Study on Hardware Courses Teaching Technology of Computer

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Abstract. According to computer hardware course teaching in domestic colleges at present, the main problems in the theory and practice teaching were analyzed. Combined with the current development of local application college and teaching experience, two aspects of theoretical and experimental teaching system were explored. The aim is to improve the quality of hardware course and cultivate talents with innovative and integrated capabilities.

Introduction

Digital Circuits, Microcomputer Theory and Interfacing Technology, SCM Principles and Application, Computer Composition Principle and Embedded Systems are professional basic courses in computers, electronic information and other related specialties. The professional knowledge of these courses is theoretical and feasible applicable. However, because practical aspects of the hardware curriculum are lacking, the theoretical basis of electronic technology of students is poor, the ability of hardware understanding and construction receives restrictions. Students have difficulties in learning the courses, teachers have difficulties in teaching, too. Many schools have explored the teaching methods [1-3].

Theory and practice teaching of the category of hardware curriculum is an important link to ensure and improve the quality of personnel training. The teaching system plays a key role in computer hardware class talent training [4]. Hardware course objective is to make students to understand internal corresponding hardware working principle of computer system, to strengthen the theoretical knowledge and improve the enthusiasm of the students. In order to improve the teaching quality of hardware courses and the students' learning interest, computer hardware courses have a positive reform and exploration. The aim is to allow students to develop the concept of a computer system, enhance computer engineering practical ability, cultivate and practical ability and creative ability. At the same time the teaching platform applies the policy of "enrollment specialty branching". In the face of students of many specialties, how to teach the courses well is a challenge. On this basis, further exploration of reform initiatives on theoretical teaching and experimental teaching is necessary. In this paper, the hardware courses is explored from the theoretical and experimental teaching aspects after the analysis of practical and teaching problems in the university taking the courses of Microcomputer Theory and Interfacing Technology, SCM Principles and Application as examples.

Problem Analysis

The Levels of Students are Different and the Content is Difficult to Choose

In the university's Enrollment, there are students of computers, electronics and mechanical engineering. It is difficult to find a teaching method to adjust all of the students.

Content is Difficultly Understand and Courses Lack Connection

As the microcomputer principle and interface technology, the concept is more, abstract and it covers a wide range. The overall realization of ideas and techniques is often difficult to understand. For example, the microprocessor in the course of Microcomputer Principle and Interface Technology
describes the basic principles and the composition of the inner workings of a microprocessor, which are invisible things. Students are very boring and difficult to understand.

Digital circuits, Microcomputer Theory and Interfacing Technology, SCM Principles and Application, Computer Composition Principle and Embedded Systems are independent and lack appropriate connection. It is difficult to control the entire knowledge system for student.

**Lack of Practical Conditions**

Computer education in many colleges and universities has the phenomenon of "Bully the soft and fear the hard". Due to less investment of software experimental teaching equipment, students tend to success in software design, many schools pay attention to the software and ignore the hardware. Relatively speaking, hardware course teaching implementation is more difficult. Each course need be equipped with specialized implementation boxes or experimental platform. Experimental equipment is expensive and the cost of equipment ranging from tens of thousands to many hundred thousands of. Equipment needs large investment and maintenance is a large amount of work. Due to the existence of these reasons, it makes a lot of Computer Education Institutes pay attention to the software and ignore the hardware. The experimental conditions of the hardware courses are obviously inadequate. Even if there is, most of the experiments are belong to verification type and experiment time is less [5]. Students can not practice and teachers are unable to encourage and stimulate the innovative ability of students.

**Study on Hardware Courses Teaching**

Combined with curriculum reform of our school, computer hardware reform of theoretical and experimental teaching system teaching will be explored from two aspects, and make recommendations.

**Theoretical Teaching Exploration**

**Course Content is Reduced.** For the students of teaching platform of several specialties, it is difficult to have a common teaching material. Therefore, we advocate to reduce the content and retain the key and difficult content. The key and difficult knowledge must be taught clearly. After the students are distributed to various professional, they can go on learning the other knowledge according to the characteristics and needs of the professional.

**Simplify Teaching Content.** Because the knowledge of hardware courses is complex, boring, difficult to understand, students do not pay attention to them and have not interest. Here you can guide students with the story.

In recent years, the robots gradually infiltrate into our daily life. For example, “my Cyborg girlfriend” by South Korea and ”Bollywood robot love” by Indian are famous. Students are familiar with them which can cause students’ interest. In the following, we take the course of microcomputer theory and interfacing technology as example. “Today, I will introduce a new robot friend, it is an important part of our PC. It has many uses, for example, it can help people do a lot of work (Chapter 1 Introduction). What is the most important part of the robot? Yes. It is the brain. Let’s look at his brain (Chapter 2 microprocessor). Then we need to communicate with him, so we need know his language (Chapter 3 instructions and Chapter 4 assembly language program design). Sometimes it is necessary to remember more things, but its memory space is limited. How to solve the problem? (Chapter 5 storage system). Then before we talk about our robot friend how to control peripheral devices, we should first to understand its nervous system (Chapter 6 bus structure).

