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# Research on the Teaching Reform of the Course "Principles and Interface Technology of Microcomputers"

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## Abstract

**The course "Principles and Interface Technology of Microcomputers" has the characteristics and difficulties of multiple teaching contents, dense and obscure knowledge points, large amount of information, and strong practicality. In the specific implementation process, various problems and difficulties will be encountered. This project explores the problems existed in the existing teaching mode, and reflects on teaching methods and means, practical teaching processes, and assessment methods. It summarizes the teaching reform ideas of this course, laying a foundation for improving students' ideological quality, theoretical depth, and practical ability.**

## Keywords

**Teaching methods; Practical teaching; Assessment methods; Teaching reform.**

## 1. Introduction

Microcomputer Principles and Interface Technology is a core professional course required for electronic information majors in higher education institutions. In recent years, with the rapid development of electronic technology and microcomputer technology, new types of microprocessors have been continuously introduced. This course focuses on the Intel 8086 microprocessor and systematically explains the basic components, working principles, assembly language design techniques, and interface technologies of microcomputers from an application perspective. Proficient in the basic methods of assembly language programming, capable of writing interface program software, as well as designing and analyzing hardware interface circuits for memory, input/output interface chips, and microcomputers.

The course "Principles and Interface Technology of Microcomputers" has the characteristics and difficulties of teaching content, dense and obscure knowledge points, large amount of information, and strong practicality. In the specific implementation process, various problems and difficulties will be encountered. This project explores the problems existing in the existing teaching mode, and reflects on teaching methods and means, practical teaching processes, and assessment methods. It summarizes the teaching reform ideas of this course, laying a foundation for improving students' ideological quality, theoretical depth, and practical ability.

## 2. Course characteristics and educational reform construction ideas

In response to the status and role of the course "Principles and Interface Technology of Microcomputers" in IoT related majors, combined with practical teaching work, this paper analyzes and reflects on the reform measures for this course from the aspects of teaching methods and means, practical teaching links, and assessment methods. The proposed teaching reform block diagram for this project is shown in Figure 1.

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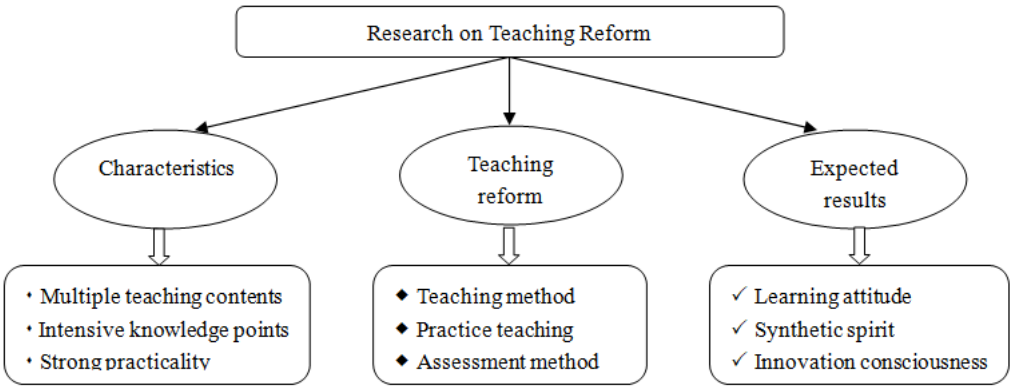


Figure 1 Proposed Teaching Reform Block Diagram

## 3. Measures for Education Reform Construction

### 3.1. Teaching methods and means

The continuous updating of computer technology requires teaching methods and means to be constantly updated and supplemented in order to adapt to the latest technological developments and enable students to better accept and understand knowledge. In terms of curriculum construction teaching methods and means, consider:

(1) Using analogies/metaphors. Especially for some obscure and difficult to understand technologies, there is a greater need for a clear and concise teaching method to make students interested in their concepts in the first place. Only then can it trigger further thinking and analysis among students.

(2) Integrate research ideas into teaching. Technology is constantly changing and updating, and if it is only taught from scratch, the acceptance of students is not high.

(3) Adopting case-based teaching. Many contents in the course can be explained as cases, and the explanation of cases should pay attention to the emphasis on knowledge points and the completeness before and after the cases.

Among them, teaching examples using analogy/metaphor are shown in Table 1.

