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Research on the Construction of Electrical and Electronic Experimental Teaching Platforms in Higher Vocational Colleges

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Abstract: With the advancement of vocational education reform, education informationization, and digitalization have become the important direction of the reform of electrical and electronic teaching in high vocational colleges. In this context, intelligent product development of professional electrical and electronic teaching should also do a good job in practice and innovation, especially in actively building a digital experimental teaching platform and promoting the reform of experimental teaching mode, so that students can learn more useful knowledge and skills in the new platform, and cultivate more applied and skilled talents for society. While analyzing the problems existing in the traditional electrical and electronic experimental teaching mode, this paper analyzes the significance and practical path of the construction of electrical and electronic experimental teaching platforms in higher vocational colleges which can be of reference in future research.

Keywords: Higher vocational colleges; Electrical and electronic; Experimental platform; Significance of construction; Practice path

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1. Introduction

As a key component of electrical and electronic education in higher vocational colleges, experimental teaching plays a critical role in the quality of professional talent development. Traditional electrical and electronic experimental teaching often suffers from limited resources, narrow experimental content, and outdated teaching methods, which fail to sufficiently engage students and hinder their ability to deeply study and master relevant professional technologies [1]. To address this issue, in the new era, many educators are leveraging the informatization of vocational education to build innovative electrical and electronic experimental teaching platforms. These platforms aim to stimulate students' interest in learning and enhance their comprehensive professional skills, thereby improving the quality of talent development. Additionally, these platforms promote students' employability and provide society with a greater number of high-quality electrical and electronic

professionals, contributing to the transformation and growth of the electronic information industry [2].

2. The problems existing in the traditional electrical and electronic experimental teaching mode

2.1. Limited experimental resources

The traditional electrical and electronic experimental teaching mode is often limited by experimental resources. Due to insufficient funds, equipment update speed, and other reasons, the laboratory equipment of many schools is obsolete and insufficient, which makes it difficult to meet the increasing practical needs of students [3]. As a result, students cannot have full access to advanced equipment and technology in the experimental process, which limits the cultivation of their practical ability and innovative spirit.

2.2. The content of the experiment is limited

Traditional electrical and electronic experimental teaching often relies on verification experiments, which lack innovation and exploration. These experiments typically aim to validate the correctness of a theory or law, with students following pre-established steps. As a result, these experiments are not effective at stimulating students' creative thinking or enhancing their practical abilities [4]. Furthermore, due to the limited scope of experimental content, students have limited access to a variety of electronic devices and systems, restricting the expansion of their knowledge.

2.3. Backward teaching methods

Traditional teaching methods for electrical and electronic experiments are often teacher-centered, leaving students in a passive role. During the experiment, teachers typically explain and demonstrate the steps and procedures in detail, with students simply following the instructions. This approach does not foster the development of students' independent thinking or problem-solving abilities. It can also lead to a decline in students' interest and enthusiasm for the experiments [5].

2.4. Disconnection from the needs of enterprises

Traditional electrical and electronic experimental teaching is often disconnected from actual engineering applications, making it difficult to meet the real-world demands of enterprises. The equipment and technology in school laboratories frequently lag behind the development levels of industry, limiting students' access to the latest technology and tools. Additionally, experimental teaching in schools tends to focus on theoretical verification and basic skill training, while practical engineering problems are often overlooked. As a result, students struggle to adapt to the needs of enterprises after graduation and require a significant period of adaptation and training [6].

3. The connotation of electrical and electronic experimental teaching platform

An electrical and electronic experimental teaching platform is a comprehensive practical teaching system that uses modern educational technology and information technology to provide students with rich experimental resources and diverse experimental content. The platform aims to cultivate students' practical abilities, innovation spirit, and problem-solving abilities through experimental operation, circuit design, equipment debugging, and other practical activities. It is not only a place for students to practice and learn, but also a

platform for teachers to conduct teaching research and enterprises to carry out technological innovation [7].

4. The significance of the construction of electrical and electronic experimental teaching platform

4.1. To improve students' practical abilities

Through the development of advanced and perfect electrical and electronic experimental teaching platforms, students can gain more comprehensive hands-on practice opportunities. All kinds of experimental equipment and simulation software provided by the platform can help students transform theoretical knowledge into practical skills. In the process of continuous hands-on practice, students' practical abilities will be significantly enhanced, which is of great significance for their future careers.

4.2. Cultivate students' innovation abilities

The electrical and electronic experimental teaching platform encourages students to explore and innovate. By providing an open experimental environment and a variety of experimental projects, students can freely use their imagination to try new circuit designs, functional verification, and many more. This training mode helps to stimulate students' innovative thinking, cultivate their innovative abilities, and cultivate more innovative talents in the electrical and electronic field [8].

4.3. Promote industry-university-research cooperation

The electrical and electronic experimental teaching platform can be used as a bridge between schools, enterprises, and research institutions. Through cooperation with enterprises, the platform can introduce the latest technology and equipment, so that the teaching content can keep up to date with the actual situation of enterprises. Simultaneously, schools and enterprises can jointly carry out scientific research projects on the platform to promote technological innovation and achievement transformation. This cooperation model can help strengthen the connection between schools and society, and improve the pertinence and effectiveness of education and teaching.

4.4. Promoting education and teaching reform

Electrical and electronic experimental teaching platform construction is an important way to promote education teaching reform. The construction of this platform can also promote the reform and innovation of electrical and electronic experimental teaching, better promote the Outcome-Based Education (OBE) teaching reform, and improve the quality of electronic and electrical experimental teaching. At the same time, the construction of the platform can make up for the shortcomings of traditional experimental teaching modes in the past, promote students' learning and growth, effectively improve the quality of professional education, and provide more high-quality electrical and electronic talents for society [9].

