

Research on Experimental Teaching of Power Electronics for Application-oriented Talents Management

Rongjie Jian

Laboratory Center of College of Engineering and Technology, Yang'en University, 362014, China

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Abstract: This paper introduces the construction of power electronics technology and electric drive system experiment teaching, from the development of experimental equipment, the update of experimental teaching content and the improvement of experimental teaching system, and expounds the comprehensive quality and innovation of experimental teaching construction.

1. Introduction

The Ministry of Education's "Several Opinions on Further Strengthening the Work of Educating People in Colleges and Universities" and "Guiding Opinions on the Transformation of Local Undergraduate Universities" point out that the reform of practical teaching methods is the key to promoting the reform of practical teaching and the reform of personnel training mode. Local undergraduate colleges should aim at cultivating undergraduate-level applied technical talents who have both systematic theoretical training and certain skills. It can be seen that experimental teaching plays an important role in the cultivation of talents in colleges and universities. The equipment and equipment standards closely related to practical teaching should also be continuously reformed with the development of industry and science and technology to meet the requirements of the state for the cultivation of innovative application talents. Generally, mature experimental platforms on the market are difficult to meet the needs of engineering application technology and curriculum system development. The experimental devices and platforms developed by college teachers and experimental technicians have gradually become an important means of current practice teaching reform [1].

2. The Necessity of Development of Power Electronics Technology Practice Innovation Platform

Power electronics and electric drive are highly practical disciplines. Only by strengthening the practical teaching links can we truly deepen the study of relevant professional courses. The Power Electronics Technology course covers devices, circuits, controls, etc., and is widely used in production practice. Its applications include motor speed control, reactive power compensation for power systems, harmonics control, flexible AC transmission, DC transmission, and new Energy, electric vehicles and other fields. The practical teaching platform of power electronics technology should be able to adapt to the needs of science and technology and production development.

At present, the power electronic technology teaching platform provided by relevant market suppliers is mainly based on functional verification experiments. From the appearance point of view, the experimental equipment produced by professional manufacturers is beautiful in appearance and convenient to operate, but from the perspective of student learning, this platform The visibility is poor, the electronic components are hidden in the experiment box, the students can't see the experimental object, and the actual shape and circuit structure of the device cannot be understood. At the same time, the functional circuit connection of the experimental platform is connected internally, and the students only need to access the panel. Simple wiring is not very helpful for improving the ability to do it. Therefore, this kind of teaching experiment device greatly limits students' innovative development thinking, and it is difficult to give full play to students' subjective initiative [2].

In order to reflect the professional characteristics and achieve the goal of training for applied talents, it is necessary to design a suitable practice platform according to the professional talent training program and curriculum system. The self-made practice platform makes different functional modules according to the teaching content. The module layout is intuitive and redundant, which is convenient for students to conduct experimental tests. At the same time, the self-made experimental platform is also convenient for maintenance. Even if there is a failure, the experimental teacher can repair it himself, which guarantees the integrity of the experimental equipment.

3. The Guiding Ideology of Experimental Teaching Construction

Power Electronics Technology and Power Transmission Control A motion control system is a major course in automation. It is generally believed that power electronics technology is an interdisciplinary subject formed by three disciplines of power, electronics and control; motion control is based on the controller, with the power electronic power converter as the driver, and the automatic control of the motor under the guidance of control theory. Control System. If the role of power electronics is compared to the human digestive system and cardiopulmonary, then the role of motion control is like the limbs of human beings. So we can say that power electronics and motion control are the basic technologies of modern industry.

The above shows that power electronics technology and motion control have strong practicability and engineering. Therefore, its experimental teaching should not only be a verification of theoretical knowledge, but also should focus on cultivating students' engineering application ability, and let students learn from the system. Highly grasp and integrate the knowledge learned. This motivates us to do the following: First, organically combine the experimental teaching of the past with each other to form a teaching experiment that systematically and comprehensively apply multiple knowledge; secondly, the content of the course teaching, teaching methods and teaching methods, and experimental teaching Third, establish an experimental system, provide students with an open experimental base, provide technical training bases for enterprises, and make useful explorations on the educational concepts of "production, learning, and research" [3].

4. The Experimental Teaching Objectives and Teaching Mode

The overall goal of talent training in China's higher engineering education is to train high-level projects with high comprehensive quality, comprehensive development of moral, intellectual and physical development, and basic engineering training with engineering practice ability and innovative spirit. After graduation, students are mainly engaged in the design, manufacturing, testing, research and product development of professional fields in the first line of industrial production, and can also engage in management, management and teaching. Under the guidance of this goal, experimental teaching must seek a new model, integrating professional-related disciplines, integrating individual subject experimental teaching into a complete industrial system, enabling students to follow the curriculum and experimental teaching. Gradually deep people, contact with a complete system, and gradually establish a system perspective, master the system's composition, master the design method and debugging method of the industrial control system, and lay a solid practical foundation for the future work. To this end, the automation profession has re-planned the original teaching experiment content of the power electronics technology and automatic control system laboratory, and designed three types of experiments: one is the confirmatory experiment. Using experimental lectures complete the experiment according to the designed experimental requirements and experimental steps, test the required data, and explain the data, verify the correctness of the corresponding theory, and deepen the understanding, integration and integration of the theory. The second is engineering experiments. The design fully simulates the actual industrial control system demonstration experiment, providing students with complete system configuration, controller parameters and system wiring diagram, so that students can complete the connection and configuration of the system by viewing the drawings, so that the system can be

viewed while the system is running. The operation data and operation curve of each equipment will deepen the understanding and integration of the internal links of each course, and grasp the composition and control mode of the modern control system as a whole. The third is an extended experiment. This type of experiment opens up a vast space for students who are eager to learn and who are interested in scientific research to cultivate creative thinking and creativity. Students design their own experiments based on research interests and laboratory conditions, or design experiments with the help of teachers and experimental teachers, select the appropriate equipment, form the experimental system and complete the experiment [4].

