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The Application of Virtual Simulation Technology in Vocational Education from the Perspective of New Engineering

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Abstract: This article delves into the application and effectiveness of virtual simulation technology in vocational education within the context of the new engineering discipline. With the emergence of new engineering education, traditional educational models have become inadequate in meeting the demand for cultivating high-quality engineering and technical talents. As an emerging educational tool, virtual simulation technology exhibits significant advantages in new engineering education. Using the "Internet of Things Communication Technology" course as an example, this empirical study assesses the specific impact of virtual simulation technology on students' learning outcomes. The research reveals that virtual simulation technology not only remarkably enhances students' learning effectiveness and interest but also effectively compensates for the shortcomings of traditional practical teaching. By constructing a highly realistic and safe practical environment, this technology enables students to practice repeatedly in a simulated setting, thereby deepening their understanding of professional knowledge and improving skill levels. Nevertheless, virtual simulation technology has certain limitations that require collective efforts from educational institutions, enterprises, and researchers to address. The study provides strong support for teaching method reforms in the new engineering discipline and anticipates the future development prospects of virtual simulation technology in vocational education.

Keywords: Virtual Simulation; New Engineering; Internet of Things; Vocational Education

1. Introduction

With the rapid development of global technology and the arrival of the Industry 4.0 era, the field of engineering technology is undergoing unprecedented changes. New engineering education has emerged in this era, emphasizing the practicality, interdisciplinarity, and comprehensiveness of disciplines, aiming to cultivate high-quality engineering and technical talents with innovative spirit and practical ability. Traditional education models and methods are inadequate in the face of the challenges of new engineering education, making it difficult to meet the demand for cultivating high-quality engineering and technical talents[1].

In this context, virtual simulation technology is gradually emerging with its unique advantages. This technology not only has high interactivity, realism, and security, but also effectively compensates for the shortcomings of traditional practical teaching, injecting new vitality into new engineering education. Virtual simulation technology can simulate real engineering environments and operational processes, allowing students to practice in virtual environments and deepen their understanding of engineering principles and methods[2]. This paper takes the course of "Internet of Things Communication Technology" as the starting point, aiming to explore in depth the practical application and effectiveness of virtual simulation technology in vocational education from the perspective of new engineering. The author hopes to quantitatively evaluate the specific impact of virtual simulation technology on students' learning outcomes, thereby providing strong data support and practical experience for the reform of teaching methods in the perspective of new engineering [3-5].

2. Implementation of Virtual Simulation Technology in Teaching

IoT Communication Technology "is a core course in IoT engineering. Through theoretical teaching and practical training, students are equipped with the ability to understand and master the basic concepts and principles of various IoT communication technologies, as well as the basic design methods and development implementation techniques of related application systems[6]. With the continuous emergence of new concepts, models, and technologies such as industrial Internet of Things, intelligent manufacturing, Industry 4.0 era, 5G, and low-power wide area networks[7], the course of "Internet of Things Communication Technology" has brought rich teaching innovation content. Therefore,

it is necessary to keep up with cutting-edge technologies and industry development trends in content setting.

2.1 Systtemview Virtual Simulation Platform

By teaching students to use Systemview for modular modeling in class, various parts of IoT communication (such as sensors, gateways, servers, etc.) are connected and configured through simulation software. After completing the modeling, run the simulation to observe the data transmission and processing process. The system will display the working status and communication results of each module in a graphical interface. Finally, by analyzing the student simulation results, key indicators such as data flow, transmission delay, and signal strength will be understood and optimized. The following figure is a student training session on the Systemview simulation platform.

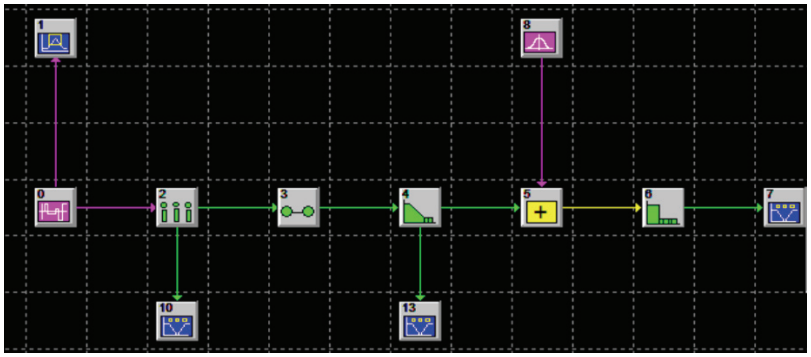

Figure1. The eye diagram simulation connection diagram

2.2 NLECloud New World IoT Cloud Platform

Through the introduction of the new continent IoT cloud platform, the progressiveness of the company's platform and the actual project content are demonstrated in the teaching, and the advantages of supporting IoT device design, software programming, etc. are fully used to greatly expand the content of the IoT experiment, providing great convenience for project driven teaching. The following is a student training session on the NLECloud New World IoT Cloud Platform.

