

Research on Teaching Reform of "Single Chip Microcomputer Principle" Based on Technical Ability Cultivation

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Abstract—"Microcontroller Theory" is an important professional technical course of the automation, machine building and automation, with a strong comprehensive and practical. The teaching reforms in the analysis of teaching, the research capabilities of students has been made in this paper based on the current situation and problems, from the teaching content, methods, teaching methods and in particular, laboratory methods. This reform which can improve the timeliness of the teaching of specialized courses for the training of outstanding professionals and lay a good foundation has a certain reference value in the current traditional teaching philosophy.

Keywords—Microcontroller, Teaching reform, Practice Teaching, Capacity-building, Teaching philosophy

I. INTRODUCTION

The basic characteristic of the traditional education view is that knowledge teaching is the center, thus forming a teaching model in which teachers focus on teaching materials and classroom teaching. This teaching mode ignores students' initiative and hinders the development of students' innovative ability. At present, it is necessary to change the concept of education, stimulate students' independent thinking and innovative consciousness, and effectively improve the quality of teaching. Students should feel and understand the process of knowledge generation and development, and cultivate their scientific spirit and innovative thinking ability. Attention should be paid to training students' ability to deal with information, acquire new knowledge and analyze and solve problems. From the simple emphasis on knowledge transfer to the organic integration of cultivating ability and improving quality. Efforts should be made to cultivate students' comprehensive knowledge and multicultural integration ability, and to use various means and realistic conditions, especially modern technical means to acquire new knowledge, so as to enhance students' innovative ability. To improve students' innovative ability, they must have a deeper understanding and understanding of what they have learned, which is exactly the problem to be solved in practice.

The most important thing in educational reform is to cultivate students' innovative ability. The ability to innovate is the essential characteristic of human beings and the expression of their talent and overall quality. It is not only the study and application of knowledge, but also the ability to discover problems, actively explore psychological orientation and be good at grasping opportunities and actively transform themselves and the environment. However, most of the experiments in the current textbooks are confirmatory experiments, which cannot play their due role in cultivating students' innovative ability. Therefore, it is a key and important link to study and formulate programs to improve students' practical ability and innovative spirit, constantly update experimental contents and enhance students' engineering practical ability.

Efforts should be made to cultivate students' comprehensive knowledge and multi-cultural integration ability, especially practical operation ability, and transform knowledge into economic wealth through innovation and entrepreneurship. How to improve the ability of talents to solve practical problems and how to train innovative talents, and how to do a good job in employment of graduates are important after enrollment expansion, etc. We must make unremitting efforts to improve the teaching quality of theoretical and practical links. Because the employment level of graduates directly reflects the quality of talent training and is related to the survival and development of colleges and universities, it is particularly necessary to do a good job of graduates' employment and conduct in-depth research on specific issues such as "applied undergraduate talent training mode" and "graduates' employment countermeasures".

The teaching reform of "Microcontroller Theory" is mainly discussed in this paper.

II. CHANGE TEACHING METHODS AND CONCEPTS TO IMPROVE STUDENTS' INTEREST IN LEARNING

With the development of microelectronics and VLSI technology, monolithic microcomputer has been widely used in process control, data acquisition, electromechanical integration products, household appliances, intelligent instruments and network technology due to its high integration level, fast operation speed, small size, reliable operation and low price. At present, many specialties in most of the universities offer "SCM Principles and Applications" or related courses. However, because the teaching environment and teaching methods are relatively backward and the teaching idea is outdated, the students' in-depth study and practice of SCM technology are hindered to a great extent. On the other hand, the teaching reform of the course is particularly important and necessary because of the limited academic system, the small class hours and the relatively poor foundation of some students.

Interest is the best teacher. Due to the abstract nature of this course using traditional narration, beginners, especially students with less basic knowledge, tend to become more confused and lose confidence. Therefore, it is the key to improve students' interest in learning in the teaching process.

In the introduction of the first lesson, in addition to a large number of illustrated application cases, you can also bring into the classroom the real objects of works such as " tracking car", " novel 60 - second LED rotating electronic clock" and " high - precision program-controlled function signal generator" and briefly introduce their working principles and applications, so as to stimulate students' interest in learning. For example, take the tracking car that students are more interested in as an example, and tell the structure of the system: the core part is a single chip microcomputer, combined with the " Motor Drive" course and " Sensor and Detection Technology", plus keyboard input and LED display output, will put an intelligent toy car made by oneself in front of students. In this way, students can be given the impression that " learning the principle and application of single chip microcomputer is not only useful but also interesting".

A. Learning content

To learn this course well, students must be familiar with the main contents and key points of study. Single chip microcomputer is a kind of integrated circuit chip. It is a small and perfect computer system that integrates CPU RAM, ROM, various I / O ports and interrupt systems, timer / timer and other functions (possibly including display drive circuit, pulse width modulation circuit, analog multiplexer, A / D converter and other circuits) with data processing capability on a single silicon chip using VLSI technology.

