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Innovation and Application of Electronic Process Training Course under the Background of New Engineering

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Abstract

Electronic technology training is a very important basic training for electrical students, and it is an important way to shift from classroom theory to hands-on practice. However, during the epidemic, many training courses were carried out after returning to school, and a small number of them used virtual simulation experiments instead of practical training. In response to the call of the Ministry of Education to "suspend classes without suspension" during the epidemic, as far as possible to ensure the progress and effectiveness of students' training. This article takes the cultivation of students' independent practical ability as the starting point, and explores the influence of the "virtual + offline" teaching mode on the teaching of the "electronic technology training" practical training course.

Keywords

Electronic Technology Training; "Virtual + Offline" Teaching Mode; Practical Ability.

1. Introduction

The rapid development of science and technology has promoted a new round of industrial transformation, which requires higher education to cultivate innovative talents who can quickly respond to industrial changes and adapt to future technological changes. Electronic Technology Training is an important basic training for electrical students, and an important step from theoretical teaching to hands-on operation. The sudden epidemic in 2020 disrupted the normal offline teaching sequence. Most of the theoretical classes have turned to online teaching. Experiments and training courses are mostly carried out by means of virtual simulation or postponed to unified training after returning to school. Both methods have their pros and cons [1-2]. This article proposes a "virtual + offline" teaching model, breaking through the limitations of training place and time, and actively guiding students to carry out training and learning.

2. Analysis of the Situation of Training

Before the outbreak of the epidemic, the "Electronic Technology Training" course was carried out in a theoretical teaching + practical training method. Teachers concentrated on teaching theoretical knowledge, and students completed training projects as required. The training content included: identification and use of electronic components, the use of instruments, manual welding and desoldering training, the production and debugging of electronic products. During the training process, there are the following problems:

(1) The theoretical explanations are relatively concentrated. Students often only remember one-sided knowledge points without forming a comprehensive theoretical system. In actual operation, they will not flexibly deal with various circuit problems that appear, resulting in the phenomenon of repeated explanations of the same knowledge.

(2) During the training process, there are detailed circuit diagrams in the training instruction book. Students have a mentality to deal with things. They only study the distribution of

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components and the layout of wires during soldering, and will not study the circuit principle and its results in depth. Therefore, during the debugging process, students lack the ability to check circuits, blindly ask teachers and classmates, and lack the ability to think independently.

(3) In the production process of electronic products, all students receive are printed circuit boards. They only need to assemble, solder, and debug according to the instructions. They lack the ability of engineering analysis and PCB board production.

(4) The training project is single and lacks the cultivation of students' innovative consciousness and ability.

3. Types of Training

After considering the current situation of teaching during the epidemic, specific teaching methods are given. The training project is adjusted from the traditional confirmatory experimental project to four levels from shallow to deep [3]:

(1) Verification

The content is mainly theoretical teaching, including the identification of common components and the use of common instruments. Since the students have not returned to school, theoretical teaching relies on virtual reality technology. Virtual reality technology can integrate experimental scenes, image data and other data information to construct an experimental environment that combines virtual and real. It helps to improve the interest of teaching and the initiative of students to learn, thereby improving the efficiency of students' learning. Through this technology, students can experience experiments in an all-round and real situation, and they can arrange their learning progress reasonably according to their own mastery of knowledge. Students can use the virtual reality platform to fully understand the appearance and identification methods of experimental components, the structure, functions, and use methods of laboratory equipment, as well as the standardized procedures of experimental operations.

(2) Comprehensive

The content is manual soldering and desoldering skills, and the design and production of simple experimental circuits. Students choose simple circuits in theoretical classes, select appropriate components, and use the methods and skills of manual soldering and desoldering on the virtual reality platform to complete circuit assembly, soldering and testing. Consolidate students' theoretical knowledge and cultivate students' comprehensive application ability.

(3) Design

The content is for students to complete the selection of topics in the electronic technology course, program demonstration, to simulation circuit design and production, PCB board design, to assembly, debugging, and finally to complete the experimental report. The purpose is to improve the spirit of teamwork among students and let students understand the basic process, basic craftsmanship, and basic methods of completing an engineering project.

(4) Innovation

Guide students to observe and study the excellent cases of electronic competitions over the years, from learning the methods of others to having their own ideas, inspiring students' enthusiasm for learning, enhancing practical skills and innovative consciousness, and selecting excellent seedlings for future competitions.

The teaching process mainly consists of two parts: online tasks include theoretical study, topic distribution, student selection of topics and program demonstration, consumables declaration and purchase, online defense and acceptance; offline tasks are physical testing and acceptance based on test project requirements.

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4. Implementation Process

The teaching implementation process will focus on five aspects: identification and testing of commonly used components, virtual simulation circuit design, PCB board production, manual soldering and desoldering, and electronic technology course design.

(1) Virtual reality platform learning theoretical knowledge: students learn the four aspects of component identification and detection, virtual simulation circuit design, PCB board production, manual soldering and desoldering methods and skills. And complete the simulation design plan, teachers and students communicate and answer questions through the Tencent meeting, and score according to the design plan.

(2) Assign electronic technology design tasks: Under the premise of mastering the basic theoretical knowledge, select a topic from the electronic technology course, draw up a design plan, and conduct a theoretical proof.

(3) Circuit production: purchase training consumables, complete simulation design, physical production and testing. During the simulation design process, students need to build a test platform to simulate the test environment to achieve the expected design results. Students complete the physical construction according to the results of virtual simulation, and at the same time complete the circuit test, compare the real results with the simulation results, optimize the circuit parameters, and improve the circuit performance.

(4) Online defense: Students organize all the training content, make PPT, and complete the project report.

5. Conclusion

This article proposes a combined online and offline teaching implementation plan for the development of "Electronic Process Training" during the epidemic.It aims to break the limitations of traditional training teaching such as venue, time, and training content, and improve students' practical ability, teamwork ability and project analysis and production ability.

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