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Application and Realization of Teaching Thinking Based on OBE in the Course of Electrical Control and PLC Technology

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Abstract: With the continuous emergence of new terms, new fields and technologies such as "Made in China 2050", "Innovation and Entrepreneurship", and "Artificial Intelligence", society's requirements for engineering universities have gradually changed, and the functions and development directions of schools have gradually changed. Many universities.It is also gradually transforming to an applied university. In order to meet the challenges of the new industrial revolution to higher engineering education, and at the same time, in order to adapt to the real needs of the rise of public accountability, people pay more attention to the return of educational investment and actual output, result-oriented education (OBE) has become the mainstream concept of education reform in some foreign countries. "Electrical Control and PLC Technology" uses the combination of TIA PORTAL programming and SIM simulation software, follows the OBE concept, results-oriented teaching reform, and discusses its teaching mode and solution strategies.

1. Introduction

OBE: Outcomes-based Education, abbreviated as OBE, is an education model based on learning output, from a "knowledge-oriented" curriculum system to a "ability-oriented" curriculum system. Break the separation between classrooms and laboratories, cross and integrate theoretical teaching and practical teaching, achieve "synchronization of theory and practice, and interactive integration", emphasizing practice in theoretical study. At present, this teaching mode has prevailed abroad, and it is also a teaching concept advocated by some domestic application-oriented universities [1-2].

The course "Electrical Control and PLC Technology" is a university course that significantly reflects the cultivation of application ability in applied universities. The "Electrical Control and PLC Technology" course is a very important professional compulsory course for electrical engineering, automation, automation and other majors. The course itself is very practical, which is conducive to cultivating the practical ability of engineering college students, and it is also in the

construction of new engineering. An important core course Cheng, has made great progress in many years of curriculum construction practice and exploration. According to the difference of students' learning quality, the teaching method and teaching assessment are designed and reformed. Use real scenes and modern educational technology to optimize the teaching process, realize the integration of theory and practice, and integrate teaching, learning and doing. To enable students to master the method of electrical control principle circuit design, from relay control system to PLC control system; from basic instructions and simple programming to using computer-aided design software (TIA Botu software and SIM simulation software) to compile PLC application programs, combining hardware and The software is combined together to establish a relatively complete PLC system design idea, with the ability to design a simple PLC application system. The previous method of assessing student performance in this course was mainly to take closed-book exams for students, in which 10% of the usual scores, 40% of the practical scores, and 50% of the final course exam scores. However, due to the strong practicality of the course, The scores that students get by rote memorization can't really reflect every Individual students' mastery of the knowledge they have learned is not conducive to the cultivation of students' ability to apply knowledge, practical work abilities, and innovative abilities, and is contrary to the requirements of the training goals of applied undergraduate talents. Based on this, apply for examination reform of this course in order to change students' learning methods, cultivate students' knowledge ability, practical work ability and innovation ability, and promote the reform of teachers' teaching content and methods [3].

2. Teaching content link design

Starting from level 16, this course adopts self-compiled textbooks. The textbooks are compiled by key teachers in the course team. The textbooks are developed around the basic principles of electrical control, the instruction system of Siemens S7-1200 PLC, hardware structure, and practical applications. The content highlights the applicability, focusing on allowing students to better absorb and master the theoretical knowledge points of the course and transform them into practical applications through some practical application cases of PLC in the textbook. The purpose of compiling self-compiled teaching materials is to make the content of the teaching materials more in line with our school's talent training positioning, and the course content is more suitable for our students. The key points and difficulties in the textbook are more obvious, and students can review and review the content of the course according to the content of the textbook.

This course is taught to students majoring in electrical engineering and automation in the second semester of the sophomore year, and students majoring in automation in the first semester of the junior year. The students have studied circuits, digital electronics and other knowledge, and have a certain understanding of control circuit schematics. And simple design capabilities. If students are taught traditional theory-based lectures, they will be dissatisfied. Therefore, in teaching design, reduce the proportion of pure theoretical courses as much as possible, and increase the links of practical teaching. Teachers can also stimulate students' enthusiasm and interest in learning by demonstrating some experiments for students in the classroom, and make up for some limitations brought by the experimental environment. In this way, the learning of modern educational concepts such as enlightenment, inquiry and collaboration is applied to teaching. According to the difference of students' learning quality, the teaching method and teaching assessment are designed and reformed. Use real scenes and modern educational technology to optimize the teaching process, realize the integration of theory and practice, and integrate teaching, learning and doing [4].

The teaching method of the integration of theory and practice (OBE) runs through the

curriculum. The teaching method of the OBE educational philosophy is to target the expected learning output, and use the output results to reverse design and curriculum-related teaching activities. In the course, the actual case is combined to introduce the content of the course, so that students can link the content of the course with the reality of life and production, improve their learning interest and motivation, stimulate students' interest in exploring reality and in-depth learning, and closely integrate the classroom content with Students' "second classrooms" are connected, allowing students to form an organic integration of "first classrooms" and "second classrooms", embodying the educational philosophy of "student development as the center". Establish the enthusiasm of students to learn independently, improve teaching efficiency and improve teaching effects. For example, when explaining the knowledge of timer in this course, the instructor introduces the common examples of the countdown of traffic lights and the timing display of household appliances into the course, and introduces the content of the course through these familiar examples, so that the students will learn Not so laborious. After the theoretical explanation of this part of the content, the instructor combines the laboratory experiment table equipment to demonstrate the actual working effect of the timer, and through flipping the classroom, inspiring students to self-summarize and discuss with each other by means of excellent and poor methods to achieve The purpose of mastering knowledge points. After the theoretical course is over, this knowledge point will also use the corresponding experimental links for practical operations, allowing students to implement the timer design by themselves, and show the timer-related works designed by the students at the end of the course.

