Research on Virtual Practice Teaching Platform Based on Industry Development Demands

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Abstract. With the further development of China's energy reform, it puts forward higher requirements for the subject of energy and power professional personnel training based on traditional energy sources. This paper proposed to carry out the "13th Five-Year" education planning idea, of which the modern educational technology and virtual reality technology will be introduced into practice teaching of energy and power undergraduates. In order to enhance the dynamic balance between the demand of electric power industry and personnel training, it's necessary to reform the practice teaching mode and teaching methods, what's more, constructing virtual practice teaching platform. Cultivating the compound talents with solid theoretical foundation and collaborative innovation ability, in order that providing strong support for the development of China's energy and electric power industry.

Introduction

Energy power industry is the basic industry of national economy, and it is also one of the basic directions of national science and technology development. The success or failure of talent education in the field of energy and power is relevant to the fundamental interests of the country. Innovation is the creative activity which people can change the objective reality, and the practical ability is an important prerequisite for the formation and development of innovation ability [1,2].

In recent years, a list of advanced computer technology represented by virtual reality technology has been gradually applied in military training, scientific research, engineering management, teaching and so on. The origin of the virtual simulation technology in the United States, and firstly to be used in education and teaching. With the advanced hardware equipment, software development, UI interface and interactive way, forming a systematized virtual simulation teaching platform. In Colleges and universities with the characteristics of energy and power industry, due to the huge power plant system, complex equipment structure and other reasons, at present, there is no completely virtual practice teaching platform for the purpose of practical teaching and personnel training.

The electric power industry, as the representative of the energy industry needs to cultivate high-quality talents to adapt to the development of the industry presently. Therefore, it is of great significance that integrate with advanced computer technology, information technology and teaching technology and building a reform idea of practical teaching and an energy and power innovative talents training system.

The Current Situation and Problems in the Practice Teaching of Energy and Power

In recent years, with the rapid development of electrical energy field, both the talents cultivation model is difficult to adapt to the current development trend of energy and electric power industry, giving priority to the integrity of systems, ignoring the practice of practical and innovative [3]. At present there are following common difficulties: (1)Practice teaching educators team construction lag and educators lack engineering experience; (2)Production practice teaching part is given priority.
to with site visit, disconnect with engineering practice; (3) Attaches great importance to theory but despise practice and low input, lead to low levels of practice teaching\textsuperscript{[4]}. In view of the above problems, introduced modern educational technology and virtual reality technology into the energy and power undergraduate's practical teaching link, reform the practical teaching methods and contents, and construct the teaching platform of virtual practice. It is of great significance to improve the teaching quality of practice teaching and cultivate innovative talents with comprehensive quality and adapt to social needs.

**Construction of Practical Teaching Platform Based on Virtual Reality Technology**

**General mind**

Based on virtual reality technology, the general mind of constructing a practical teaching platform including following aspects. First, improve practice teaching system and realizing the scientific and efficient mode of practice teaching; second, continuous reform and innovation, to realize the modular of the practical teaching content and the sharing of the enterprise technological resources; finally, strengthen the practical ability of students and improve collaborative training thinking.

The platform around the energy and power industry requirements of technical personnel, in cooperation with the energy of power production enterprises, through the computer to simulate the real power production scene. Platform covers the power plant construction process, operation process, equipment maintenance process and other aspects of the virtual simulation. To build a virtual reality teaching platform for electric power relevant majors, aiming to enhance students' ability to adapt to key positions of electric power production, realize students' ability training and industry technology level, job requirements to adapt to the teaching objectives\textsuperscript{[5]}, to protect the industry standard and college education standards docking.

**Platform Construction Ideas and Content**

The platform construction is based on the research on the demand of a miraculous number of electric power relevant enterprises, and makes the talent training objectives of institutions of higher learning's energy disciplines and the needs of the power enterprise organic integration. And in strict accordance with the relevant industry technical standards, the virtual simulation technology applied to the undergraduate practice teaching links, so as to establish power-related professional virtual practice teaching platform to build a sound power-related professional practice teaching system. Specifically including:

(1) Three-dimensional simulation of civil construction and installation of thermal power plant

The construction and installation quality have an important influence on the operation and maintenance of the power station. Nevertheless, the process is a complex system engineering. In order to meet the needs of enterprises, the "three-dimensional simulation system of civil construction and installation process of thermal power plants" is designed in the virtual practice teaching platform. The design of the simulation system not only enables students to systematically study the engineering technology of power station construction process, but also takes the virtual platform as the learning environment and avoids the security risks of field practice learning.

