Application of Virtual Simulation Technology in Mechanical Engineering Experiment Teaching

Liu Xiao

Shengli College China University of Petroleum, Dongying, Shangdong, China

Keywords: Virtual Simulation Technology, Mechanical Engineering Experiment Teaching, Operation Process, Application

Abstract: as the Key Specialty of China's Science Universities, Mechanical Engineering Experiment Teaching Has Strong Practicality, Focusing on Training Students' Ability of Practice and Innovation. through the Application of Virtual Simulation Technology, Mechanical Engineering Experiment Teaching Can Not Only Help Students Master the Principle of Mechanical Operation, But Also Give Full Play to Their Sense of Initiative and Improve the Effect of Mechanical Engineering Experiment Teaching. by Analyzing Virtual Simulation Technology, This Paper Focuses on the Application of Virtual Simulation Technology in Mechanical Engineering Experiment Teaching, in Order to Provide Theoretical Reference for College Teaching.

1. Introduction

1.1 Literature Review

At present, under the background of rapid development of science and technology, virtual simulation technology is developing faster and faster. It is gradually applied in the production field, and provides a good experimental basis for mechanical engineering practice. By introducing the application of virtual simulation technology in mechanical engineering, Wang Yanli discusses the reform and planning of related equipment, which can provide a new reform direction for the application of virtual simulation technolog (Wang,2012). Based on the application advantages of virtual simulation technology, Wei Chanliang studies the specific application of virtual simulation technology in mechanical engineering experiment teaching, which is of great significance to the reform of teaching methods (Wei,2016). Zhang Zhihuan and Zhang Huidi found that virtual simulation technology can effectively improve teaching ability, enrich teaching content and achieve the purpose of efficient green teaching by studying the application of virtual simulation technology in actual teaching (Zhang and Zhang,2014). By analyzing the practical operation of mechanical engineering experiment teaching, Lin Shaofang analyzed the practical application value of virtual simulation technology in detail, which is of great significance to mechanical engineering teaching in Colleges and universities (Lin,2014).

1.2 Purpose of the Study

The engineering major has strong practicality, and the experimental link plays an important role in the specific teaching. To set up enough practical teaching activities is the main means to cultivate students' practical ability and innovation ability. Traditional mechanical engineering experiment teaching needs more instruments and equipment. Many instruments are very expensive, but their functions are single and fixed, which can not stimulate students' enthusiasm for learning and is not conducive to improving students' hands-on and creative ability. With the rapid development of computer technology, virtual simulation technology is becoming more and more mature. With the help of virtual simulation technology, practical teaching has gradually become the development direction of mechanical engineering experiment teaching. Therefore, the application of virtual simulation technology in mechanical engineering experiment teaching is further analyzed to provide a new direction for the teaching reform in Colleges and universities.

  DOI: 10.25236/icatpe.2019.208

2. Theoretical Overview of Virtual Simulation Technology

Virtual simulation technology, also known as virtual reality technology, refers to a virtual environment generated by computer technology, and through relevant professional equipment, users are put into the corresponding environment to achieve natural interaction between users and the environment, between people and the environment, between people and the machine(Dong and Tang,2018). In the virtual environment, users can directly operate and inspect the objects in the virtual environment with the help of virtual simulation technology, and obtain the sensory experience related to vision, hearing and smell (Zeng et al,2018). Virtual simulation technology mainly uses simulation technology, mathematical modeling technology, visualization technology and virtual reality technology. With the help of computer system, the whole experiment process can be simulated, which can make users have a high sense of immersion in virtual environment. Through this experience, users can understand the working principle and design process of related mechanical equipment in a relatively complex virtual environment. In addition, users can understand the processing and design process of mechanical equipment in virtual environment, which is conducive to analyzing the performance of related equipment. In this process, the user can grasp the working principle and function of the system in real time, and on the basis of the original equipment, carry out the corresponding function demonstration to understand the specific operation process of different equipment. Then, in the functional demonstration of the device, the user can judge the availability of the function, and then carry out the corresponding fault diagnosis according to the problems of different functions, so as to increase the user's interest in participation and improve the experimental effect.

In a fundamental sense, virtual simulation technology is a relatively advanced human-computer interaction interface, which can provide users with some different visual, auditory and tactile feelings in different time and space dimensions. It is a means for people and nature, as well as mechanical equipment, to perceive and interact. In the specific application process, virtual simulation technology has three main characteristics, namely immersion, interaction and imagination. In terms of immersion, in virtual environment, users can immerse in a virtual environment generated by computer devices, and can see, hear and feel things that are exactly the same in real environment. Therefore, for virtual simulation technology, immersion is a core function. In terms of interactivity, users can interact with various objects in the virtual environment. Generally speaking, interaction is the key factor to realize the interaction between users and environment. When users enter a virtual environment, they can interact with a variety of machines and diverse information environment, greatly improving the user's perception experience. As far as imagination is concerned, the realization of this feature is mainly through the interaction of users in the virtual environment, from both quantitative and qualitative perspectives, to generate a kind of rational cognition in the environment, which can further understand the relevant concepts, generate new ideas, and promote their own cognition upgrade.

