Research on project-driven teaching of microprocessor courses

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Abstract: In the face of the trend of new engineering construction, higher education is experiencing new opportunities and challenges. In order to meet the requirements of high quality, with global competitiveness of comprehensive skills talent cultivation, this study puts forward the talent needs of research enterprises, and according to the characteristics of regional economic development, based on the development and use of practical projects as a starting point, analysis of the current microprocessor course teaching problems encountered, while considering its strong practical nature, teachers to explore the teaching mode. This paper describes in detail how to construct the main path of project-based implementation, and realizes the above steps through Proteus software simulation project. The project-driven teaching method helps to promote the close integration of teachers, students and practical activities, and then improve students' project thinking and project concept, so as to strengthen students' practical experience and creativity.

Key words: Project-driven; Microprocessor; Teaching strategies

As one of the core basic knowledge of electronic majors in colleges and universities, microprocessor has both strong theoretical and practical value. This subject covers a wealth of knowledge points and its concept is more esoteric and complex, so it needs high operational skills to complete the challenges in the learning process. In order to stimulate students' enthusiasm for learning and have a deeper understanding of the obscure content they learn, so as to better solve the problems in teaching, teachers must seek a method to optimize the traditional teaching methods: that is, adjust the content setting structure and educational strategy of this subject through the driving force of the project, so as to achieve the purpose of improving the teaching effectiveness. To this end, teachers should have a deep understanding of the needs of the industry, and work out a project plan that meets the actual situation according to the characteristics of regional economic development, so that students can make full use of the knowledge they have learned, and in the process of practical operation, constantly strengthen their individual innovation ability and resilience, and then effectively cultivate students' ability in the field of engineering application.

I. Application of project-driven teaching method

According to the characteristics of microprocessor courses, teachers integrate the level of college students, and put forward a suitable project-driven education method. Before the beginning of the course, the teacher should distribute project-related learning tasks to the students, so that after the students understand the composition of the microprocessor, they have enough time to analyze the project needs by themselves, find relevant information to determine the component selection and draw the circuit diagram. Meanwhile, the programming work is also carried out simultaneously. In order to confirm the design validity of the hardware and software equipment, Proteus software will be used for simulation testing and adjustment to achieve the completion of the circuit function, and finally ensure that it meets the requirements of the project. This kind of project-style teaching mode can stimulate students' enthusiasm for learning, increase their investment in the project, and then deepen their theoretical knowledge, from passive acceptance to active exploration and application of these knowledge to solve problems, so as to improve their ability to use theoretical knowledge in actual operation.

II. The problems in the traditional curriculum teaching mode

First, the teaching content focuses on theory and the teaching form is single. The teaching mode of colleges and universities is usually constructed according to the subject knowledge structure, and does not fully combine the learned knowledge with practical tasks, nor does it introduce the most advanced technical means. As a result, students attach too much importance to the learning of knowledge framework and neglect the improvement of ability, which cannot meet the needs of cultivating high-quality and multi-functional talents. Second, teacher-oriented teaching is difficult for students to form a sense of initiative. The "infusing" education method adopted in the education process cannot mobilize students' enthusiasm to participate in learning activities independently. Most students just follow the cases provided by teachers to carry out their academic tasks, without deep thinking or creative thinking. Third, the content of practical training teaching is too simple, and the improvement of students' practical ability is not obvious. When performing experiments, students often follow the steps in the laboratory manual to connect the circuit board, write the program and adjust the equipment until it works normally. They focus too much on the results of the test and neglect to study and understand the whole process. In addition, most of the learning tasks are carried out in a confirmatory way, and the problem analysis and solution design are simple and easy to understand, which makes their independent thinking ability and creativity not effectively exercised or enhanced. Fourthly, the examination and assessment methods are too monotonous, and the traditional open-book and closed-book test methods are difficult to accurately evaluate students' learning ability, research and development of practical projects and application skills. Fifthly, the knowledge points are numerous, discrete and abstract. Microprocessor theory and practice course is an important series of courses to cultivate the engineering practice ability of electronic information major students, including "microcomputer principle and application", "single-chip microcomputer principle", "DSP technology and application", "embedded system technology" and other courses, from the traditional teaching content of the organization, these three parts of the theoretical knowledge points, more discrete and abstract. This leads to students unclear microprocessor knowledge system, learning difficulty, learning

purpose is not clear, to a certain extent, affecting the enthusiasm of students.

III. The application of project-driven teaching method and practical cases

The theory and practice course of microprocessor is an important series of courses to cultivate the engineering practice ability of students majoring in electronic information, including "microcomputer principle and application", "single-chip microcomputer principle", "DSP technology and application", "embedded system technology" and so on. The unified teaching content organization makes the connection between the various knowledge points is not close enough, the loose relationship between the knowledge points will make the context of the knowledge is not clear enough, increase the difficulty of students' learning.