B. The Application of Image Metaphor

It is also a good choice to use image metaphor correctly in teaching. Because this can not only describe the embedded system of single chip microcomputer completely, but also be easy to understand. If a single chip embedded system is compared to a person, then the single chip is equivalent to the heart and brain of a person, and the input interface is like a human sensory system, used to obtain various information such as changes and states in the external world and transmit these information to the human brain. The brain processes the acquired external information, determines how to respond to the information, and then executes the information through the sensory system and limbs. The program is like the brain's thinking: when the brain receives external information, it always has to pass judgment before it makes a corresponding response, and the program is actually the function that is realized: when the MCU receives the port, it will make corresponding control actions according to different situations. Just as the way everyone handles things is different, so are the programs written by different single-chip computers (even the different compiling environments of the same single-chip computer) to realize the same function. Only with interest can students be willing to learn and learn well.

C. Task - driven

Pressure is the biggest driving force. The pressure here has multiple meanings: First, it is the pressure of responsibility. Learning the course "Principle and Application of Single Chip Microcomputer" well is the need of industrial technological transformation and economic construction; The second is the pressure of employment. Learning the course well is the need of employment. Mastering SCM technology can greatly expand employment opportunities. Third, the pressure of assessment, that is, every student at the end of the semester has curriculum design in addition to the regular written test, experiment and normal homework.

The pressure from these three aspects can be released through the corresponding tasks in theoretical study and time study. Driven by the learning task, cultivate students' spirit of bold experiment and exploration. Encourage students to dare to question, boldly experiment, diligently experiment and innovate in the process of completing the task. At the same time, we should pay attention to the teaching of using methods, principles, experimental design principles and experimental operation principles of experimental instruments in the experimental teaching. Only knowing the reason can we understand and master them and innovate in the flexible application. In a word, it can stimulate students' independent thinking and innovative consciousness and promote the improvement of teaching quality.

D. Case teaching

Select a large number of application cases that come directly from engineering practice and have been practiced by themselves to stimulate students' thirst for knowledge. The adoption of case teaching method is also very helpful to improve students' initiative in learning. Teachers can let students preview the example materials prepared by teachers before class to form certain opinions and prepare for the discussion of the example. In the classroom, teachers organize the whole class to discuss the problems arising from the examples, and students find out the solutions and differentiate them. Finally, the teacher made a brief comment or a supplementary and improved summary.

E. Take the student as the center

Modern teaching theory holds that students are the subject of experimental teaching, and the most basic manifestation of their subjectivity is experimental initiative. Although students have experimental initiative in experimental teaching, they are not completely independent subjects. The gradual establishment of students' subject status and the full play of experimental initiative will also be influenced and restricted by the degree to which teachers play a leading role.

"Principle of Single Chip Microcomputer" is a highly practical course and should be student - centered. Teachers tell students how to learn, what to learn and guide students to solve the problems they encounter through persuasion. Teachers

should give students "fish" instead of "fish". Grant students the ability to connect the knowledge needed for practical activities, and cultivate students' ability to solve problems and innovate in practice, so that all activities can proceed smoothly.

III. CHANGE THE KNOWLEDGE STRUCTURE IN TEACHING MATERIALS APPROPRIATELY TO IMPROVE TEACHING EFFICIENCY

The course "Single Chip Microcomputer Principle" integrates the relevant contents of many courses and contains the knowledge system of the single chip microcomputer technology itself. The single chip microcomputer "sparrows are small and all - sided.". In order to clarify a concept of SCM, more new concepts are often involved. Therefore, in the process of learning the principle of single chip microcomputer, many students feel confused and hard. In order to solve the contradiction between curriculum structure and human cognitive law, teachers can gradually take tasks as teaching units and break the organizational structure of the original teaching content in the teaching process. Regardless of the hardware structure, addressing mode and instruction system of the single chip microcomputer, each part of knowledge is first decomposed into knowledge points. Then according to the task to extract knowledge points and combine them. When the first task is completed, students can understand the application of SCM. When the second or third task is completed, students will understand the development process of SCM and will be able to write their own programs in imitation, making the learning process a continuous and successful task completion process. When all the tasks are completed, the knowledge points will be completely learned (even if only part of the tasks are completed, applications can also be developed). Let the students enjoy the joy of success in learning from it, and then eliminate the fear of MCU learning. With the gradual progress of the task, students' interest in learning will be stimulated, their knowledge will be improved and their ability will be improved.

We can consider changing the knowledge structure in teaching from both theoretical and practical aspects.