3. Application Significance of Virtual Simulation Technology in Mechanical Engineering Experiment Teaching

From the current situation of mechanical engineering experiment teaching, there are still many problems in the whole teaching process. These problems not only reduce the quality and efficiency of teaching, but also restrict the development of teaching field. Especially in the construction of experimental base, there are still many problems in mechanical engineering experiment teaching, which cannot provide a good practical platform for students, and also cannot meet the requirements of improving students' practical ability, all of which lead to the lack of practical operation opportunities for students. Under the influence of this, after graduation, students cannot adapt to the relevant operation of the job in a short period of time, nor can they apply their knowledge better on the job, which greatly reduces the matching between the school and the enterprise.

Virtual simulation technology is applied in mechanical engineering experiment teaching. Generally, CAD machine room is used in the teaching organization to carry out actual teaching, and

corresponding virtual simulation technology is used to continuously improve the corresponding teaching equipment. In this context, the teaching institutions can continuously improve the teaching test equipment by virtue of virtual simulation technology, and greatly reduce the equipment damage rate through the application of related equipment in the teaching process. In addition, the application of virtual simulation technology in mechanical engineering teaching can help students make use of related technology, carry out flexible practice and experiment, and improve the quality of teaching. At the same time, students can make use of virtual simulation technology to carry out flexible practical operation, and apply their own ideas in relevant operation links, so as to deepen their application of relevant theoretical knowledge, also can give full play to students' innovation ability and improve the interaction between teachers and students in teaching.

The specialty of engineering is characterized by strong practical ability, and the experimental link occupies a large proportion in the whole teaching process. The application of virtual simulation technology in mechanical engineering teaching can enable teaching institutions to set up many experimental links and cultivate students' practical ability. With the help of virtual simulation technology, the school can change the traditional teaching methods and carry out experimental teaching according to the theoretical teaching materials. It can not only improve the cognitive ability of students, but also effectively improve the creativity and enthusiasm of students, so as to achieve the goal of improving the teaching quality of mechanical function experiment and provide great convenience for relevant colleges and universities.

4. Application of Virtual Simulation Technology in Mechanical Engineering Experiment Teaching

4.1 Reducer Equipment Experiment

For mechanical engineering experiment, it often involves the application of reducer by teachers and students. Therefore, in the process of mechanical engineering experiment teaching, the most fundamental experiment is the reducer experiment. In the traditional reducer teaching process, the teacher basically takes a real reducer to the classroom, and lets the students master the basic structure, function and corresponding working principle of the equipment by disassembling and installing the equipment. However, such a teaching process not only wastes most teachers' teaching time, but also limits students' imagination space. With the help of virtual simulation technology, teachers do not need to bring the real equipment into the training room, only need a computer equipment to complete the actual teaching. Students do not need to check the corresponding equipment, only need to enter a real scene, they can grasp the structure and application principle of the equipment in real time, greatly improving the convenience of teaching.

4.2 Application of Virtual Reality System

In the process of mechanical engineering experiment teaching, it usually involves the demonstration of deceleration equipment principle, functional simulation and fault demonstration, and also includes the complex process verification and comprehensive experimental simulation analysis. After the teacher's presentation of complex large-scale equipment, students need to use virtual simulation technology to enter the corresponding scene for system vulnerability removal and troubleshooting, which greatly improves the effectiveness of system operation and is conducive to the relevant personnel's grasp of system functions. In addition, in the process of mechanical function experiment, with the help of virtual simulation technology, it can fully show the new metallurgical complete set and roadheader equipment for students, help students to develop and design large-scale mechanical equipment, and improve students' practical ability.

4.3 Simulation Experiment of Nc Machining Technology

CNC machining technology is the core technology of China's modern manufacturing industry, which lays a good foundation for the development of China's machinery manufacturing industry. In virtual simulation technology, NC machining technology not only combines microelectronics

technology and machining technology, but also marks the development prospect of mechanical engineering. In the current mechanical engineering experiment teaching, the main purpose of students studying this major is to better employment. Therefore, in the process of experiment, mastering NC machining technology is the most important learning content for students. However, due to the high price of CNC machine tools, the traditional teaching mode can not meet the requirements of students' learning, which makes the relevant teaching methods have certain limitations. Using virtual simulation technology, through the operation of CNC machine tools and detailed steps of real-world simulation, to provide a good learning environment for students of this major, conducive to students better experience the CNC processing environment and process, improve students' learning efficiency.

Acknowledgement

This research has been financed by Research project of teaching reform of undergraduate colleges and universities in Shandong Province “Research on the second class of mechanical and electrical engineering and the cultivation of innovation and entrepreneurship ability of College Students” (C2016M095)

References

[1] Wang Y.L(2012).Analyze the application of virtual simulation technology in Mechanical Engineering Experiment Teaching, Science and technology innovation,16(33):187-187.

[2] Wei C.L.(2016).Application of virtual simulation technology in Mechanical Engineering Experiment Teaching, Jiangxi building materials,36(18):282-282.

[3] Zhang Z.H, Zhang H.D.(2014).Virtual simulation experiment teaching practice of mechanical engineering control, Experimental technology and management,2014,52(7):102-103.

[4] Lin S.F.(2014).On the application value of virtual simulation technology in Mechanical Engineering Experiment Teaching, Journal of Hunan Polytechnic,14(5):65-66.

[5] Dong Z., Tang Z.H.(2018).The application of Virtual Prototype Technology in virtual simulation experiment teaching of mechanical innovative design,Education watch,7(03):78-81.

[6] Zeng H. Zhang D.Q., Hang H.L., et al.(2018). Research and Practice on the construction of mechanical engineering virtual simulation experiment center [J]. Experimental technology and management,56(01):251-254.