a new teaching mode, virtual simulation experiment teaching is conducive to the sharing and optimization of high-quality educational resources, the promotion of educational informationization and the continuous improvement of educational quality.

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