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## Civil Engineering Teaching Research Based on the Virtual Simulation Technology

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# Civil Engineering Teaching Research Based on the Virtual Simulation Technology

WANG Gui-hua\*, ZHOU Ji-guo

School of Civil Engineering, Baicheng Normal University, Baicheng Jilin, 137000, China.

\*Corresponding author's e-mail: 466124747@qq.com

**Abstract.** Apply three-dimensional virtual simulation teaching technology in the civil engineering specialized courses. The virtual simulation technology applies on undergraduate teaching, which makes the students be able to experience the engineering design, construction and experimental testing, and other operation process and the current standard in the classroom, also can understand the latest modern construction technology. Solve practical problems such as the construction process affected by seasonal factors, shortage of training equipment, update slowly and insufficient funds. At the same time, enable students to master the knowledge and skills, exercise the students' innovative thinking.

## 1. Introduction

Virtual simulation technology generally includes digital image processing technology, multimedia technology, sensor technology and so on. It can form an organic system combining stereo visual environment, stereo sound effects and human-computer interaction interface. It can simulate the real environment, thus to solve the requirements learning situation and natural interactive, which has the very good extension in the field of modern education teaching. Virtual teaching applied in civil engineering technology teaching can effectively solve some problems.

### 1.1 *Make up the deficiency existing in real teaching conditions*

In the actual teaching, due to the long construction period, construction process and practice difficult, it becomes more and more obvious trend that through the virtual simulation technology to realize civil engineering professional virtual teaching. The three-dimensional model of structure is established by using the virtual simulation technology to simulate the structure design and simulation. Through the human-computer interaction structure cad, eventually form structure design teaching demonstration system. Based on the virtual simulation teaching technology of authenticity, feasibility and advantages of the interactivity, it can make students understand the knowledge and specification related to the structure, deepen the students' mastery of knowledge which lay a solid foundation for subsequent work in a virtual presentation. At the same time, using the virtual teaching technology can solve the problem of lack of teaching resources.

### 1.2 *Avoid an internship or maximum danger existing in the experimental process*

In the teaching of engineering practice, often for some reason it can't meet the requirements of students practice and experiment, like building site in the process of blasting can make a big risk. Through the virtual software demo can let students more secure and clearly observed the whole



process of blasting. Through the slow down it can have a more comprehensive observation on building blasting process.

### *1.3 Solved the space and time limit*

Through virtual simulation teaching, it breaks the limit of the space and students and can be observed through demonstrating the whole sea-crossing girder construction process. Virtual simulation teaching technology also can break through the limitation of time. For the changing process many need long time observation, the use of virtual reality technology can be presented in a very short period. For example, the process of reinforcement corrosion in reinforced concrete will take years in the reality, but the application of virtual simulation technology can be in a very short time and vivid to present in front of students.

## **2.Existing problems of the virtual simulation technology in the teaching application**

### *2.1 The differences between virtual simulation technology and the practical engineering*

Virtual simulation technique applied to teaching which can improve the level of practice teaching, solve many outstanding problems that exist in the practice teaching in the applied undergraduate colleges and universities. However, we also noticed that virtual simulation technology experience is simulation technology and form of teaching methods which extracted from production practice and direct output practical experience to students. So, it cannot completely replace the field practice. In the process of teaching, deal with relationship between virtual simulation teaching and practice teaching according to the actual situation. Firstly, use the virtual simulation teaching method to solve some practical teaching to solve the problem which can't solve in practical teaching. Secondly, using the virtual simulation teaching system to improve the level of practice teaching ability, to lay a firm theoretical basis of practice teaching. Again, using the virtual simulation teaching forms to improve the students' learning enthusiasm, maximum stimulate students' innovation ability. Thus, improve the teaching quality, enhance the students' innovative practice ability.

### *2.2 Hardware environment needs to be continued to improve*

Virtual simulation is mainly with the aid of modern multimedia technology and simulation model to express the physical characteristics and rules of nature. It is hard to meet the practical operation level and requirements in the aspect of hearing, touch and smell.

At present, the configuration of the hardware system is low for the virtual simulation system of the simulation training rooms for many colleges and universities. So, it can't fully play the advantage of simulation teaching software. Usually because of the computer's low memory configuration, it can't meet the requirement of the virtual teaching data operation. It is temporarily unable to real-time rendering especially for some complex operation. There are no research and development on basic equipment basically for smell, taste. So, the level of the hardware needs to be improvement and upgrading.