Integrate the curriculum content, closely combine the professional foundation and the professional curriculum teaching content with the production practice, and compile the teaching materials of characteristic series of experimental guidance; Arrange the laboratory teachers to enter the practice of large enterprises to form a double-qualified teacher team with industry background knowledge and strong engineering practice ability. to build a high-level student innovation training base and encourage and guide students to actively participate in various domestic and foreign science and technology competitions in order to cultivate students' engineering practice ability and innovation ability. Let students participate in more scientific and technological activities; Reforming the current talent training mode, strengthening the training of engineering ability and systematic training, and running the training of engineering practice ability through the whole process of talent training; Joint training with high-tech enterprises for students with certain competitiveness; " Move the factory into" the campus and build a platform for engineering ability training; set up a part of all-round open laboratory to solve the problem of students' difficulty in starting work; Take the road of combination of production, teaching and research, give full play to the role of good experimental and practical teaching zones in schools, and cultivate students' advanced corporate culture and engineering practice ability before taking up their posts.

IV. STRENGTHENING THE REFORM OF PRACTICAL TEACHING AND IMPROVING STUDENTS' ABILITY

A. Hardware Facilities Guarantee

The teaching method of "teaching, learning and doing in one" should give full play to the enthusiasm of teaching and learning and strive to take the road of " practice - theory - practice". Emphasize teaching in doing and learning in doing. The school and relevant departments can cooperate in the following aspects.

(1) Strengthen the implementation and management of practical ability training, ensure students' practical needs, establish laboratories in line with modern productivity through school investment, and improve students' practical ability and innovation ability as well as their ability to deal with practical problems.

(2) Increase the number of open laboratories and innovative laboratories. While ensuring basic education, actively carry out characteristic education, encourage students to participate in the second class and students' scientific and technological innovation activities, carry out quality development training, and actively participate in various competitions such as " Challenge Cup", national college students' electronic competition and mathematical modeling competition. Improve students' interest in learning and innovation ability.

(3) Strengthening laboratory teaching management. On the basis of the existing laboratory teaching rules and regulations of the school, and in combination with its own characteristics, it refines and supplements the relevant experimental teaching management documents. Promote the steady improvement of experimental teaching quality. Through the reasonable implementation of rewards and punishments, teachers' enthusiasm for teaching has been further mobilized to ensure the improvement of practical teaching quality.

B. Improve the practice teaching system

In practice, the three-level practical teaching system of "foundation, improvement and innovation" is adopted. The basic experiment link completes the routine follow-up experiment in order to increase students' perceptual knowledge, familiarize themselves with the experimental environment and the working environment of the single chip microcomputer, and further understand the internal resources and instruction system of the single chip microcomputer and its programming. Improving practice requires each student to complete at least one MCU course design with certain technical difficulties, such as " novel 60 - second LED rotating electronic clock" or " high - precision program-controlled function signal generator" in order to improve the hardware practice ability and software programming ability. The innovative practice link is to guide and encourage students

to actively apply for school-level open experiment projects, innovative experiment projects and provincial university students' related projects, or to encourage students to actively participate in teachers' school-level open experiment projects, school experiment technology development projects and teachers' scientific research projects, and to participate in national and provincial university students' electronic design competitions in order to improve the development ability and scientific research innovation ability of single chip computers.

C. Project teaching mode

According to the requirements of the course on students' knowledge structure and operation skills, the corresponding learning module project is set up, the project content is designed based on the principle of mastering basic knowledge and skills, the basic knowledge directly serves for skills training, and the project content should be forward - looking, introducing new technologies, new materials and new processes adopted by enterprises in time, and the project teaching content should be conducive to fostering students' spirit of unity and cooperation and innovative consciousness. Of course, the teacher's job is to pay attention to the detailed elaboration of the task itself and provide a solid carrier for theoretical study. To make students understand work tasks and remind them to focus on work tasks, not just knowledge, the ultimate goal of teaching is to complete work tasks. Through project - driven, students learn to think, read and query materials in the process of doing experiments. Ask students and teachers to help students learn to learn and change from " I want to learn" to " I want to learn", so as to cultivate students' innovative ability and team spirit, serious and responsible work attitude and meticulous work style. To organize the experiment in the unit of the project, let the students draw out relevant theoretical knowledge in the process of completing the project, and deepen the comprehensive application of professional knowledge and vocational skills in the process of completing the project experiment. And then realized that the transformation from practice to theory to practice.

V. CONCLUSION

In the teaching process of " Principle of Single Chip Microcomputer", if one-sided teaching of knowledge in textbooks and neglecting the cultivation of students' practical ability will lead to students' lack of practical ability, which runs counter to the aim of education. Therefore, in higher education, teachers should take the cultivation of students' application ability as the standard, constantly innovate teaching modes and methods, and strengthen their self-cultivation and ability so that the trained applied technicians can make greater contributions to society.

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