The Study of Practice Teaching Reform for Single-chip Microcomputer

ZHANG Yujun, LU Yongfang
Henan Polytechnic University, Jiaozuo University, P. R. China, 454000
Zyj@hpu.edu.cn

Abstract: Since the existence of single-chip microcomputer, it has been widely used in the actual production. In this paper, it is based on the development of single-chip technology and the teaching in colleges, points out that the process of teaching problems and to analyze the reasons, and putting forward the reform of various forms of the practice of teaching methods. The purpose is developing the analysis of problems and problem-solving abilities, and improves their innovation capability and comprehensive quality. The paper has done a useful discussion in order to enhance the single-chip microcomputer of teaching and learning performance.

Key words: Single-Chip Microcomputer, Practice Teaching, Reform

1 Introduction

As the typical representative of computer, promote the development of embedded systems. It has become an important part of modern electronic systems intelligent tools, and has had a great influence on the society. Now, single-chip microcomputer has become an important branch of computer technology. And it is widely applied to industrial control, intelligent instruments, consumer products, automotive, consumer electronics and communication etc. 'Principle and Application of single-chip microcomputer' is an important professional majors of the electricity, communications and mechanical students. They besides study the courses, having many practical lessons, such as experiment courses, curriculum design, graduation project etc. But in today's society, with the rapid development of industry and single-chip microcomputer, traditional teaching can't adapt to the needs of the industry. Therefore, the practice teaching reform for single-chip microcomputer will do.

2 The practice teaching reform for single-chip microcomputer is necessary

Principle and application of single-chip microcomputer is important in the theoretical and practical. In the teaching process, we must emphasize the practice and theory of teaching. Students, through experiment process such as the circuit design, software programming and debugging systems, can be a better grasp of theoretical knowledge and application skills. But by the traditional teacher-centered practice teaching, the students’ accord to detailed experiments within the prescribed time for circuit connection and experimental program input, compile the program before operation, and observe the same results in the same experiment. This kind of practice of teaching method is single and rigid. It is not conducive to the students' practical ability and creative ability and the comprehensive use of knowledge, and can’t stimulate students' interest in study. Therefore, in order to adapt to the needs of the industry, the practice teaching must be reform.

3 The forms of practice teaching reform for single-chip microcomputer

Principle and application of single-chip microcomputer of the theory and practice is very closely linked. The Students can really grasp the knowledge only by their own hands. They can further consolidate and digest the classroom learning and master the application of single-chip technology through experiment, and they can be able to train themselves in practical ability, innovation and the ability of the integrated using knowledge through experiment. To make comprehensive and innovative talents has the vital significance.
3.1 The reform of the Single-chip microcomputer experiment contents

According to the course features of principle and application of single-chip microcomputer, the experimental contents were divided into the basic experiment, the basic interface experiments and Comprehensive designing experiments.

The basic experiments are basic of the experimental teaching. The students mainly complete to study experiment contents about the hardware, software and program design. They have learned some related courses and grasped hardware, software, and programming knowledge. So, this part of experiment contents can be accomplished through the experiment of system understanding.

The basic interface experiments are arranged in the experiment, and they are the main content of experimental teaching. The students mainly understand the design method of single chip microcomputer system, the principle of hardware circuit and the programming process. The basic interface experiments mainly include hardware and software programming. In the laboratory, according to the experiment task, the students complete the hardware design, the circuit connection and the software programming. Finally, the result of the experiment show in the test equipment.

