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Design and Application of "Fieldbus Technology" Engineering Practice Case under the Concept of OBE Education

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Abstract

"Fieldbus technology" is a professional characteristic course of motor and electrical technology and similar majors, and it is a task-driven course with the integration of learning and doing, so it is difficult for the traditional teaching mode to obtain good teaching results. The result-oriented concept of OBE is the guiding idea of engineering education reform in our country. In this paper, the course teaching research is carried out based on OBE. In the process of practical teaching, the real engineering practice cases are divided into several typical application sub-projects, so that students can understand the basic principles of fieldbus, master the methods of intelligent monitoring and configuration of intelligent electrical products, have the ability to design and plan fieldbus control system, and achieve good teaching results.

Keywords

Fieldbus, engineering case,OBE.

1. Introduction

OBE education model emphasizes the three basic concepts of "student-centered", "result-oriented" and "continuous improvement". Pay attention to student-oriented, pay attention to the teaching effect and the correspondence between curriculum learning and goals. Fieldbus Technology is a practical application course. The leading courses required for this course include "structure and Assembly of Electrical products", "PLC and Inverter applications" and so on. By dismantling and optimizing real engineering cases, we can refine the knowledge and skill points closely related to this course. In a number of practical training projects, students can not only have access to the new knowledge of typical intelligent electrical appliances, but also have direct access to the content of real engineering practice projects. Through the study of this course, students can master the application of fieldbus technology in water conservancy, hydropower and related industries, and cultivate students' excellent professional qualities, such as good team spirit, innovation, dedication and pleasure, etc. it will lay a solid foundation for practical work such as the establishment, management, maintenance and application of distribution engineering projects in the future.

2. Organization of the Text

In view of the deficiency of traditional classroom teaching, the concept of OBE has been gradually introduced into the classroom teaching of "Fieldbus technology". OBE is the abstract expression of "learning by doing" and "project-based education and learning". It is an engineering education mode which takes the engineering project design as the guidance and the engineering ability training as the goal. According to the needs of curriculum teaching, setting up a number of practical projects to deepen and strengthen students' understanding and application of curriculum content is the basis and core of this model. It is designed based on the life cycle of the product, process or system, and places great emphasis on the engineering environment under the real social background, and realizes the concept of

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organic combination of theoretical knowledge learning and engineering practice ability training.

Through OBE result-oriented teaching, students are trained to have the following three characteristics: 1) solid mastery of basic knowledge; 2) better participation in new technology and new product development and operation; 3) understanding of the importance of technology research and development to society and good team consciousness. Guide the students to study the "fieldbus Technology" course through OBE, make them interested in the course, and lay the foundation for ability training and comprehensive training. In addition, we should fully consider the factors such as professional ethics and quality, and combine the curriculum knowledge points in teaching practice with practical engineering, so that students can form a good interaction with teachers in the process of learning, and students have feedback and teachers have reflection. the curriculum can become an effective classroom. At the same time, elements such as professional ethics, integrity and professional quality must also be organically integrated in the process of teaching, emphasizing the combination of being a man and doing things, being a man through doing things, and relying on being a man to ensure. In the process of training, we should pay attention to the edification of humanistic spirit, this kind of education and talent training mode is more in line with the actual situation of higher vocational education.

In the teaching practice of professional courses, we should change some of the teachers' original habitual teaching ideas, flexibly apply the results of OBE to the engineering teaching model, and put the core elements of this model. It includes enriching practical projects, constantly improving plans, increasing active learning and hands-on practice, strengthening learning feedback mechanism, diversification of assessment methods, and so on. On the basis of building a wealth of practical teaching projects, a new teaching system is established, including teaching in the training venue, extracurricular students' learning and course feedback mechanism, which involves how to assist in teaching and auxiliary learning. combined with real engineering cases to cooperate with the practical teaching of "Fieldbus Technology" course.

3. Engineering Case Teaching

3.1. Overall Design of Classroom Case Practice Teaching

The use of OBE teaching model can help students to establish the basic ability of engineering application, with the continuous strengthening of students' professional knowledge, the comprehensive quality of students will also be improved. The teacher introduces the engineering practice case into a number of projects, from simple to difficult, allowing students to gradually master the field bus usage of intelligent power instruments, frequency converters, intelligent contactors and other equipment. As the projects are all derived from the actual cases of enterprises, students have to consult a large number of reference materials in different periods of course study. Including animation, video, instruction manual, with group discussion and communication and feedback with teachers in the training class, students' application ability and thinking level of the equipment will be improved in the process of practical operation. Of course, teachers should control the overall situation and evaluate the performance of students in all aspects to ensure the quality of teaching. Teachers should also reflect on the curriculum in each class, so as to summarize the gains and losses of project teaching in time, so as to improve teaching methods and teaching contents in time.