### *2.3 Implement cost problem remains to be lower at present*

At present, the virtual simulation teaching system on the market price is more expensive, and many professional equipment require higher operation. It needs to improve the level of research and development technology, compress the production cost, reduce the market price, then virtual software products can be rapid popularization and promotion in the market. Virtual simulation technology is a kind of modern teaching media tool, which has caused wide public concern in education. With the continuous improvement of computer and artificial intelligence technology and progress, the virtual hardware and software costs will reduce, which is bound to speed up the popularization and application of virtual simulation system.

#### *2.4 The degree of open sharing of teaching resources need to be extended*

Many colleges and universities teaching project and most of the virtual simulation experiment of teaching resources is mainly for the university students. A small number of information resources shared by some multimedia offerings and fixed-point promotion. But, in accordance with the relevant regulations, it needs to share the experiment teaching program and teaching resources for the construction of virtual simulation experiment teaching center. Promoting the teaching program and teaching resources into more and more colleges and universities and related research institutes to make more effects in large range.

### **3.Solving Suggestions for the virtual simulation teaching problem**

#### *3.1 Further strengthen the construction of the simulation system of training rooms*

To make the virtual simulation technology successfully apply in classroom practice teaching process, relevant policies and system construction is the important guarantee. Further optimization of relevant policies to encourage the leader and high-level teachers involved in virtual simulation experiment teaching. At the same time, introduces of high-level professional and technical personnel, improve the level and technology of the virtual simulation teaching.

#### *3.2 Careful choice of teaching resources construction project*

Poor choices of virtual simulation resource will cause unnecessary money and human consumption, and lead to relevant work more complex. So, the choice must be careful. First, the project should be positioned to traditional teaching efficiency too low, or difficult to complete. Second, it should do well in theoretical arguments to ensure the necessity of buying software. Relevant professional teacher complete investigation on the work ahead of time, from a number of software development companies choose to use software. Then the collective argument, from the aspect of different angle analysis software of teaching requirements, fit for jobs and the money strength of the school, and then make a decision.

Civil engineering is a closely with practice discipline, which is close to the engineering practice and can reflect the actual teaching. So, virtual simulation experiment teaching courses will continue to adopt advanced technology, introduce to high performance computing systems of more complex numerical simulation and have more real vivid three-dimensional model technology. Maximize share internet technology. When conditions permit, effectively combine technology and create virtual simulation teaching project development platform with high performance characteristics.

#### *3.3 Continue to develop the high-quality goods curriculum project*

Virtual simulation teaching project under the system guarantee of the powerful, under the advanced technology development platform support, through the effective integration of teaching, scientific research team, give full play to the special personnel features and advantages of teaching and scientific research. Around the latest science and technology forefront dynamic and the engineering practice, developed a more able to contact the actual virtual simulation project. With the support of schools and colleges, constantly promote in-depth development of virtual simulation teaching technology and achieve comprehensive information technology sharing.

### **4.Outlook of virtual simulation teaching technology**

virtual simulation teaching technology product development and application in many developed countries has become the main method of education, and in some domestic vocational education also has been widely used which make the higher concern worldwide. With the continuous development of information technology, computer hardware and software and network technology rapid development, and the increasing attention of applied education, virtual simulation teaching technology will get more extensive application in the field of applied undergraduate education. The simulation results will become better and more realistic. Virtual simulation technology for applied undergraduate college has

high development costs. So, the development of the subsequent also needs the government and the joint efforts of relevant departments of education. Need for government support, increase financial investment.

### **5. Conclusions**

Schools should actively pursue the development trend of the virtual simulation teaching technology. According to the development prospect and direction in the future, cooperate with related information technology enterprise and jointly develop for the virtual simulation system that conforms to the actual situation teaching in school. At the same time, schools should develop software application together with enterprise, and reduce the development high cost, big investment. Meanwhile, more schools should jointly develop simulation software and form development association.

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### **References**

- [1] TAN Yin. Education application vision of virtual reality technology [J]. china education technical equipment, 2009, 27: 126-127.
- [2] LI Du-jie. How to bring into full play the advantage of simulation technology in the practice teaching [J]. Education front (theory), 2008: 05-15.
- [3] JI Wei-rong. practice teaching mode Innovate, improve the quality of practice teaching [J]. Higher education and economic, 2009: 12-15.
- [4] WANG Xiao-fang. The application of virtual simulation technology in the teaching [J]. public science and technology, 2010.
- [5] GAO Wei, SONG Wei-hua, CHEN Shu-fang. The virtual simulation teaching practice based on the cooperation between colleges [J]. Communication world, 2019(02): 308-309.
- [6] ZHU Hai-ying. The design and implement of simulation teaching environment based on virtual reality technology [J]. Modern information technology, 2018, 2(10): 88-89+91.