Table 1 Teaching examples using analogy/metaphor methods

| Knowledge Unit Module | | Analogy/Metaphor Teaching Methods and Means |
|---|---|---|
| Serial Number | Knowledge Unit Name | |
| 1 | The working principle of computers | If we want to make a fish flavored shredded meat and do a mathematical calculation as a computer, we need to first memorize the steps of making fish flavored shredded meat and create a mathematical calculation program in the memory part of the brain, which is called "storage program"; At work, "we humans and a computer" follow the method of making fish flavored and dark silk that was previously memorized in the "memory part of the brain" - step by step, creating a complex calculation program. Step by step, "adding ingredients, setting fire, cooking, stir frying, taking out the pot, adding, subtracting, multiplying, and outputting results" is called "program control". |

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| | | |
|---|---|---|
| 2 | stack | The definition section can be broken down into piles and stacked, encouraging students to engage in associations. When you see piles, you usually associate them with mounds of soil, books, grass, etc., and they all have the characteristic of stacking. Stacks, commonly used in ancient times, were called guesthouses. And the inn is used for accommodating people. If people are associated with goods and rooms become containers, it is easier to understand the meaning of a stack. By combining the stack together, it is easy to understand that the stack is a place where goods are stored through stacking. The principle of stack operation is one of the most important and fundamental principles in microcomputer principles, as it is the fundamental basis for implementing two extremely important functions: subroutine calls and interrupt service programs. |
| 3 | The application of stack in interrupt subroutine calls | Analogy the execution of a processor program to a teacher giving a lecture in class. Normally, the teacher will continue to give lectures, but sometimes the teacher will pause the lecture and do other things, such as drinking water, solving student questions, receiving students outside the classroom, etc. Then the teacher will continue with the previous content. In this example, the teacher is analogized to a processor, and the lecture is analogized to the execution of the main program. Therefore, the teacher pauses the lecture to do other things, which is called the interruption of the teacher's lecture. This is very similar to the concept of interrupts in processors. |
| 4 | Traps and single step execution. | In the classroom, teachers can compare a single execution of a program to a student going from the classroom to the cafeteria after class. Generally speaking, students walk directly from the classroom to the cafeteria, and the result they see is that they appear in the classroom and then in the cafeteria. If we want to know what happened to students on the road, we can set "traps" on their walking paths, so that students will fall into the traps and cannot move. Similarly, if we set the trap flag to the processor, the program will pause; In order for the student to continue moving forward, it is necessary for someone to rescue him from the trap and then continue moving forward. Therefore, the entire process of the student from the classroom to the cafeteria is no longer continuous, but a step-by-step process, called single step forward. Similarly, if the trap flag remains valid in the microcomputer system, the program will always pause after executing one sentence and wait for the user's action before proceeding to the next step, also known as single step program execution. |

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| | | |
|---|---|---|
| 5 | Unified addressing and independent addressing | Analogy the address to a student ID, and compare the memory address and interface address to students from different majors. Assuming there are 146 students in a certain department, including 78 in computer science and 68 in communication. Analogous to two majors with unified student numbers, the student numbers for 146 new students are from l to 146. The analogy of independent addressing is that each major independently assigns student numbers, so the new student numbers for the science class are 1 to 78, and the new student numbers for the communication class are 1 to 68. The advantage of unified numbering is that it is treated uniformly regardless of profession and easy to operate. The advantage of independent numbering is its strong ability to number, and the same number of digits can manage more students. |

### 3.2. Practical teaching process

The courses related to the Internet of Things have the characteristic of emphasizing both theory and practice, so improving students' hands-on ability is very important. From this perspective, the experimental practice section can be divided into a step-by-step content, allowing students to gradually improve their hands-on abilities. For example, it can include cognitive practice, validation experiments, demonstration experiments, and comprehensive design experiments. It can also be extended to activities such as school enterprise cooperation and teaching competition. Enable students to fully experience microcomputer technology and its applications in various industries from different perspectives.

### 3.3. Assessment methods

For example, in the assessment of experimental practical ability, scores can be given in terms of experimental plan design, content completeness, language proficiency in reporting, and PPT design effectiveness. We also try to adopt diversified assessment methods, incorporating ideological and political elements into the assessment and evaluation mechanism, and calculate the final score according to different weights. For example: classroom performance during class, student classroom behavior norms, etc; The implementation of socialist core values and whether students are honest and trustworthy during the assessment process.

## 4. Summary and Outlook

The summary of teaching reform in this course is as follows:

(1) The extensive use of multimedia technology increases the amount of classroom information, enabling students to focus on deepening their understanding of abstract concepts;

(2) Adopting case-based teaching and research-based teaching, encouraging students to solve problems and propose their own ideas through methods such as consulting materials and comparative analysis;

(3) Emphasize the infiltration of research ideas and methods into teaching;

(4) The practical teaching process adopts a step-by-step teaching approach, with increasing difficulty levels;

(5) Adopting different assessment methods to assess different abilities, i.e. setting up diversified assessment methods.

The above aspects have important practical significance for achieving the educational and teaching goals of cultivating morality and nurturing talents.

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