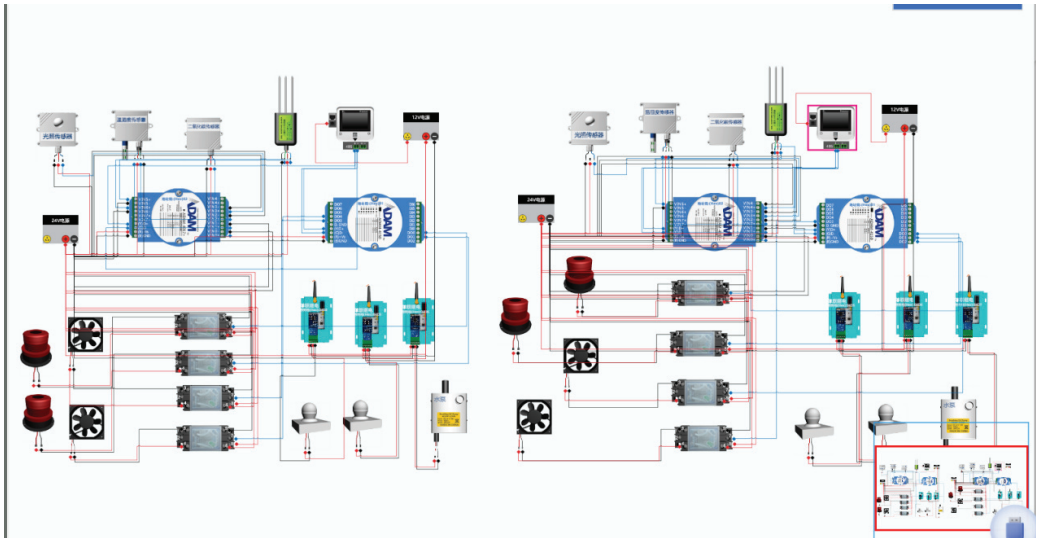

Figure 2. Connection diagram of smart greenhouse

By using the above virtual simulation platform in teaching, students can intuitively understand the principles of IoT communication. Systemview's visual modeling and simulation components can display modules and view simulation results, which helps students to have a more intuitive understanding of the theoretical knowledge and working process of IoT communication. In order to further enhance their practical abilities, students can experience the process of configuring, debugging, and optimizing IoT devices firsthand through IoT device design, software programming, and other operations on the NLECloud New World IoT Cloud platform, thereby improving their practical skills. The improvement of this practical ability will help students better cope with practical problems in their future careers.

3. Effect evaluation

The main purpose of this paper is to improve the quality and efficiency of teaching: by simulating a real work environment, students can engage in simulated practice before actual operation, helping them better understand and master knowledge and skills, and meet the talent cul-

tivation needs under the background of new engineering.

When evaluating students' learning effectiveness, we should start from three aspects: knowledge understanding and mastery, practical operation ability, and innovative thinking and problem-solving ability. This implementation model adopts the Peterson Lincoln index method for comprehensive analysis of teaching data, focusing on the research and improvement of the ESP-32 camera module. In order to approach the real data, this experiment adopts a cross comparison method and randomly selects nearly 500 undergraduate students from three consecutive years in this major through an average number of group experiments, ignoring errors caused by factors between teachers or grades, including individual performance, group average performance, and overall experimental performance. After three rounds of learning, it is expected that students will achieve comprehensive learning outcomes. This evaluation system is not only comprehensive and accurate, but also effectively evaluates the positive role of digital twin platforms and virtual simulation technology in improving students' learning outcomes, providing strong data support for the teaching quality of the course "Internet of Things Communication Technology".

4. Conclusion

This article comprehensively explores the application and effectiveness of virtual simulation technology in vocational education from the perspective of new engineering disciplines. In the context of the global technology and Industry 4.0 era, traditional education models are facing new challenges in cultivating high-quality engineering and technical talents through new engineering education. Virtual simulation technology, as an emerging educational tool, has gradually demonstrated its unique advantages in new engineering education. Virtual simulation technology can provide a highly realistic and safe practical environment, allowing students to practice repeatedly without risk, thereby deepening their understanding of professional knowledge and improving their skill levels. At the same time, this technology effectively compensates for the shortcomings of traditional practical teaching, significantly improving the quality and efficiency of teaching. The highly interactive, realistic, and secure nature of virtual simulation technology enables students to gain an intuitive learning experience in a simulated environment and better understand engineering principles and methods.

However, virtual simulation technology also has certain limitations. A highly simulated learning environment may cause students to become dependent and affect their ability to cope in real environments. In addition, there may be differences between the operations in virtual environments and those in real life, which may interfere with students' actual operational abilities. Therefore, when applying virtual simulation technology, it is necessary to fully consider these potential issues.

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