Exploration and Practice of Project-oriented Teaching of Application Technology of Single Chip Microcomputer

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ABSTRACT

The application of "single-chip microcomputer technology" has a strong engineering practice, high technology, the traditional single-chip application technology courses prevalent students practice practical ability and so on. This paper summarizes and analyzes the existing problems in curriculum practice teaching, from the center of "teaching material theory" in the traditional teaching mode to student, project and task as the center, the teacher teaching to the practice of student practice, Students as the main body, the project task-oriented teaching model, teachers design projects, provide practical places, the whole process of teaching to "teaching, learning, innovation +" integration, highlighting the ability of students to apply, and effectively improve the students' engineering design awareness, enhance students' practice and innovation ability, lay a good foundation for future work.

Key words: single chip computer; teaching reform; projectization; teaching design

Monolithic microcomputers (i.e., microcontrollers or microcontrollers) place the central processing unit, memory, input / output units, etc. in a single chip, as long as a few small components, such as resistors, capacitors, quartz crystals, etc., to become a complete micro-computer system. So the whole system of small size, low cost, high reliability, becomes the mainstream of microcomputer control system. With the rapid development of computer network, communication technology, Internet of Things engineering, integrated circuit and simulation software, the application course of single chip microcomputer should be adapted to the teaching content, teaching...
method and teaching method. This paper analyzes the problems and shortcomings in the teaching process of SCM technology course, and puts forward the idea of "project teaching" to cultivate students' practical ability, analyze and solve problems and enhance students' engineering quality and innovation ability.

At present, most of the single-chip application technology course teaching the prevalence of the following problems:

1. The structure of the teaching material does not take into account the student's ability to accept. The contents of the teaching materials are mainly written in the order of MCU hardware structure → instruction system → assembly language design → system extension → interface technology → application system design, pay attention to the discipline and system of the course, but not the students' cognitive characteristics.

2. Learning objectives are not clear. SCM application technology is a practice, application of strong courses, the ultimate goal of learning is how to use, and in the traditional teaching only emphasizes the understanding of the theory, students in the learning process only listen to the teacher's explanation, what teachers say, I listen to what, not to think why. And so the end of the course do not know what to learn, purely just for the examination and learning, lost the initiative of learning.

3. Students lack hands ability. The traditional teaching experiment is the main hands-on way, but the experiment is basically an integrated experimental box, up to add a guide book, the experimental content is verifiable, the students to the laboratory teacher wrote a blackboard on the blackboard, guide the connection circuit, knock into the program, and then intuitively see the results of the operation, and the experimental project for the operation of the principle, the reason I do not know, the result is through the experiment does not understand their own content, nor flexible applied to other projects, and can not be used in actual life projects.

4. Lack of projectable innovation practice teaching. According to our hospital personnel training program, specifically a week of single-chip application technology curriculum design. Students are only selected 1-2 topics, mainly on the program debugging, and the single-chip hardware system is unclear, the students in order to complete the task, but also copy each other procedures, no innovation. Teachers and students in the application process are the lack of technical, practical and engineering practice, mostly on paper.

Implementation of Project - based Teaching

Based on the above problems, we have explored the project teaching model, we integrate the demand from the single-chip system design project
into the teaching, from the project design - device selection - hardware circuit design - control program preparation and debugging Aspects of the start. At the same time, the completion of a project depends on the scene settings, operating environment, independent exploration, collaboration spirit, learning evaluation. Only with the entire collaboration system, students can play the initiative and innovative thinking.

Project selection and design is the key to the course, the project in the selection of time, not too large or too small, we basically divided into basic, technical, integrated, innovative. Project development is to consider the practical application of the ability, but also has practical significance, while taking into account the ability of students to accept, can cause students interest, so that they are psychologically acceptable. The feasibility of the project, each project design contains one or several knowledge points, can reflect the comprehensive application of knowledge ability, but also integration of other courses of knowledge points, such as analog / digital circuit design, automation, sensor technology. In short, teachers and students to learn around the project to achieve the function to complete, should abide by the goal of cultivating applied talents, mainly reflected in the cultivation of students self-learning ability, problem-solving ability, teamwork ability.

The process of project implementation: the classification of the project as a basic training project design, such as Proteus software Keil software teaching platform, single-chip input / output, digital display, etc.; two for the skills training programs, such as single-chip interrupt system, Such as digital voltmeter, electronic password lock, etc.; four for innovative project design, such as GPS real-time positioning information display system design. The specific implementation steps are as follows: organize the team to assign tasks and analyze the respective tasks of the project; learn, consult the relevant knowledge points; use Proteus software to build the circuit Keil software program and simulation; painting PCB board and carved PCB board; physical installation and debugging. We take the alarm generator project as an example:

1. Project tasks

With P1.0 output 1KHz and 500Hz audio signal to drive the speaker, for the alarm signal, requiring 1KHz signal ring 100ms, 500Hz signal 200ms, alternating, P1.7 then control a switch, when the switch close the alarm signal, when Switch off the alarm signal to stop, compile the program.
2. Circuit schematic

3. System board hardware connection
   (1) Connect the P1.0 port in the "Microcontroller System" area to the SPK IN port in the "Audio Amplifier Module" area;
   (2) Connect an 8-ohm or 16-ohm speaker to the SPK OUT port in the "Audio Enlargement Module" area;
   (3) Connect the P1.7 / RD port in the "Microcontroller system" area to the K1 port in the "Four toggle switch" area;

4. Programming content
   500Hz signal cycle is 2ms, the signal level for every 1ms reverse 1, 1KHz signal cycle is 1ms, the signal level changes every 500us 1;

5. Block diagram
6. Assembly source, physical installation and debugging slightly

In this paper, the shortcomings of the application technology teaching process in the past are put forward, and the method of project teaching is put forward. The method of this institute is fully applied and achieved some achievements in the second classroom of Electronic Science and Technology Innovation Association. Nearly three years to obtain the provincial electronic design competition before the three 29 people / time. Practice has proved that the project teaching content is more targeted, can fully integrate the theory and practice of operation, fully mobilize and stimulate students' interest in learning and hard study of the spirit, so that students hands-on ability, innovation, comprehensive use of ability, Team collaboration has been significantly improved, we will continue to explore the process, and strive to improve the quality of teaching.

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