

The Role of Virtual Simulation Experimental Platform Construction in Experimental Teaching——Taking Bacillus Anthracis in Bacteriological Testing as an Example

Shiran He, Xiaoxuan Ge, Xinyu Li, Wei Zou*

School of Public Health, Kunming Medical University, Kunming 650000, China.

Abstract: Virtual simulation experiment is a technology created by computer technology and virtual reality technology to simulate the real operating environment. This paper intends to take Bacillus anthracis in bacteriological testing as an example to explain the role of virtual simulation experimental teaching platform in experimental teaching, aiming to improve the construction of preventive experimental center and promote the improvement of students' hands-on ability.

Keywords: Experimental Teaching; Virtual Experiments; Hygiene Microbiology

Introduction

Virtual simulation experiments are conducted on computers by simulating actual experimental operations and experimental scenarios, allowing students to obtain observations and data similar to real experiments. If the construction of virtual simulation experimental platforms in experimental teaching is accelerated in pharmaceutical colleges and universities, students can simulate experimental operations by themselves, cultivate hands-on ability, promote the improvement of innovative thinking, and make up for the shortcomings of traditional experimental teaching.

1. Limitations of traditional experimental teaching

In the past, traditional experimental teaching had the following limitations: 1) due to safety issues, it was impossible to teach special microorganisms such as highly pathogenic microorganisms; 2) The experimental equipment and materials are insufficient to ensure that each student conducts the experiment in person; 3) Low engagement. Taking a medical university as an example, the preventive medicine experimental center of the university only has BSL-1 and BSL-2 laboratories, but does not yet have BSL-3 laboratories, according to the laboratory biosafety management regulations, the center cannot engage in experimental research and teaching of highly pathogenic pathogenic microorganisms, which means that students cannot carry out experimental operations of highly pathogenic pathogenic microorganisms. However, in the long run, public health students will inevitably face public health emergencies in their future careers, and if students fail to receive relevant skills training, it is contrary to the original intention of cultivating talents in the field of public health.

2. Application of virtual simulation experimental platform in experimental teaching

2.1 Virtual simulation experiment teaching content - taking Bacillus anthracis as an example

As a highly contagious disease, early detection, early diagnosis and early treatment are the keys to reducing transmission and controlling the epidemic^[1]. The steps to simulate the culture of Bacillus anthracis using the virtual simulation experimental platform are as follows: Firstly, open the virtual simulation experiment software and select "Bacillus anthracis test experiment". secondly, prepare the medium. Thirdly culture Bacillus anthracis. Fourthly determine if Bacillus anthracis is present in it. The fifth step, Perform susceptibility testing. The sixth step, analyze the results. At last, carry out the total report. Through virtual simulation experiments, students can simulate experimental operations related to Bacillus anthracis, observe and analyze the growth and drug response of Bacillus anthracis under different conditions, so as to understand the characteristics of Bacillus anthracis and related experimental principles, and deepen the knowledge and understanding of the pathogen.

2.2 Virtual simulation experiments in the development of experimental teaching

The objects of medical experiments are mainly animals or microorganisms, and due to the lack of practical experience, the failure rate of experiments is very high, which seriously dampens their enthusiasm for participating in experiments. The use of the virtual

simulation experiment platform allows students to rehearse before the real experiment, which can not only improve the success rate of the experiment, but also increase students' interest in the experiment [2]. The virtual technology used by universities and research institutes can simulate virtual experimental steps that cannot be operated due to real objective conditions, making up for the limitations of factors such as insufficient laboratory level or insufficient equipment and instrument configuration. Relying on the virtual simulation experiment platform, teachers can show students the microscopic world of bacteria through computer demonstration, and guide students to actively explore and practice; After class, students can carry out simulation experiments of pathogenic pathogenic microorganisms through the virtual simulation experimental platform without leaving home, which improves safety. At the same time, in traditional experimental teaching, it is necessary to divide students into groups, batches, and time periods into laboratories for experimental operations, which reduces the teaching quality of experimental courses. After the introduction of the virtual simulation experiment platform that can accommodate thousands of people online, students can choose to conduct simulation experiments at any time and place according to their own abilities, which improves the efficiency of teaching.

Even if the virtual simulation experiment platform breaks through the limitations of traditional experimental teaching, it is also necessary for teachers to fully prepare lessons and maximize the use of virtual technology before conducting experimental teaching. After all students have completed the experimental operation, the teacher will release the test with the help of the platform to consolidate the relevant knowledge of the experiment in time and test the students' mastery. In terms of operation evaluation, the virtual simulation experimental platform mainly adopts the method of process evaluation, and generates personalized experimental reports through cloud computing. In the final assessment stage, students can review and consolidate the specific operation of a certain experiment repeatedly; Classroom teachers can also collect the experimental report data of the classmates through the background program, or use the platform to conduct the final assessment as a reference for the final grade evaluation of the course.