A complete explanation of this knowledge point. Through the use of these teaching methods and the setting of teaching links, students can participate in the learning of the course in an all-round and multi-mode [5].

2. Practical Teaching Link Design

This course contains in-class practice links. The in-class experiment totals 20 hours, including 6 confirmatory experiments and 2 comprehensive experiments. The confirmatory experiment includes six experiments including TIA PORTAL programming software and computer-aided design, basic instruction programming exercises, timer and counter instruction exercises, answerer programming exercises, comparison instruction exercises, and shift instruction exercises. Comprehensive experiments include basic instructions. Two experiments including comprehensive application experiment and PLC sequential control system comprehensive experiment. The experiment of this course focuses on the application of PLC instruction system and the method of ladder diagram program design. Through hands-on practice, students are able to analyze problems, write ladder diagram programs independently, hardware configuration, software and hardware communication, program online operation and debugging. The ability to finally solve the problem. The experimental classroom combines the actual realization of the control function of the simulation software, compares its differences in the hands-on operation of the equipment and experiences its actual effects. Corresponding training links expand the difficulty of tasks based on the mastery of theoretical courses to fit actual factories and life examples, use theoretical knowledge to write program simulations, and also exercise students' innovation and creativity. In addition, starting from the 19th level, in order to better carry out the teaching of the theory and practice of the course, the original in-class experimental hours have been cancelled, and all the practical links have been integrated into the daily theoretical teaching, so that students can talk and practice in the classroom. In teaching middle school, learning while practicing, teaching methods that integrate theory and

practice run through the entire curriculum. After class, there were also links to open laboratories, academic guidance, counseling and answering questions. In addition, inter-school studies were also declared, and the integration of online and offline teaching was initially carried out [6].

3. Assessment Effect After Reform

In the course of electrical control and PLC technology, an evaluation method that combines usual results + experimental results + final computer evaluation results is adopted. The ratio of the three parts is 2:4:4, usually including attendance, classroom performance, and stage testing, highlighting the proportion of normal learning. Let students fully clarify the importance of daily assessment, and strengthen students' accumulation of knowledge in the course of daily learning. In this process, the classroom process assessment is adopted. In order to mobilize the enthusiasm of students in learning, there is a task of designing a simple program within a specified time. At the same time, it is accompanied by different assessments of grades, which are included in the personal final grades. The learning potential of the students is Gradually develop and exercise their innovative ability. Of course, if there are students who cannot complete the task, there will be a corresponding deduction policy, so that everyone has to complete the task by themselves, and there will be no bystanders. The experiment assessment includes attendance assessment, experiment report, and operation process assessment to strengthen students' practical operation ability. During the experiment operation, the students first complete the preview content part of the experiment report, then according to the task requirements, design the program in the TIA Botu software, and then use the SIM simulation software to debug whether the program realizes its function, and finally make the actual connection on the experimental equipment. While practicing wiring, the integration of theory and practice can be better reflected. In the process of completing the experimental task, examine the performance of the students in the process of completing the task, and record the results. The final assessment takes the form of open book for computer assessment, program design analysis questions, focusing on the assessment and learning of the understanding of electrical control and PLC and the actual programming ability, while training students' innovative design ability.

In order to better integrate the training program of our school, use the two weeks at the end of the term to carry out PLC application technology training to simulate the production line process of the enterprise. Ability, while expanding the theoretical knowledge of textbooks, adding tasks close to the reality of life, and training students' creative design ability.

The actual effect can be slightly improved through the comparison of results in the past two years on the one hand, and on the other hand, the discrete industry automation direction and the discrete industry motion control direction in the "Siemens Cup" China Intelligent Manufacturing Challenge for automation and electrical students. Won a provincial special prize, first prize and second prize for many outstanding achievements. It can be reflected that the use of teaching thinking such as OBE is more suitable for the reform plan of applied universities to cultivate talents [7].

4. Conclusion

Through the integration of the OBE concept into this course, combined with the addition of many modern auxiliary teaching methods such as: the Cisco simulator used for project implementation, the computer-based test platform used for theoretical knowledge learning, the cloud class used for classroom interaction and stage testing, and the use of data release Baidu

network disk and so on. The results of the teaching reform have changed into two aspects: students, learning and practicing the content of each link, enabling students to master the relevant knowledge of this course, including the knowledge of electrical control circuits, PLC composition and working principles, PLC programming instructions and other related systems. . The ultimate goal of the course is to teach students to analyze, design, program, and connect electrical control technology and PLC for different application requirements based on the basic knowledge they have learned. Teachers contribute to the smooth implementation of teaching reforms and enhance teaching effects.

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