Research and Exploration on the Construction of the Virtual Simulation Experimental Teaching Center

GUANG YANG

ABSTRACT

Establish the Virtual Simulation Experimental Center, carry out the virtual simulation experimental teaching, analyze the advantages and limitations of the virtual simulation experimental teaching, indicate the effect of the virtual simulation laboratory in the experimental teaching, and clarify the interrelation between the virtual simulation experimental teaching and the cultivation of innovative talents.

KEYWORDS

Experimental teaching, Virtual simulation, Virtual platform

INTRODUCTION

An operating environment and testing objects equivalent to the real experimental scene can be built by the virtual experimental teaching system based on the integrated application of the virtual reality, big data, network technology, computer programming and other technologies, so that students can carry out open, economical and efficient experiments in the high-independent and interactive virtual environment, and then achieve the effect that cannot be realized by the physical experiments. Especially in an extreme or a highly toxic environment or in a big time-consuming and labor-intensive or comprehensive complex environment scene, the virtual simulation experiment has more obvious advantages. Compared with the traditional experimental teaching, the virtual simulation experimental teaching has been changed greatly in the way, method, effect, means and mode.

THE IDEA OF THE VIRTUAL SIMULATION EXPERIMENT TEACHING

The construction content of the Virtual Simulation Experiment Center mainly contains the course experiment, practice, course design, graduation design and scientific research of this subject, which can be realized by the virtual reality, multimedia, human-computer integration and computer simulation technology to integrate the curricular content and extracurricular activities, the intramural activities and extramural activities, and the reality and virtuality, and finally form the idea of the virtual simulation teaching --- “first virtuality and later reality, combination of virtuality and reality, strengthening reality by virtuality, and complementing reality by virtuality”.

Guang Yang, ygyangguang@16.com, Changchun University of Science and Technology, Changchun, China
The virtual experimental teaching can break through the limitations of the time and space and the discipline barriers of the traditional experimental teaching and practice, expand the experimental teaching content with low experiment effect and high consumption that cannot be finished and is operated inconveniently in the traditional experimental teaching, support the running of the multidisciplinary cross-over experimental system, improve the teaching effect, and lower the teaching cost, so that students can be the beneficiaries and practitioners of the virtual simulation experimental teaching and the pioneers of the virtual simulation technology.

With the idea of “first virtuality and later reality”, the corresponding virtual experiment can be offered in the basic teaching experiment, so that students can understand the courses preliminarily and own the necessary skills, methods and relevant notes for the experiments. The idea of “combination of virtuality and reality” can further expand their cognitive ability and practical ability to engage in the concrete practice of "reality" through the theoretical and practical means of “virtuality”. The final purpose of “virtuality” is to strengthen the “reality”, and students can actively use the virtual skills to complete the necessary theoretical analysis, simulation design and the design of other key environments, such as the course design, graduation design, research training and skill competition after owning the essential practical skills, so as to lay a foundation for the reality and then realize the teaching idea of “strengthening reality by virtuality”. The experiment teaching staff shall actively replenish the experiment with the latest research achievements, add new virtual experiment projects, and maintain the dynamic links of the latest research achievements, to really realize the purpose of scientific research serving teaching and “complementing reality by virtuality”.

THE EFFECT OF THE VIRTUAL SIMULATION EXPERIMENT CENTER IN THE EXPERIMENTAL TEACHING

Deepen the connotation of the subject and meet the need of the real experiment with high cost, high consumption and high risk

Introduce the scientific research achievements into the practice teaching to promote the scientific research to serve the teaching better and highlight the subject characteristics more, and keep synchronous development with the science and technology. However, due to the limitations of the scientific research content, the testing instruments and the experimental testing environments, it is difficult to apply the scientific research achievements to the practice teaching directly. The first demonstration of the laser communication between the airship and ship and between the planes has verified that it is impossible to provide such practical opportunities for students. In addition, some scientific research instruments are expensive and they cannot be used directly by students. For example, a 60G oscilloscope costs several million yuan. Some instruments are easy to be damaged in the test, such as the optical amplifier and modulator, and some instruments will hurt human bodies if they are operated improperly. For example, the protective goggles are required if necessary when the laser with 800nm band is applied. Therefore, the realization of introducing the practice teaching in the form of virtual simulation in the above-mentioned scientific research not only could effectively solve problems mentioned above and enable students to obtain the practice exercise, but also could help students understand the connotation of this
major better and highlight the research direction and the school characteristics of this subject, so that the scientific research can serve the teaching better.

**Promote the subject development, enhance the effect of real experiment teaching and improve the experimental teaching quality**

With the development of the experimental course system, the practical operation has been combined with the virtual simulation more and more closely and has been integrated gradually, and they can make up for the deficiencies of each other. Virtual experiment is a helpful and necessary supplement to the real experiment. Students can have a more concrete, intuitive and deep understanding of the abstract knowledge in the theoretical courses by the virtual simulation experiment. Meanwhile, students can finish the preview, the parameter design and the function analysis of the experiment and other work in a virtual environment, so as to save more practical operating time, improve the efficiency, and reduce the error rate. Because the real experimental teaching in the traditional teaching mode is limited by the large number of students, teachers and laboratory conditions, students only finish the experiments within the prescribed time and they have little opportunity to practice repeatedly, which will result in an embarrassing situation that the laboratory resources are short severely but they also are idle mostly and wasted seriously. This system can integrate the experimental equipment, teaching content, teacher guidance and students' operations organically with the computer by designing the virtual instrument through the digital modeling in the virtual experiment environment. Students can independently choose the experiments and practice them repeatedly in any computer to break through the constraints of time and space, strengthen their physical ideas and methods on the experiments and their understanding on the structures and the principle of the instruments, and achieve the effect that is difficult to be realized in the real experiments. The combination of virtual technology and communication technology can make students have a "hand laboratory", where they can learn and practice repeatedly in any place and at any time, to really achieve the purpose of taking students as the center and promoting the independent learning.

**The virtual simulation experimental teaching and the training of creative talents**

Provide students with an unlimited experimental environment and broaden their knowledge and field of vision. The progress of science and technology has resulted in the rapid development of various subjects, and new technological products, equipment and devices have been replaced quickly, but the experiment content in the traditional experimental teaching is monotonous and most experiments are confirmatory, and students don’t need to consider the establishment of the experimental platforms and they only need to complete the experiment according to the operation steps, so there is no training of students' creativity. The establishment of the virtual experiment platform can increase the content of the independent experiment design for students, so that they can design the experiment implementation schemes and analyze the experimental results according to the experimental purposes. Thus, it can be seen that the establishment of the virtual simulation laboratory not only can cultivate the students’ ability to work independently and their creative thinking, but also is conducive to stimulate their interest.
in learning, which are very helpful to cultivate the innovative talents with outstanding practical ability.

CONCLUSION

There are some problems with same characters in the theoretical teaching of the specialized course. Some theories are so abstract that it is difficult to find some examples to practice them in the real world. In order to solve the problems in the theoretical teaching process, it is necessary to expand the content of the experimental teaching, realize the seamless connection between the theoretical teaching and the experimental teaching, and synchronize them in class as much as possible. Therefore, the establishment of the Virtual Simulation Experiment Center, the application of the virtual simulation experiment teaching platform and the presentation of the intuitive and accurate experimental scenes with good operability and strong sense of reality play a crucial role to develop the university students' ability of innovation and practice.

REFERENCES

2. WANG Wei-guo. Construction Consideration and Suggestion of Virtual Simulation Experimental Teaching Center [J]. RESEARCH AND EXPLORATION IN LABORATORY. 2013(12):5-8