

Application of Case Teaching Method in Electrical Control Technology

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Abstract: Combined with the characteristics of electrical control technology, this paper analyzes the problems existing in the traditional teaching process. According to the requirements of cultivating students' engineering practice ability in the talent training programs, the course of electrical control technology was reformed. The case teaching method based on engineering project is proposed. With practical application as the teaching concept, according to the teaching purpose, teaching content and students' cognitive law, with the help of practical engineering cases, students are brought into the project development process and guided to explore the whole process of engineering design independently. The practice results show that the case teaching method has greatly stimulated students' interest in learning and improved students' engineering thinking and electrical control technology engineering project design ability.

1. Introduction

Hebei agricultural university has always attached great importance to innovation and entrepreneurship [1]. The “Taihang Mount Road” initiated by Hebei agricultural university is a road of innovation and entrepreneurship that can educate people and enrich people with science and technology, and has achieved remarkable results in the practice of entrepreneurship and innovation. In more than 110 years of school history, Hebei agricultural university continues to promote the reform of personnel training mode, and focus on training students' sense of social responsibility, innovative spirit and practical ability.

With the increasing degree of production automation, electrical control technology has been widely used in various fields of automatic control [2-4]. At present, the demand of electrical control talents in enterprises is increasing rapidly. In Hebei agricultural university, electrical control technology was set up in the major of electrical engineering and automation, agricultural electrification. Electrical control technology is a course that combines theory with practice and has strong applicability and engineering [5]. And, electrical control technology involves computer control technology, sensor technology and many other fields, is a multidisciplinary course. Case teaching method is a method for teachers to impart knowledge to students through engineering cases in class, guide and inspire students to analyze actively, think actively and discuss together. Case teaching method is more and more widely accepted and adopted. Case teaching method is a new teaching method linking theory with practice, and this method can improve students' ability to analyze and solve problems. Case teaching method is beneficial to cultivate the ability of autonomous learning, practical ability and innovation ability.

2. Problems Existing in Traditional Classroom Teaching

Specifically, the problems include the following contents:

Electrical control technology is a practical professional course with relatively little theoretical knowledge. The traditional classroom teaching is centered on the theoretical knowledge of each chapter and it is easy to be cramming education. Students are mainly memorized some instructions mechanically. Thus, the classroom teaching is boring. The students are passive to accept knowledge, and they are hard to learn practical curriculums.

In the classroom of electrical control technology, the teacher is on a one-man show. In this case, teachers find problems and solve problems by themselves, while students listen passively and memorize mechanically, with low participation in class. The students are easily distracted and can't keep up with the teacher. As a result, students are more likely to prepare for the final exam than to master the skill.

Traditional teaching methods is failed to motivate students to learn. After all, in the whole teaching process, the teacher deals with all the problems, and the students should also deal with the problems in accordance with the standard answers of the teachers, which seriously inhibits the creativity of students, makes them have no sense of achievement and frustrates the enthusiasm of students to learn.

In traditional teaching classroom, the teaching content is centered on the textbook, and the content of the textbook is mainly a list of knowledge points in turn. The knowledge of each part lacks a systematic and organic integration, and the knowledge structure is like scattered sand, so students cannot apply all kinds of knowledge comprehensively to solve practical problems.

In addition, due to the lack of training in practical application, it leads to lack the practical experience and engineering application ability. So, the traditional teaching method cannot reflect students' ability to apply electrical control technology in practice.

3. Case Teaching Method

Engineering case teaching method is a teaching method that teachers teach students knowledge through engineering cases in class, guide and inspire students to analyze actively, think actively and discuss together [6].

Case teaching method has various teaching forms, and students can adjust their attention in time, which is conducive to maintaining the best mental state. Because the teaching content of case teaching method is concrete examples, students can easily understand, students' interest in learning was stimulated, and teams can pool their ideas. Students are no longer busy taking notes all the time, but discussing and thinking with teachers. To discuss problems together mobilizes the collective wisdom and strength, easy to broaden the mind.

4. Determination of Engineering Cases

Although the case teaching method has many advantages, it does not mean that it can completely replace the conventional theoretical teaching. Therefore, we can build a bridge between theory and practice by combining project teaching and other methods, broaden students' perspective of observing problems, and cultivate students' ability of discovering, analyzing and solving problems.

In the conventional control section, we set nine project modules and set corresponding knowledge goals and skills goals. The project modules include one-way manual control circuit, one-way operation control circuit, motor positive inversion control circuit, motor delay start control circuit, sequential start-stop control circuit, low voltage starting control circuit of three-phase asynchronous motor, three-phase asynchronous motor brake control circuit, two-speed motor control circuit, hydraulic power head sliding table automatic cycle control circuit. Part of them was shown in Table 1.