2.3 Achievements of virtual simulation experiments in experimental teaching

In 2019, the Ministry of Education clearly proposed to carry out the national first-class virtual simulation experimental teaching first-class course recognition in the implementation opinions on the construction of first-class undergraduate courses, and identified 728 first-class virtual simulation experimental teaching first-class courses in the list of the first batch of national first-class undergraduate courses [3]. In terms of the distribution of professional categories recognized by the national virtual simulation experimental teaching project, the projects that have been recognized cover 60 of the 93 professional categories in the 2020 undergraduate major directory [4]. Taking the Preventive Medicine Experimental Center of a medical university as an example, the center has tried to use virtual simulation experimental technology and offline classroom teaching to teach two experiments, "testing of water microorganisms" and "detection of harmful factors in occupational places", and students can simulate real operations through the experimental platform for self-examination and self-examination, which is convenient for review; Teachers can understand the students' mastery of the principles and operations of this experiment through the background data, deepen the construction of learning style, and ensure the quality of student training in the field of public health. Graduate students and doctoral students can also use the virtual simulation experiment platform to design, propose and optimize innovative experiments, reduce the consumption of human, material and financial resources caused by improper design, transform the high-level talent training mode, and promote the upgrading of talent level in the field of public health. The "2022 Work Points of the Department of Higher Education of the Ministry of Education" clearly states that the construction of "virtual simulation experimental teaching 2.0" should be promoted, the informatization leading technology and the deep integration of higher education teaching should be promoted, and education informatization should be regarded as an endogenous variable in the reform of talent models and teaching methods [5].

3. Development prospect of virtual simulation experiments in experimental teaching

3.1 Virtual simulation experiment platform promotes students' autonomy

The one-foot podium is often a sign of traditional teaching, where teachers teach students in one direction, and students passively accept knowledge. Even though teaching units at all levels are vigorously advocating "interactive teaching", due to the limitations of teachers' professional level, funds, equipment and facilities in different regions, the results have been uneven in various places. Therefore, as far as bacteriological testing is concerned, the virtual simulation experiment platform can make up for the above shortcomings. The computer processing system guides students to actively explore through science and technology, stimulating exploration and creativity. The future international community needs brainy, hands-on, and operational human resources, so deep learning and active exploration

capabilities are particularly important to improve personal core competitiveness. Relying on the virtual experiment simulation experiment platform, students can also share and communicate with teachers or other students about problems they do not understand after class, and the learning atmosphere is more humane [6].

3.2 Virtual simulation experiment platform strengthens the connection and collaboration between schools and enterprises

The virtual simulation experiment system is based on the funds and research equipment provided by enterprises or governments, relying on artificial intelligence technology, software engineering and computer technology, medical expertise and other research and development of an interdisciplinary exchange platform, providing convenience for teachers and students, but also hinting at the complexity of its development. Colleges and universities as a capital reserve strength is still lacking, enterprises have rich capital reserves and need a positive publicity platform. Strengthen school-enterprise ties, schools introduce equipment by introducing official channels for bidding, and at the same time enterprises carry out their own publicity. In the long run, the demand for professional technology and precision equipment will increase greatly, and the "school-business cooperation" between schools and enterprises will be closer to create a win-win situation.

3.3 Virtual simulation experimental platform expands the boundaries of experimental teaching

In this case, anthrax belongs to Class B infectious diseases, and the dynamics of anthrax in China tend to be distributed in the vast agricultural and pastoral areas in the northwest and southwest [7], although there are few reports of public health events related to anthrax, but as a qualified future practitioner in the field of public health, should not have any luck. With the help of the virtual simulation experiment platform, operators can feel the corresponding steps of public health emergencies, so that students can understand their future careers at the undergraduate education level. At the same time, with the help of three-dimensional reconstruction technology, the epidemic process of pathogenic bacteria is restored, the boundaries of experimental teaching are broadened, students' insight and responsiveness are cultivated, and the level of talent reserve in the field of public health is improved.

Conclusion

At present, China's experimental teaching has a relatively complete training system, and colleges and universities should accurately position themselves according to their own regional characteristics and formulate high-level talent training plans with characteristics [8]. Virtual simulation experiments make up for some limitations in traditional experimental teaching, save the cost of experimental equipment and materials, and solve time and space constraints, so that more students can carry out experimental learning, so as to deeply understand the experimental principles and phenomena. Therefore, in the context of today's scientific and technological development, it is especially necessary to build a virtual simulation experimental platform to improve the effect and quality of experimental teaching.

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Corresponding author: Wei Zou, zouwei@kmmu.edu.cn