The traditional professional curriculum teaching will aim at some specific knowledge points when selecting projects, but between different projects, the correlation of these knowledge points is not high, students do not have a good systematic grasp of curriculum knowledge, and students' innovative ability can not be brought into full play. In order to solve such problems,

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teachers should pay attention to the relationship between projects in the process of designing projects. In the course of "Fieldbus Technology", the knowledge points are dismantled based on the real engineering case "Intelligent platform of pumping Station", and a number of projects are formed to carry out teaching. at the end of the course, there is a more complex comprehensive test project to strengthen the training of most key knowledge points. let students realize the importance of the relationship between knowledge points, emphasize group cooperation and feedback in class, so that students' practical ability and engineering thinking have been strengthened.

Based on the project case of "intelligent platform of pumping station", see Fig. 1.Single intelligent components such as intelligent plastic shell switch, soft start, frequency converter, intelligent motor controller, communication controller and system software are communicated and networked based on fieldbus technology to complete configuration monitoring. The ability to cultivate includes intelligent electrical appliance applications and communications, FBD programming, serial communication (Modbus-RTU) data packets and address table typical applications.

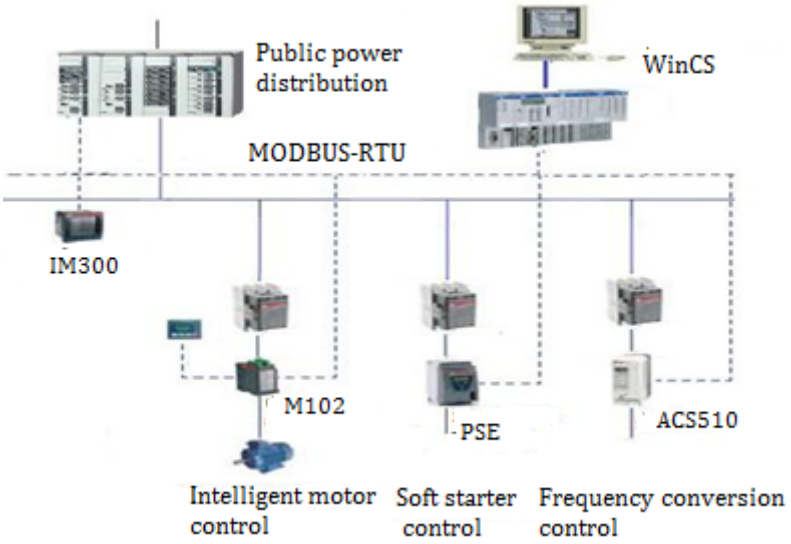

Fig. 1 Simplified model of engineering case

3.2. Teaching Implementation Design

The total number of hours of the course "Fieldbus Technology" is 72 hours and 4 hours per week, while the comprehensive practice project "Intelligent platform Design of pumping Station" of this course is 28 hours. Teachers organize teaching implementation according to the six steps of "information, planning, decision-making, implementation, inspection and evaluation". The specific teaching implementation plan is shown in Table 1. In the whole process of teaching implementation, two transfers have been realized, namely, "teacher-centered" and "textbook-centered" to "student-centered" and "project-centered".

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Table 1. Steps of typical engineering case project teaching

Steps	Organize and implement content
Information	Issue the task book; provide access to information.
Plan	Guide the students to discuss the plan and determine the cooperative team members according to the design requirements of the intelligent platform of the pumping station.
Decisionmaking	There are eight large groups, each with three groups and two students in each group. Under the guidance of the teacher, the network address allocation scheme is determined according to the group location, and the team members make clear the network configuration list and debug to make sure that the Ethernet network is smooth.
Implement (BLE)	Under the guidance of the teacher, carry out the task according to the plan. Teachers will define the main points of work and important knowledge and skills points at the beginning of each sub-project.
	Project a:EM Intelligent instrument Communication.
	Project b:ACS510 Inverter Communication.
	Project c:M102 Intelligent Contactor Communication.
	Project d:PSE soft start Newsletter.
	Project e:UMC100 Newsletter.
	Project f: practical training of electrical appliances based on WINCS
Check	According to whether the intelligent platform design of the pumping station meets the technical requirements and process requirements, put forward the improvement plan; complete the work task report, summarize the experience and experience.
Evaluation	Through group mutual evaluation and teacher evaluation, a comprehensive evaluation is made on networking, configuration, FBD programming and debugging, picture function, security awareness, teamwork and so on.