In the part of PLC (Programmable Logic Controller) applied technology, we also set some project modules, such as basic knowledge of PLC, basis of systematic design, basic programming instruction and application, sequential control design method, application of functional instructions and application of advanced programming instructions. But beyond that, we set four engineering cases,

traffic lights control of crossroads, and PLC control of automatic washing machine, PLC-based beverage vending machines and three-storey seven-car stereo garage.

Table 1 Part modules of project teaching

Project module	Knowledge goals	Skills goals
One-way manual control circuit	Master the symbol, structure, principle and function of low-voltage circuit breaker and fuse protector; Understand motor nameplate information correctly.	Master the reading method of circuit diagram; Use multimeter to test components; Can install the manual control circuit correctly.
One-way operation control circuit	Grasp the symbol, structure principle and selection method of button, contactor and thermal relay.	Familiar with drawing and reading methods of wiring diagram; Check the circuit before power with multimeter.
Motor positive inversion control circuit	Master the structure, principle and symbol of travel switch and approach switch; Master the operation process of wiring groove.	Can correctly install the positive and negative rotation control circuit of the motor; According to the fault phenomenon, check the positive and negative rotation control circuit of the motor.
Motor delay start control circuit	Master the purpose, structure, principle and symbol of time relay and intermediate relay.	Can correctly install three-phase AC asynchronous motor delay start control circuit; Can examine and repair circuit according to the fault phenomenon.

Through the above project modules, especially engineering cases, the teaching content is no longer separated from engineering practice, which promotes the improvement and development of students' engineering quality and stimulates their enthusiasm in learning electrical control technology. Students are also more aware of the importance of theoretical knowledge; study will be more diligent, hard.

5. Execution Process of Case Teaching Method

To ensure the quality of case teaching method, the implementation process must be strictly controlled. The execution process of case teaching method is showed in Fig. 1.

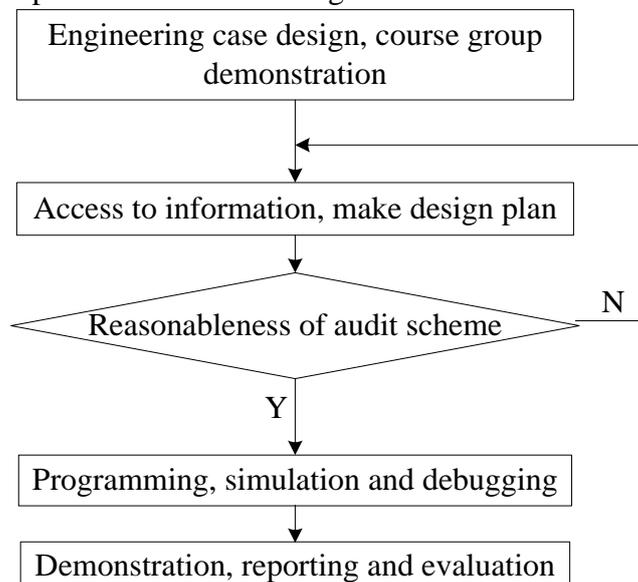


Figure 1. Flow chart of case teaching method implementation

First of all, the selection of engineering cases is very important, and engineering cases must be carefully prepared. According to teaching program requirement, engineering cases should cover as far as possible much knowledge point, difficulty and complex level should accord with student actual situation, and should notice practicality and integrity.

Secondly, in case teaching, students need to be grouped. Each group of 4 is the best. Too many people, not conducive to division of labor and cooperation; Too few people, it cannot inspect the team cooperation spirit. In addition, in order to evaluate the effect of grouping, students in one part of the classes were grouped freely, while the teacher appointed group members in another part of the classes.

After that, it is the concrete implementation of case teaching. The group leader randomly selects the case teaching topic. Reasonable divisions of labor among team members, consult relevant literature and materials, and complete the design task. When the design is completed, randomly select the team members to report the design results. More practical ability should be assessed in the assessment process. The teachers of the evaluation team and all students will score the final score after weighted average. After the evaluation, teachers and students should make a targeted summary and give reasonable suggestions on the problems and shortcomings encountered in the process of case teaching.

6. Conclusions

In the process of the case teaching method, the teacher is no longer a "one-man show", but focuses on inspiring students to think actively, discuss together and conduct independent design, effectively exercising the students' comprehensive application ability of electrical control technology and the ability to analyze and solve problems. Engineering case teaching method takes practical application as the teaching concept to bring students into the process of project development and guide students to complete the process of independent inquiry learning. The engineering case teaching method puts more emphasis on cultivating students' independent and active learning ability. Moreover, the engineering case teaching method is helpful to cultivate students' teamwork ability. By using engineering case teaching method, the enterprise engineering application ability of students is improved, and the talents needed by enterprises are cultivated.

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