![Figure 1. Three-dimensional simulation system of thermal power plant construction and installation process.](image)
In the simulation system, the whole process of construction is divided according to the technical link and the workflow. The selection process is adopted in the hierarchical list and the visual query. Each learning session can control the learning progress through the time axis to realize the repeated exercise of the key learning contents.

(2) Virtual scene roaming in thermal power station
Large-scale thermal power station has a complex pipeline system and a large number of high temperature and high pressure equipment, normal production and operation of the unit is noisy and has a certain security risk. Virtual design training platform designed "virtual scene roaming system", as shown in Figure 2. The simulation system design not only increased the student's interest in learning, but also played a role in the field of practical teaching.

The research and development of the simulation system are based on the cooperation with the power generation enterprises, and take the actual thermal power plant as the simulation object. Using three-dimensional modeling technology to build three-dimensional scene of the thermal power plant audience, using virtual reality technology design virtual staff to the first or third person perspective in the scene in the roaming function.

(3) Thermal power station equipment structure virtual disassembly 3D simulation
Thermal power station equipment, precision parts complex, in the normal operation of a certain period of time or when a temporary failure of the equipment overhaul. In the teaching of theory, the plane of the equipment can not meet the detailed explanation of the internal structure. In the virtual practice education platform “the virtual simulation of thermal power station equipment structure” is designed, as shown in Figure 3, the model of the simulation system can save the cost of practical equipment, providing systematic learning platform for students of equipment structure.

The simulation system was developed and applied to the power equipment enterprise, and the 3D model was transformed into 1:1 by using 3D modeling software.
Three dimensional simulation of working principle of thermal power plant equipment

At present, the working process of teaching equipment in the theory of teaching usually by the way of the theoretical calculation, students mainly two-dimensional graphs in the textbook based on equipment. The design of the 3D simulation system of power station equipment "principle in the virtual practice teaching platform", the simulation system in the most intuitive way to show the equipment of rotating machinery and other parts of the medium inside the working state, makes up the shortage of current education.

The simulation system is based on the three dimensional structure models of the equipment, simulation of the movement of each component during the operation of the equipment is simulated by motion simulation, and simulates the state of the media in the device by means of particle simulation. Finally, the simulation process combined with the theoretical content of the course and the basic information of the actual equipment, the use of voice, text and other forms of multimedia files, to the most intuitive way to show the working principle of the device, as a supplement to theoretical teaching and understanding of internships.

Reform of Practical Teaching System for Industry Needs

(1) Reform of Practical Teaching Mode and Innovation of Teaching Method. The virtual simulation technology is introduced into practice teaching of energy and power undergraduates, reforming the traditional "theory → practice → actual production" knowledge extension process, forming the comprehensive application of knowledge in the practical teaching link, and combining the independent links with "virtual practice teaching platform "as the core integration, improve the practice of teaching the cross, systematic and integrity. The traditional practice teaching in the internship session of the project site, the production site "move" to the school, improve the practice of teaching process safety and organizational coordination, reduce the economic costs of practice.

(2) The Integration of Practical Teaching Content and the Construction of Teaching Staff. According to the current employment situation of energy and power undergraduate students, combined with the demand of power generation enterprises, electric power construction enterprises, equipment manufacturers and so on. The practice teaching content includes the electric power construction process, the operation process, the overhaul process and so on each kind of electric power production link modular knowledge content, constructing a comprehensive practice teaching content system, and building a series of teaching materials.

Conclusion

In order to enhance the dynamic balance between the demand of energy and power industry and the cultivation of talents, it is of great significance to construct the practice teaching system oriented to the industry demand with the virtual practice teaching platform. The platform construction content has been applied to some colleges and universities, energy and power enterprises practice teaching and technical training, and as a platform to establish a cooperative R & D, training and other mechanisms to promote the university and enterprise personnel training, scientific research and other aspects of coordinated development. At the same time, in the construction of the platform and system reform, implementing the "The 13th Five-Year" educational planning concept, reforming the traditional application of college education thinking, fully absorbing the virtual reality technology, other advanced scientific and technological achievements and "Internet+Education" wisdom campus development concept, providing strong support for China’s development.

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References