In the initial stage of project teaching, teachers make use of existing video resources, PPT and other microvideos related to the project to help students quickly understand the main knowledge points of this course, and teachers explain the key and difficult points pertinently. Then, distribute or use the relevant software to provide the work tasks, work points, videos and other materials to the students, and the tasks are decomposed and reflect the gradient of the tasks. Taking the project "Communication of M102 Motor Control and Protection Unit" as an example, the teacher directly uses the industrial training equipment (hardware) and WinCS control system (software) to explain the key points in the ABB Intelligent Technology Center, so that the students can make their own work plans. The group leader makes full use of the respective advantages of the team members to assign tasks to the team members. Under the intentional guidance of the teacher, the pre-work preparation is completed quickly, and the students immediately begin the study and practice of the project. For the course "Fieldbus Technology", each project involved in the course puts forward the requirements of knowledge and skills, and pays attention to the application of classroom discussion and engineering manual, so that students can have a clear purpose in each training. Let students

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connect knowledge points and skill points in the process of practical training, so that the effect of practical training can be greatly enhanced.

In the middle stage of project teaching, students carry out project exercises according to the materials provided by teachers. Under the leadership of the team leader, the team members simulate and debug according to the training content. In this process, teachers accept students' questions at any time. At the same time, students should be reminded to summarize what they have learned in class, and to pay attention to group discussion and group-to-group discussion. Teachers should summarize some common problems in the process of students' practice and inform students in time in class. Students should also think about what they have learned and done in this class and give feedback to teachers so that teachers can further improve.

Finally, let the team communicate, summarize the gains and losses of the task, sort out the documents (including training reports and related materials), if time permits, let the student team report in class, and the teachers comment and summarize the groups. In this process of work, it not only exercises the students' ability to work independently, but also strengthens the students' sense of teamwork.

The project adopts the "total-sub-general" design idea, that is, after assigning the overall task of the project, the teacher divides the task into several small application projects to reduce the difficulty of students' hands-on operation. at the same time, it is easy for students to improve the project from simple to difficult. Each small project can be an independent and complete work process. Including engineering analysis, program design, screen configuration, development and debugging and other specific steps. Finally, after students have completed several branch projects based on Modbus, Profibus-DP bus, etc., students are asked to try to "integrate" the engineering project tree. The engineering files completed by many students are close to the actual engineering project applications.

The case comes directly from the enterprise engineering practice, which closely combines the teaching content with the work of the enterprise position, so that the students can quickly familiarize themselves with the basic work of the position of intelligent electrical appliance application technology. In the process of work, the division of labor among the students is clear (the operator / engineer station uses the IP address directly), and the team members can only cooperate with each other to complete various tasks smoothly. Students have a high degree of interest in this kind of engineering application project, and the classroom atmosphere is good, so they can often put forward some questions worth discussing in the process of specific design and debugging. Many cooperative enterprises also recognize this teaching method, and the practice of this case-based project can really cultivate students' practical ability and comprehensive adaptability in engineering.

4. Project Evaluation and Assessment

Pay attention to the process assessment, strengthen the process assessment in the process of project-based teaching, and set up a number of assessment links to highlight the evaluation of the project production process in the process of project development, so that students have the opportunity to carry out productive training independently in the classroom. overcome and deal with the difficulties and problems in the project work. Emphasize the evaluation of project results, the evaluation of project results is completed by teachers and students together, pay attention to the practicability of project results, and feedback the evaluation to students in time. Highlight the ability assessment, decompose the overall ability goal of the course into several special ability goals, and work out a specific ability target assessment system. In the corresponding teaching process, according to the requirements of each special ability goal, assess each student's ability to reach the standard level.

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5. Conclusion

Under the concept of OBE education, it has achieved remarkable results in carrying out practical teaching through engineering cases. The students carry out the project practice in the intelligent technology training center, and the engineering project designed by the students has the advantages of simple and clear operation interface, easy operation, perfect monitoring function, stable and reliable operation and so on. The practical operation in the real environment not only realizes the integration and promotion of knowledge and skills, and the training of professional quality, but also trains the students' process control system integration and installation skills. The use of a variety of teaching methods to optimize the teaching process, improve teaching quality and efficiency, with remarkable results.

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