Interface part of the course is focus on the four main types of chips: parallel interface chips, serial interface chips, interrupt and timer counter c chips, A/D, D/A conversion chips, etc. This causes the interest of students, so that the course is no longer monotonous.

The microcomputer principle and interface technology is divided into two parts: Microcomputer Principle (8086 CPU and assembly language) and Interface Technology (four categories of chip). It
can be integrated into one sentence: we use assembly language to drive CPU to control four major categories of chips. So there is a very clear line for students to learn.

**Flexible Application of Various Information Technologies.** The understanding of curriculum theory can be strengthened with the use of multimedia technology and the network classroom.

With the development of modern teaching technology application and teaching reform, the classrooms are usually equipped with perfect multimedia equipment. Teachers can use multimedia technology to teaching. Through the integrated use of multimedia equipment and multimedia courseware, the obscure and abstract knowledge can be specific, visualization and students are easy to understand. For example, the design of pipeline in computer principle course and be taught through effective animation demo.

MOOC(Massive Open Online Courses), network learning platform, providing free courses on the Internet, provide more students with the possibility of system learning. MOOC curriculum integrates a variety of networking tools and a variety of forms of digital resources. It provide a wide variety of learning tools and rich curriculum resources.

The course of MOOC is easy to use and break through the limitation of the time and space of the traditional courses. Learners can learn from the famous university courses of all over the world rely on the Internet. MOOC has wide range of subject and meet the needs of large-scale courses to learn breaking through the number of traditional courses.

Our school opens network courses which are similar to MOOC in a very long time. There is a person is in charge of each course system and lead the course team to conduct a systematic study, and record the network classroom for students to self-study. At the same time, students can do online self-test. A certain number of judgment and multiple choice questions are selected at each sections of course, including theoretical problem sets and theoretical questions which is for students to self-study test. Students can download the materials through the campus network to preview or review the contents of the lecture.

With the elite lecturer of MOOC and network courses, education deepens students' understanding of knowledge.

**Practical Teaching Exploration**

**Diversity of Experimental Methods.** The first method is to study in the laboratory. The experiments are basic and essential experiments for the understanding of the contents of the textbooks. Through the study of the basic experiment in the laboratory, the students can understand the basic technology and concept radically.

The second method is learning outside the laboratory, including the open laboratory, the second classroom, contest promoting learning and other ways. The open laboratory mainly pays attention to the students' self-promotion after class. For example, you can guide the students after class in the open lab to make electronic works, so that they can deepen the understanding of theoretical knowledge in practice. The laboratory experiments led students to complete the basic experiments, students can make use of the bread board to design a single chip system after class in open laboratory. Open laboratory is not limited time. On one hand, it improves the utilization rate of the laboratory. On the other hand, it provides students with practice places and improves the practical ability of students.

The second classroom refers to the learning, education, and practice of outside of the classroom teaching activities. It is conducive to the students' spare time to develop skills, increase knowledge, develop intelligence, build capacity and improve the practical ability. In terms of its organizational form, the second class is mainly to manage their own education by the students themselves in addition to the relevant departments and the teacher's guidance and help. Students with the same interests and hobbies together to solve the problem, improve the ability to participate in competitions and so on. It has formed the new development pattern of the old help the new. After just a few years of activities, our college has formed many associations, such as a mathematical modeling Association, the Internet Association, the ACM Association, the Internet Association, the animation Association,
network of things Association, etc. The associations hold regular lectures every week, organize the whole school's competition, improve the students' ability of practice and expand the vision.

Professional and technical courses, are very practical courses. Based on the characteristics, teaching always adheres to the practice. That is combining with experiment, extracurricular activities of science and technology and all kinds of competitions necessary. The students in our school have participated in many National Undergraduate Electronic Design Contest and summer training. Students with competition winning can gain credit of a similar course. For example, students win prizes in Qilu Software Design Contest through the JAVA technology. They can gain the credit of Java course. The method greatly arouses the enthusiasm of students to participate in the competition to improve practical ability.

**Experimental Content Systematization.** Our college has carried on the construction of the curriculum group facing the system ability training, including the course of digital circuit, the computer composition principle, the embedded system course. In the design of the teaching plan, we accord to the above order to arrange the courses. A SOC system design is completed through a large experiment across the semester. Such as digital circuit course is the base course of the hardware design. It enables students to deeply understand how the circuit to process information. By experiments, it provides standard ALU, register files and so on for subsequent course of computer composition principle. The course of computer composition principle enables students to in-depth understanding of the CPU and mining CPU performance capability. By experiments, it provides necessary and standard CPU, memory, interrupt, GPIO subsystems and some components for subsequent courses of embedded system course [6]. Through the embedded system, the hardware design of a SOC is completed. The SOC design is finished combined with the subsequent operating system, compiler theory and other courses. The combination of these courses is helpful to the cultivation of students' system ability.

**Conclusion**

There are some common problems in teaching and learning of hardware courses, the impact of the hardware courses teaching effect is influenced by many factors and the theoretical and experiment teaching effect are not ideal. In this paper, some relevant recommendations are proposed combining with our own practical experience. The reform need to be integrated and updated from the teaching content, teaching mode, teaching methods, experimental teaching and so on. The reform will be more efficient and better development and more and more comprehensive talents will be cultivated.

**References**


