

Development Studies of Virtual Simulation Experiments Are Integrated with the Biological Curriculum

Qingling Peng¹ & Su Xu¹

¹ Qinghai Normal University, XiNing, Qinghai Province, 810008

Correspondence: Su Xu, Qinghai Normal University, XiNing, Qinghai Province, 810008.

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Abstract

Virtual simulation experiments are widely used in modern information education. Virtual simulation experiments are integrated with the biological curriculum, which can develop experiments' strong points, enrich the resource of biology, shorten the distance of education, promote biological teaching.

Keywords: virtual simulation experiments, biology, mixing development

1. Synopsis of Virtual Simulation Experiments

With the development of computer technology, information technology are most deeply integrated with the curriculum. In order to thoroughly implement the spirit of the 19th National Congress of the Communist Party of China, run online education well, actively promote the development of "Internet + education", and accelerate the modernization of education and the construction of an education power, China's Ministry of Education issued the document "Education Informatization 2.0 Plan" on April 13, 2018. Since the Eighteenth National Congress of the Communist Party of China, China's education informatization industry has achieved unprecedented rapid development, achieved all-round and historic achievements, and achieved the "five major progresses" such as the rapid advancement of the construction and application of the "three links and two platforms", the significant improvement of teachers' information technology application ability, the significant improvement of the level of information technology, the significant improvement of the role of informatization in promoting the development of education reform, and the significant enhancement of international influence. Therefore, the development of education informatization is also becoming more and more important, and the teaching method of virtual simulation experiments, as a product of the information age, has played a huge role in promoting the teaching of various courses.

Virtual simulation experiment, in short, is not the actual existence of the experimental method, is a use of computer technology, combined with the course teaching involved in the various types of experimental operation design, the experimental content, experimental steps, experimental operations, experimental precautions, etc. programming designed as an experimental mode that can be operated under network conditions, virtual experimental design will be experimental materials and instruments highly simulated, the user can use the mouse on the teaching software to complete the experimental operation and quickly observe the experimental results. Its outstanding features are: easy and fast operation, large space for use, unlimited number of repeated operations, etc. The birth of virtual simulation experiments makes some experimental practices of the course get rid of the limitations of experimental conditions such as some venues, experimental equipment and reagents in the actual course, which is conducive to teachers to better carry out and implement the teaching design of the course, and can also better practice the basic concept of biology courses with core literacy as the purpose, and improve the comprehensive quality of students.

2. The Analysis of The Experimental Practice Status of The Biology Course

The implementation of experimental courses is still deficient in the current high school biology curriculum. Nowadays, there is often an increase in experimental content but no increase in the number of class hours in high school biology experiments, and the proportion of classroom teaching and experimental teaching is seriously uncoordinated, resulting in some experiments only “talking about experiments” and not “doing experiments”; Coupled with insufficient experimental equipment and funding, students can only rely on rote memorization to remember experimental phenomena, processes and results; In addition, there are also a series of problems such as the outdated experimental teaching concept and single teaching mode of some teachers, which greatly reduces the cultivation of students’ hands-on ability to operate biological experiments (Su Yongqian etc., 2021). Due to the characteristics of China’s vast territory and large population base, the cultural and economic situation of each region is also different, resulting in differences in the teaching level of each region, and the real curriculum experimental conditions will also be different. In areas with relatively backward teaching conditions, teachers and students may not have access to real biological experiments at all, which is incomplete for teachers; For students, the knowledge learned is imperfect. Therefore, in view of the current situation of experimental practice in China’s biology curriculum, it is very important to integrate the curriculum teaching of virtual simulation experiments.

3. Analysis of the Integration of Virtual Simulation Experiments and Biology Courses

3.1 The Purpose of Integration

The Outline of the National Medium- and Long-term Education Reform and Development Plan (2010-2020) clearly states: “Strengthen the development and application of high-quality educational resources, strengthen the construction of the online teaching resource system, and develop online learning courses.” Establish digital libraries and virtual laboratories, establish an open and flexible public service platform for educational resources, and promote the popularization and sharing of high-quality educational resources. The “General High School Biology Curriculum Standards (2017 Edition)” promulgated by the Ministry of Education clearly states: “Schools can make full use of multimedia, Internet and wireless communication technologies for virtual experimental teaching.” (Ministry of Education of the People’s Republic of China, 2018) The integration and development of virtual simulation experiments and biology courses is to promote the development of biology teaching, optimize and enrich biology teaching resources, provide students with a better educational environment, and achieve the teaching goal of cultivating students’ all-round development.