Comprehensive designing experiments are the key of the practice teaching. They can give full play to their autonomy, help their comprehensive learning contents, improve their comprehensive the using knowledge ability and solve problems ability. The main contents of experimental are the simple design of electronic products. In comprehensive designing experiment, the teacher gives only a task, requirement and the rational explanation. Students, according to the experimental purposes and requirements, independently design the software and hardware system. In the experimental process, the students observe the experimental phenomena and analyze the experimental results, and they solve the problems appeared in the experiment by themselves. Through the experiment, students can deeply understand the design of single-chip microcomputer’s hardware and software. They write the report of experiment after the experiment is finished. The third part of the experiment contents is complementary and indispensable. The basic experiments are the prophase in the teaching experiment, the students understand the microcomputer hardware and software environment in the beginning of teaching, and are interest of the course. They can master the basic principle and application of single-chip microcomputer through this experiment. The basic interface experiment is the main part of the experiment, the arrangement of teaching in the middle. Students can understand single-chip microcomputer system development process and development method by the basic interface experiment, and grasp the single-chip microcomputer system development process. For the comprehensive designing experiments to lay the foundation. The comprehensive designing experiment is to cultivate students' practical ability, integrated design ability and the innovation ability. In this experiment, the students, according to their knowledge, can choose different experiment content. They complete test requirements through the design of the software and the hardware circuit. By the experiment, the students can get more practical and more comprehensive training. Their experiment courses are arranged in the later period of teaching. The students use the resources of laboratory, combining curriculum design, outside interest groups, the university students’ electronic design competition and graduation project etc. The integrated design experimental although has the certain difficulty and depth. But they are very attractive, they can make the students from the passive experiment becomes active experiment. They not only stimulate the students' interest of learning, also improve students' initiative and creativity.

3.2 Choose the experiment content

In recent years, with the rapid development of single-chip microcomputer technology, the teaching of single-chip microcomputer course is improving. In order to adapt to the pace of the single chip microcomputer course. The content of experiment teaching must update. First, the typical of basic experimental modules must improve, and increase the diversity of the experiment content, meet the needs of students with different experiment. Secondly, the teacher must develop the experiment content that it is close contact with actual engineering, as far as possible to meet the needs of students in different levels. The experiment content is developed from Confirmatory experiment to the comprehensive designing experiment. That may enhance students' consciousness of participation and
improve students' practical ability and the overall design capability. The single-chip microcomputer experiment should not only hardware circuit connection, also want to write programs. In the experiment, the students should design all hardware circuit, and connect the hardware circuit on the experiment device. Then they need to program the software, and debug and operate in the device. But, when the students do some of the more complex the experimental project, it is very difficulty that they complete the relevant content in the limited time. Therefore, the teacher need to careful design experiments for students. To the complex experiment, the students may need the part of the software of experiment, and the students must add the source program and the removed key sentences. Or the teacher gives them demonstration program, and let them revise the program. Then they receive the required experimental results in the experiment. Such they not only can shorten the time of programming, and can master the key content. After the students finished the experiment content, they need to answer the corresponding question. The students may expand the scope of knowledge, improve the ability to analyze and solve problems by completed the analysis.

3.3 Increase different forms of experiment teaching
3.3.1 Increase simulation software—Proteus
In recent years, along with the development of simulation technology, appeared to simulate microprocessor simulation software, the software not only has Proteus, usually draw circuit and digital, analog circuit simulation, and the most prominent function is able to simulate the microprocessor. In the practice teaching of single-chip introducing the student through simulation software, hardware and the related principle chart drawing program, will be programmed to draw the virtual curing process in the diagram, the realization of software source code, and the real-time debugging of virtual instrument software through cooperation to observe the results after operation. Introducing the experiment, the student can use the spare time for SCM experiment, arouse the students' interest in learning, realizing the maximization of space of experiment teaching.

3.3.2 Encourage students to open laboratory experiment
Open laboratory is by teachers organize the students use their spare time in the teaching activity, it is added to the classroom teaching and students are independent and hands-on laboratory, and less than content and solve school important means of this one contradiction. Experimental teachers can combine classroom content, puts forward some design sex topic or student self-designed experiment topic and solutions, commissioning, operation by the student independent experiment report last write and harvest. Good students to open laboratory experiment, display their talent, the design of the experiment scheme has distinguishing feature quite, write good experiment report. Not too good foundation and students will feel pressure, enhance the initiative and self-consciousness.

3.3.3 Using multimedia technology trace online virtual laboratory
Make full use of modern information technology, combined with the experimental teaching contents and teaching experiment project outline requirements, the corresponding experimental principle, experimental procedure, test equipment and instrument, the image galleries chips working principle and shape through the multimedia technology to design a text, graphics, sound, video, images and animations etc of virtual experiment of multimedia software. Imaging life like to show the related experimental contents in front of the student, combining static pictures and intelligent inspire repulsive function, enables the student to feel overwhelmed, direct experience, facilitate students. They learned in class to further consolidate the foundation theories, and understand the basic skills, so that students in a relatively short period to obtain more information provide efficient and interactive teaching, real-time operating environment and good service. Greatly improve the efficiency of experimental teaching and the experiment teaching effect.