First, the project-driven teaching strategy is adopted. The setting of each topic content enables students to use the knowledge they have learned to analyze and solve these problems, so as to strengthen students' basic knowledge. At the same time, students will be exposed to some new knowledge points in the process of conceiving the project, which will help promote the learning of new knowledge. Students' ability of self-inquiry and innovation is improved, and they feel more sense of accomplishment and responsibility when completing the task, which further enhances their enthusiasm for learning. If it is project-driven, the planning of the project will become a key factor in determining educational outcomes. While most students may not study microprocessors specifically in the future, it helps to understand the entire computer system better, and learning how to build processors can be fun and challenging. This task can also be subdivided into two sub-tasks: traditional executive flow design and pipeline design. Take the traditional execution structure CPU design as an example, you need to design a cpu with a traditional execution structure in order to be able to perform sequential arithmetic and logic operations. Corresponding course content microprocessor structure, the basic theory of von Neumann computer, memory structure, timing, program counter and bus knowledge points, including basic logic operators such as "and", "or" and "not", digital logic circuit and combinational logic circuit and so on. Design tips Traditional execution structure CPU processing an instruction is usually composed of instructions, decoding, execution and other steps.

The following shows the corresponding project implementation cases. First of all, we need to do in-depth research and understanding of the project, according to the specific problems and objectives of the project, the implementation of needs assessment, overall planning, and then enter the detailed design stage. In this specific detail design process, students in accordance with the master plan and refer to the instructions in the task book, in turn to create the logic components required for each step, including basic and, or, not, and then to the high-level detection of bit and byte matching, byte and byte multiplexing, until the final mathematical/logical calculation module, memory manipulation part. After research, it is found that the processing process of each instruction includes obtaining commands, decoding, running and so on. Each stage needs to be completed in strict accordance with the prescribed time order.

Second, make full use of the characteristics of Qilu University of Technology, penetrate the advantages of production and education integration and scientific and technological innovation in the teaching process, follow the pace of development of The Times, focus on the characteristics of talent cultivation, around the new engineering and engineering education certification related needs as the benchmark, implement the principle of student-oriented, output oriented, combined with the scientific research strength of the provincial Academy of Science and the engineering project practice of cooperative enterprises, The innovation of microprocessor courses, strengthen the integration of theoretical knowledge and practical skills, and integrate project-driven teaching method into it. First of all, promote the integration of theoretical knowledge and practice to consolidate students' foundation. Through the combination of theory and practice to complete the subproject program, the classroom teaching is transferred to the laboratory, the teacher imparts some knowledge to the students, the students as an important part of the experiment, learning while doing, deepening the experimental concept. The use of practical teaching activities to strengthen students' understanding of professional knowledge is helpful for students to master the hardware and software resources and working principles related to microprocessor.

IV. Class discussion

In the teaching process, the role of students is crucial. After the needs of the project have been thoroughly analyzed and the tasks broken down, the teacher will guide them to identify the key problems needed for the success of the project; Then, after discussing the key knowledge points, students are encouraged to explore potential problems and actively seek solutions, so as to find multiple paths and implementation strategies to achieve the goals. With tools such as Proteus, we create a learning environment that puts the student at the centre, demonstrating the manipulation and demonstration of the various basic components, making the theory more lively and easy to understand, helping to attract students' attention and keep them more actively engaged in the learning process. As for the final problem summary report in the project activities, the teacher can explain the common difficulties, but also can deal with special cases individually, to further optimize the problem-solving thinking and planning of the project.

V. Project evaluation

Evaluate students' skill level according to their individual performance: including students' observation power, thinking power and self-learning potential displayed in practice; Working methods such as teamwork were also taken into account. This interactive mode of learning helps improve students' abilities and accelerates the process of knowledge sharing. Teachers should measure these outcomes using positive incentives, clearly communicate directions to all students, motivate those who take the initiative, and praise those who continue to try to improve, so as to encourage more students to participate in research work.

VI. Blended instructional design

Through the integration of network technology, teachers can realize the mixed education mode of online and offline for the implementation of classroom project tasks. Among them, the online part covers the topic research preparation stage, team member assignment, interactive discussion, online test, questionnaire survey, results submission, online assessment and so on. The offline part includes face-to-face teaching, group discussion, practical operation, presentation, reflection summary and other steps. Students can study independently based on the online materials provided, set appropriate study strategies for themselves, and plan study schedules scientifically. At the same time, teachers can use students' online learning records to know their learning status in real time, motivate them to keep working hard, and adjust teaching methods according to students' responses.

VII. Conclusion

Using project-driven education, teachers have successfully transferred the core of classroom teaching from teachers to students, allowing students to fully participate in the curriculum. Through the project research and planning, students at the same time master the computer-related information, and improve their practical skills, but also stimulate students' enthusiasm for learning. In addition, this project-driven teaching mode can also cultivate students' positive thinking and creative spirit, making students not only learn knowledge, but also feel great satisfaction. In a word, the project-driven teaching of microprocessor class helps students to make all-round progress in both theoretical study and practical skills, which is extremely beneficial to shaping national talents who adapt to the needs of innovation.

References

[1] Jian Xiong.Comparative Study of "Made in China 2025" and Germany's "Industry 4.0" [J]. China Collective Economy, 2019(10):86-87.

[2] Denghua Zhong. Connotation and Action of New Engineering construction [J]. Higher Engineering Education Research, 2017(03):1-6. (in Chinese)

Foundation Project: Key Teaching and Research Project of Qilu University of Technology (Shandong Academy of Sciences), "Construction and Exploration of First-class Electronic Information Major in Applied Undergraduate Universities" (No. : 2020zd03), 2021-2022.

Key teaching and research Project of Qilu University of Technology (Shandong Academy of Sciences), "Research and Practice on Training Applied Innovative Talents by Combining Microprocessor Professional courses with the Second Class" (No. 2019zd05), 2020-2022.