Innovative Talents Training of Internet of Things Based on Virtual Simulation Experiment Teaching

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Abstract：The construction of virtual simulation teaching experiment platform environment is of great significance for colleges and universities to carry out virtual simulation experiment teaching. This paper expounds the necessity of innovative talents of Internet of things, and explains the role of virtual simulation experiment teaching platform in the cultivation of innovative talents. The virtual simulation technology is introduced into the practical teaching of the Internet of things, and the teaching practice of the virtual simulation experiment of the Internet of things is carried out, which provides a reference for the design and implementation of the virtual simulation experiment of other majors in the school of information engineering of Tarim University.

Keywords：Internet of Things Major; Virtual Simulation Experiment Teaching Platform; Innovative Talent Training

At present, virtual simulation technology is widely used in medical treatment, games, TV special effects shooting, and professional practice teaching in colleges and universities. In particular, 3D scene construction technology breaks through the limitations of the real environment and realizes the immediate access to the ideal scene. The importance of situation to learning has long been verified in cognitive psychology[1]. In domestic universities, virtual simulation technology is also integrated into the practice teaching of professional courses. Through the virtual simulation experiment teaching platform, it can provide situational practice teaching environment for learners with visual, auditory, emotional, tactile and other simulation channels of external stimulation [1], so the virtual simulation technology has important reference value for colleges and universities to carry out virtual simulation experiment.

1．The necessity of innovative talents of Internet of things

1．1 Building a systematic way of thinking

The practice teaching hours of Internet of things professional courses are less, and the supporting experimental equipment is not complete, which leads to students simply complete the simulation verification experiment, and some simple and comprehensive experiments can't be arranged in the future, which can't cultivate students' innovation ability. The introduction of virtual simulation experiment enables students design their own experimental scheme in line with the requirements of the experiment, cultivates the ability of independent thinking and their systematic way of thinking.

1．2 Improving the enthusiasm of participating in the project

Experimental teaching is an important part of teaching activities. Students can scientifically verify the knowledge learned in the theoretical class in the practical class, which can not only consolidate students' mastery of theoretical knowledge, but also cultivate students' sense of innovation. However, due to the influence of experimental environment, economy and other factors, some are not

convenient to complete on the equipment. By introducing virtual simulation experiment, students can take the initiative to explore and design the project.

2. The role of virtual simulation experiment teaching in the cultivation of innovative talents

In June 2018, the National Undergraduate Education Work Conference of Higher Education in the New Era emphasized the continuous strengthening of the construction, application and sharing of high-quality experimental teaching resources in higher education, and the creation of experimental "golden class". The Ministry of Education timely carried out the construction of demonstrative virtual reality experimental teaching projects in ordinary undergraduate colleges and universities, which also pointed out the direction for the experimental teaching reform of new engineering[2]. The core of training new engineering talents is to improve students' practical ability and innovative spirit, and build a virtual simulation experiment teaching platform. First, we should form a mode of combining multiple teaching methods and take students as the center, so as to stimulate students' potential, and enhance students' innovation ability; second, in the era of Industrial Revolution 4.0, artificial intelligence, intelligent manufacturing, industrial Internet of things and other professional directions plays an irreplaceable role for the simulation experiment teaching platform; the third is to make students form the thinking of analyzing and solving problems from the perspective of system.

3. Overview and characteristics of virtual simulation experiment teaching platform

The virtual simulation software used in the experiment of Internet of things specialty of Information engineering college of Tarim University is shown in figure 1, that is, the "Internet of things industry training simulation" software is a virtual learning resource for the installation and maintenance of Internet of things system, which is based on the typical perception layer basic equipment of Internet of things, combined with the flexible deployment of mobile training platform. Through different collocation and combination among gateway, mobile industrial control terminal and cloud platform of Internet of things, four different data acquisition, flow and processing modes of cloud platform access, gateway direct connection, tablet direct connection and PC direct connection are provided for students. It can better help students transition from the theoretical study of the Internet of things to practical operation, and cultivate students' practical ability in the comprehensive application of the Internet of things. The Internet of things basic training simulation system provides a set of configuration development platform for students' simulation training.

Classification	Basic training simulation platform architecture			
Case development	New world cloud platform			
Experiment content	Principle learning	Basic training	Industry comprehensive application training	Cloud platform case development
Basic training simulation platform	Internet of things basic simulation training system (simulation software)			
	Internet of things basic simulation training kit (supporting hardware)			

Figure 1. Architecture of virtual simulation platform.

4. Building virtual simulation experiment teaching center

4.1 Construction of virtual simulation experiment platform

NEWlab teaching suite is a kind of teaching experimental equipment for Internet of things, electronic information and computer specialty, which is composed of five modules, including experimental platform, experimental module, experimental software, experimental development tools and electronic experiment guide. NEWlab can support multiple experimental applications on one platform, and the combination of modules can simulate real industrial equipment and business scenarios. Taking smart agriculture as an example for 3D simulation, the virtual construction of smart agriculture platform should be carried out first, including "485 bus and Modbus Protocol", "ZigBee communication network", "LAN construction and WiFi technology", "gateway of Internet of things", "sensor technology and 4~20 mA industrial sensor", "analog quantity collector and sensor value conversion", "digital quantity collector and control", etc. Secondly, the content of the experiment includes analog equipment experiment (carbon dioxide acquisition, soil moisture acquisition, wind speed acquisition, wind direction acquisition, atmospheric pressure acquisition), digital equipment experiment (lighting, sprinkler irrigation, fan, water pump control), ZigBee network communication experiment (temperature, humidity and light network acquisition), gateway link debugging, etc. Finally, the experiment is carried out the real scene training includes four modules: "greenhouse cognition", "Internet of things system cognition", "system construction" and "system application".

4.2 Forming an open and independent experimental teaching mode

In the teaching process, the simulation system mainly realizes three aspects of teaching research and learning.

4.2.1 Cognitive training

Through a variety of Internet of things related devices, such as sensors, actuators, gateways, power supplies, RFID radio-frequency devices, terminals, and other peripherals, students can know, understand, and be familiar with these common Internet of things devices from the simulation system before they come into contact with hardware physical devices, so as to lay a cognitive foundation for practical training.

4.2.2 Simulation training

Students can carry out virtual Internet of things equipment, workstation, virtual connection, and Internet of things scene simulation training through Internet of things basic training simulation system, and introduce engineering practical application into experimental teaching. Students can see real signals and find problems in theoretical learning. Through remote access of the platform, interdisciplinary integration can be carried out to improve students' comprehensive quality, and lay a good foundation for students in the future in the real equipment training on the Internet of things basic training simulation suite, in order to avoid the artificial loss of real equipment caused by students' lack of knowledge and operation familiarity.

4.2.3 Extended training

The Internet of things basic training simulation system, combined with the Internet of things basic training simulation suite, forms a complete set of Internet of things basic training simulation platform system, which provides students with the Internet of things basic training of virtual and real combination, and cultivates and strengthens students' practical ability. For the virtual training provided by the Internet of things basic training simulation system, students can conduct linkage verification on the Internet of things basic training simulation suite.

5. Conclusion

In the process of practice, students' hardware knowledge has been consolidated, their practical ability has been effectively improved, their innovative thinking has been stimulated, and students can carry out individual autonomous learning and team collaborative learning. Although the virtual simulation experimental platform is in the stage of exploration and practice, the follow-up will continue to track the practical teaching progress of the virtual experimental teaching platform, providing reference for the Internet of things of school of information engineering, which provides more valuable suggestions for Tarim University to carry out virtual simulation experiment platform in the practice teaching of other courses of Internet major.

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