3.3.4 Improved the engineering practice experiment
In the traditional engineering practice process, students are completely different in accordance with practical instruction hardware circuit and the software programming welding, the same results. Such training mode is mechanical completion of the teaching task, not able to mobilize students' learning initiative and enthusiasm. While improved engineering practice link process, experimental teachers not to provide students with practical instruction, but to provide students with lots of electronic components
and circuits, the students according to their own choice of autonomous learning, then complete training contents of experiment, finally the tasks required experimental analysis and practical to write report. In this kind of training, students according to their own interests of single-chip microcomputer system design. In the design process, not only the students grasp the whole process of electronic product development, and improve their ability to analyze and solve problems. Students of the hardware circuit design ability effectively exercise. Therefore, to guide students actively, maximum limit arouse and play the main role of experiment, the traditional teacher taught the teaching mode, and evolved into basic experimental teachers, students and the teachers' comprehensive experiments and innovative experiment with equal students teaching mode. And encourage students to take part in the project application of single-chip microcomputer design project to complete the project, independent.

3.4 Professional course design add to single-chip microcomputer content
In order to further strengthen the application of single-chip microcomputer in professional course design, the application of single-chip microcomputer in content, make it become the professional course design is an important part of, in order to make students get through professional curriculum design and exercise, cultivating the microcomputer application system design and development capabilities.

4 Standard test report, reform assessment mode
After the completion of the experiment, requests the student to write test report according to the standard. The specification complete, the experiment report is the comprehensive reflection of experimental results.
Reform assessment mode, from two aspects of theory and practice, and the evaluation of students' practical application and innovation ability. Test scores by 100 points: the final exam 60%, peacetime result (assignments, q&a, classroom questioning) 10%, experiment, the experimental results accounted for 30 percent increase in the proportion of the course grade, in order to promote students' innovation ability raise and the enhancement. If the experiment results, cancel its written qualification. Experimental results of evaluation methods for previewing: 10%, the hardware circuit and software design of 25% of the connection of 25%, system commissioning, 25% of the experiment report 15%. Moreover, the experimental problems, according to the circumstance can solve 0 ~ 50 points (100 points).
In order to give full play to students' initiative and creativity, all-day opening laboratory. Students are required to ensure the smooth completion within hours, and the related experimental results in examination.

5 Emphasize experimental teaching team training, improving teachers' quality
Teacher is school curriculum standards development and implementation of the body, especially the dynamic curriculum standard is the establishment of hard work with a teacher. The establishment of dynamic curriculum standard requires teachers to update teaching concept, timely and grasp the professional technology domain, understand the position in national vocational qualification standards and into the curriculum construction. In addition, the teacher will establish close contact with the enterprise, and regularly to enterprises to research and developed in the first time grasp exercise, a craft and technology, and information feedback to the school. The school and vocational dynamic curriculum standard construction committee, both through the discussion and argument, even remove out-of-date basic enterprise, without the traditional idea and craft, and the newest professional core technology and mainstream technologies into the curriculum standard.
Experiment teaching experimental teachers, because can strengthen the comprehensive devisable experiments, which enables students to the same item of the experiment, the experimental procedure and experiment circuit different, this experiment teachers put forward higher request. Therefore, we must strengthen the laboratory personnel training, to make a stable and qualified experimental teacher.
6 Conclusion

Through the practice of teaching reform, the chip to improve the students' comprehensive quality and innovative ability, the students learning enthusiasm and initiative, make students' practical ability to a certain extent. Also, improve the teachers' knowledge updating teachers' comprehensive abilities.

Experiment teaching reform is a long and complicated task. We only based on single-chip microcomputer experiment teaching practice, gradually, innovation, and further to establish a complete set of experimental teaching system, the new teaching methods can improve, also can better adapt to the needs of the development of the society.

References


Authors Brief
ZHANG Yujun –Lecturer, School of Electrical Engineering & Automation, Henan Polytechnic University, China.