5. The Necessity of Power Electronics Technology Practice Innovation Platform Development

Power electronics and electric drive are highly practical disciplines. Only by strengthening the practical teaching links can we truly deepen the study of relevant professional courses. The Power Electronics Technology course covers devices, circuits, controls, etc., and is widely used in production practice. Its applications include motor speed control, reactive power compensation for power systems, harmonics control, flexible AC transmission, DC transmission, and new Energy, electric vehicles and other fields. The practical teaching platform of power electronics technology should be able to adapt to the needs of science and technology and production development. At present, the power electronic technology teaching platform provided by relevant market suppliers is mainly based on functional verification experiments. From the appearance point of view, the experimental equipment produced by professional manufacturers is beautiful in appearance and convenient to operate, but from the perspective of student learning, this platform The visibility is poor, the electronic components are hidden in the experiment box, the students can't see the experimental object, and the actual shape and circuit structure of the device cannot be understood. At the same time, the functional circuit connection of the experimental platform is connected internally, and the students only need to access the panel. Simple wiring is not very helpful for improving the ability to do it. Therefore, this kind of teaching experiment device greatly limits students' innovative development thinking, and it is difficult to give full play to students' subjective initiative. In order to reflect the professional characteristics and achieve the goal of training for applied talents, it is necessary to design a suitable practice platform according to the professional talent training program and curriculum system. The self-made practice platform makes different functional modules according to the teaching content. The module layout is intuitive and redundant, which is convenient for students to conduct experimental tests. At the same time, the self-made experimental platform is also convenient for maintenance. Even if there is a failure, the experimental teacher can repair it himself, which guarantees the integrity of the experimental equipment [5].

6. Improve the Experimental Teaching Content and Teaching System

The development of motion control is inseparable from the advancement of power electronics technology. The laboratory integrates the experimental teaching of the past, and highlights the close relationship between motor drive control, power electronics technology and control theory in the experiment of automatic control system, emphasizing that the electric drive system is a comprehensive application of various technologies. The college concentrates on developing new devices, writing new lesson plans, and imparting the teachers' theoretical knowledge and engineering practice experience to students. From the third year of school, students are arranged to engage in extracurricular scientific and technological innovation activities, so that students can directly participate in the teacher's scientific research. In practice, Develop engineering and innovation capabilities.

The laboratory has established a strict equipment management system: students are required to take care of the experimental equipment, and those who deliberately damage the experimental equipment should be disqualified from the experimental qualifications and experimental results. In serious cases, compensation must be paid until the qualification of the experiment is cancelled. The

laboratory constantly improves the assessment criteria: First, the verification experiment and the demonstration experimenter must write the preview report, and write the test report after the experiment is completed; second, the extended experimenter must submit the application report in advance, and the laboratory can approve the experiment before proceeding. The experiment report shall be submitted after the completion of the experiment; the third is that the non-required open experimenter must write a preview report, and the application report shall also indicate the purpose of the experiment, the requirements, and the cooperation that the laboratory should give.

7. The Laboratory Hardware Environment Construction

The automation professional laboratory has always maintained the excellent tradition of transforming the research results and teaching experience of teachers into the development and improvement of experimental equipment. In the 1990s, the experimental equipment of power electronics technology experimental device and automatic control principle was developed. In the development process of these devices, the college always adheres to the combination of teaching and practice, integrates students' curriculum design and graduation design, stimulates students' interest in scientific research, exercises students' engineering practice ability, and improves students' sense of innovation and ability. . The power electronic technology teaching experimental equipment developed not only serves the teaching experiments and power electronic technology training of undergraduates in our college, but also is also promoted to the society for use by the adult education colleges of our school and other brothers and universities. The power electronics technology experiment has been highly praised by experts in the key curriculum construction and automation brand evaluation of our institute. In particular, the consistent practice of combining laboratory construction with the cultivation of students' engineering practice ability has been approved by experts and achieved considerable Good social benefits.

After entering the 21st century, with the expansion of the scale of higher education, the number of laboratories has soared from less than 200 students to 500 or so per year. Obviously, it is far from meeting the requirements of teaching experiments. In 2003, the college seized the opportunity brought by the construction of the university and with the support of the leaders of the relevant departments of the school, began a new round of laboratory equipment development. The 10 sets of DC speed control system and 60 sets of power electronic technology experimental devices have replaced the old and backward experimental equipment and updated the experimental content to meet the needs of experimental teaching development. At present, the automation profession is also working on the construction of digital distributed electric drive automatic control experimental system in combination with students' extracurricular scientific and technological innovation activities. The experimental system takes DSP controller as the core and permanent magnet synchronous motor as the control object. It uses industrial field bus for information transmission, including computer control and monitoring, information transmission and equipment control of modern industrial systems. It can be completed: control Algorithm; industrial control network; multi-machine coordinated control; complex speed control; servo drive control and other experiments and research. The experimental system will further improve the experimental teaching of automation majors improve the students' engineering practice ability and the cultivation of innovative ability.

8. Conclusion

The construction of experimental teaching is a dynamic process. Through the organic combination of general education and professional education, students should cultivate the overall quality of students, cultivate students' sound personality and noble sentiments, and cultivate students' engineering awareness through engineering practice training for students. This requires us to continuously explore the guiding ideology, training objectives, training programs and training methods of talent training, and constantly improve the software environment and hardware environment of experimental teaching.

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