5. The construction of higher vocational electrical and electronic experimental teaching platforms in the new era

5.1. Electrical and electronic experimental teaching platform resources

In the experimental teaching of higher vocational electronics, construction is a crucial element in building the

platform. The experimental platform, based on the real-world requirements of electrical and electronic practice teaching, should focus on enhancing the diversity of resource development. Ensuring that the content and categories of resources are rich and varied will fully engage students, stimulating their enthusiasm, creativity, and autonomy, and promote their professional practice and learning.

5.1.1. Previewing the experiment

Premeditation leads to success; lack of preparation leads to failure. The development of preview experimental resources is closely linked to the quality of electrical and electronic experimental teaching. When constructing the experimental teaching platform, it is important to create electrical and electronic preview resources that align with the characteristics of the field. These resources should include experimental principles, operational procedures, equipment introductions, expected results, and other relevant content. By providing students with access to experimental videos and offering opportunities for simulated operations, we can enhance their understanding of the experiments and improve their learning quality [10].

5.1.2. High-risk experiments

In the electrical and electronic experimental teaching content, there is some high-risk experimental content, which cannot be demonstrated or operated in the real classroom. In this regard, we can construct a high-risk experimental simulation environment to promote students' experimental operation and practice, cultivate their risk and safety awareness, and help them learn and grow.

5.1.3. High-cost experiments

Electrical and electronic experiments often need to use high-cost equipment and a lot of resources. Therefore, if the real experiment is carried out, it needs to consume a lot of cost. In this regard, we can provide students with virtual practice opportunities by constructing experimental virtual resources, so that they can deeply understand the complex electrical and electronic technology with the assistance of virtual simulation technology, effectively reduce the cost of experimental teaching, and promote students' learning and growth [11].

5.1.4. Virtual and real remote experiments

Virtual and real remote experiments combine virtual simulation and remote-control technologies to create an experimental process where students can operate electrical and electronic experiments remotely. This approach allows students to experience the authenticity and flexibility of virtual experiments. In constructing a remote-control system for the experimental platform, a stable virtual simulation platform can be established. By integrating these resources, students can log into the platform to perform remote tasks, such as wiring and data testing experiments. This greatly enhances the flexibility and effectiveness of experimental teaching, while promoting the development of students' practical abilities [12].

5.2. Electrical and electronic experimental teaching platform function

5.2.1. Virtual-real integration of experimental equipment and its online management

Under this function, all instruments and equipment on the platform, including multimeters, signal generators, power supplies, and others, are equipped with wireless internet capabilities. This allows them to be controlled or adjusted remotely based on network access, while also enabling real-time data monitoring of the experiments. Specific functions include data adjustment, equipment integration, online monitoring, and

equipment scheduling.

5.2.2. Information-based teaching and management functions

This function is primarily divided into three parts. The first is digital resource extraction, where experimental teaching resources are accessed through both personal computers (PC) and mobile terminals by connecting to the experimental teaching platform. The second part focuses on online communication and question and answer (Q&A), allowing students to exchange ideas with teachers and peers through an online communication window, thus enhancing teaching interactivity. The third part involves virtual simulation experiments, providing students with virtual simulation services for electrical and electronic experiments to promote their learning experience [13].

5.2.3. Training evaluation

The experimental platform can rely on big data technology to analyze students' experimental data and give corresponding teaching feedback and improvement suggestions on this basis. Concurrently, the platform establishes an online evaluation system to realize the real-time evaluation of students' experimental process and results, and automatically records and manages students' scores and credits to simplify the score management process.

5.2.4. Safety education

To enhance the safety awareness of students and lay the foundation for their safe operation in follow-up work, the electrical and electronic experimental teaching platform also has a safety education function, which popularizes the safety knowledge of electrical and electronic experiments through the platform and enhances the safety awareness of students. Simultaneously, simulation drills and training can be carried out, and virtual simulation technology can be used to carry out safety simulation drills and training, enhance students' safe operation skills, deepen their cognition of safety accidents, and promote their safety awareness [14].

5.3. The application and expansion of the electrical and electronic experimental teaching platform

The design of electrical and electronic experimental teaching platforms should be focused on enhancing students' learning and practical experience, laying a solid foundation for their future employment and development. In this regard, the construction of the experimental teaching platform should emphasize its extension and application. Specifically, school-enterprise cooperation should be integrated to foster innovative and expansive platform development.

Firstly, schools should collaborate with enterprises to build laboratories, introduce advanced experimental equipment and technology, and elevate the quality of experimental teaching. Secondly, experimental teaching should be aligned with actual electrical and electronic projects in industry. By connecting experimental teaching with real enterprise projects, students can gain hands-on experience and mastery of electrical and electronic technologies [15].

Moreover, the development of "dual-qualified" teachers should be prioritized. Encouraging professional teachers to practice in electrical and electronic enterprises allows them to better understand the current digital landscape and the specific work processes of the industry. This helps deepen their knowledge of job

requirements and standards, enabling them to integrate industry practices into teaching reform, thereby improving the quality of professional experimental education.

Finally, the school should actively promote social services and training through the experimental teaching platform, enhancing its social influence and generating economic benefits.

6. Conclusion

In conclusion, in the context of educational informatization, higher vocational electrical and electronic teaching should prioritize the construction of experimental teaching platforms. By continuously improving student engagement and the effectiveness of experimental teaching, we can comprehensively enhance students' professional skills and overall abilities. This will support their personal growth, contribute to the development of skilled electrical and electronic professionals, and ultimately promote the progress and development of the social economy.

Disclosure statement

The authors declare no conflict of interest.

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