3.2 The Significance of Integration

3.2.1 Narrow the Gap in the Teaching Level of Biology in the Region

The integration and development of virtual simulation experiments and biology courses can narrow the gap in the teaching level of biology in the region and broaden students’ horizons for biological experiments. Virtual laboratories can break the limitations of traditional experimental teaching, such as timing, types of reagents, and experimental instruments, help students understand experimental principles, and improve their comprehensive experimental operation capabilities, and have been used in the teaching of biology, chemistry, and natural sciences (Qi Yan, Guo Lixin, Bian Jingqi & etc., 2021). In poor areas with lack of educational resources, the hardware facilities for biological experiments are insufficient, such as the biological experiments of observing water loss and water absorption of onion epidermal cells in high schools, and the experimental equipment involved in this experiment has a high-power microscope or electron microscope, the price of such equipment is very expensive, and some schools are not equipped with such experimental equipment, so biological experiments cannot be truthfully arranged in biological courses. In contrast, the national network construction has covered all regions of the country, and different network subsidy policies have been formulated for different regions, so that everyone can use electricity and connect to the Internet. On this basis, the use of virtual simulation platform for experiments can solve the problems in practice to a large extent, so that every educated student can experience the process of doing experiments, understand the operation of each experiment, activate the knowledge in the books, and motivate students to take the initiative to explore and learn. It can be seen that the integration of virtual simulation experiments and biology courses can reduce the level of teaching differences caused by regional differences.

3.2.2 Promote the Development of Biology Teaching in Colleges and Universities

Virtual simulation experiment platform, under the advantages of convenient operation and time saving, China’s colleges and universities can use virtual simulation experiments as experimental practice guidance for biological teaching, design school-based biology teaching programs according to such teaching modes, and implement the programs, from which to gradually establish the characteristics of school-based education. After the introduction of the virtual simulation experiment operation platform in colleges and universities, on the one hand, biology teachers will learn how to use the experimental platform, in this process, teachers will re-understand the

experimental content, and can also improve the level of classroom informatization use of biology teachers in colleges and universities; On the other hand, students can also realize in the network environment that biological experiments can also be carried out in this way, updating students' understanding of the network and enriching students' knowledge. After the integration of biology teaching and virtual simulation experiments, it will not only enrich the biology teaching resources of colleges and universities, but also improve the level of biology teaching on this basis and promote the development of biology teaching in colleges and universities.

3.3 The Strategy of Integration

The development of virtual simulation experiments in China is relatively backward compared with developed countries, so the construction and use of the platform are not very mature. However, how to exert the value of a thing lies in the user's practical process, after the actual teaching and research of China in the virtual experiment platform, our mastery of virtual experiments has tended to mature. The types of high school biology experiments include inquiry, demonstration, observation, and hands-on, and not all experiments are suitable for teaching. For example, in microscope experiments, virtual experiments show their shortcomings and cannot adjust the rough focal helix of the microscope well. For example, in the microscope experiment, the virtual experiment shows its shortcomings, and cannot adjust the coarse and fine focal helix of the microscope well; Therefore, the virtual experiment should be suitable for the type of experiment and the teaching content (Marvin Hua, 2021).

The integration of virtual experiments and biology courses can be started from the content requirements of the "new curriculum standards". There are detailed requirements for relevant biological experiments under the curriculum standards, and colleges and universities can start from the actual conditions, and teachers will write virtual experiments into the teaching design through teaching design, carry out teaching implementation, and finally conduct teaching analysis and evaluation. According to the learning index data feedback by the students, the effectiveness of the virtual simulation experiment into the biology course teaching is analyzed and summarized, and the scientific conclusion is drawn, and the decision is considered whether to continue to use the virtual simulation experiment. For some schools with sufficient conditions, virtual simulation experiments can be used as a means to improve students' extracurricular biological knowledge and skills, encourage students to learn independently, obtain new knowledge from virtual experiments, experience different learning, and form their own unique biological experimental knowledge structure.

4. Conclusion

As a teaching product of the new era of scientific and technological development, the virtual simulation experiment has a certain role in promoting the development of education and teaching, and it is necessary to rationally use the platform for the teaching of related disciplines, and cultivate outstanding new young people for the comprehensive development of the new era for the country and the society.

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