

# Research on Teaching Reform of Operating System Course in Engineering Education Mode

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## Abstract

With the progress and development in the field of automation and IT, teaching operating system will face more new problems, as a traditional computer courses. The teaching of operating system course is discussed in this paper from the perspective of the "operating system" in our school's teaching situation, combining with the characteristics of our students learning and education psychology theory. At the same time the teaching methods guided by the project are put forward, which can improve the students' interest in learning and cultivate the students' comprehensive ability.

**Keywords:** Operating System; Teaching Reform; Project Guidance;  $\mu$ C/OS-II

## 1. Introduction

Operating system is the first layer of the system software for a computer system hardware platform. It also is very important professional foundation course in computer and related speciality. So no matter in the teaching, scientific research and project development OS has a very

important position. With the rapid development of modern science and technology, the embedded operating system has also been increasingly used in automatic control, medical equipment, household appliances and other fields. So the teaching aim of modern operating systems course can not only stay in training the students to understand and master the basic principle of operating system, but pay more attention to cultivate the students' engineering practice ability. It means that the students could follow the new tendency of modern OS and have the ability to develop simple system by using modern teaching methods.

## 2. The status and insufficient of operating system course teaching

### 2.1. The obsolete teaching materials

In the recent ten years, engineering practice of computer operating system develop fast. More and more new development thoughts and basic concepts are created and applied to the current popular operating system products. But at the present most of the materials used in the teaching is just focusing on the basic the-

ory, the analysis and design case of the operating system is less. It is difficult to keep up with the rapid development of computer operating system theory and cutting-edge technology. From the point of teaching, teaching material is a very important factor to influence the teaching content. Teaching material deviating from practice and updated slowly will affect students' learning interest.

## **2.2. The single teaching methods and the lack of teaching means**

The operating system of most universities is often set in the sophomore year next semester. Although the students have finished C Language Programming and Principles of Computer Composition courses, but the first-time contact of operating system definitely will make them puzzled. At the present most of the colleges and universities adopt the teaching method of "force-feeding", which focuses on the teachers' teaching and students' passive listening. The students have few opportunities of independent thinking and practice. Because of the lack of heuristic teaching, cases teaching and group teaching method, the lack of interactive teaching, we ignore the students' subjectivity and dominance.

## **2.3. The theory deviating from practice**

At the present most of the teaching materials have the basic structure of the overview for the operating System and the five components, combined with the analysis of the Unix system<sup>[1]</sup>. Because the main emphasis is theoretical teaching, the students can not understand the relationship between the theoretical teaching and practical use of Windows, Linux OS. There is a far distance from Learning contents to practical application. Thus students lose interest in theoretical content, there is no way to make them understand those classic algorithm in the operating system deeply.

## **3. The exploration in teaching reform of operating system**

Here the project oriented teaching method is built in OS course. In fact, we provide an OS which make the students grasp all classic algorithms in a real operating system. So we should choose a fully functional, dapper and open-source operating system. In numerous open-source operating systems,  $\mu\text{C}/\text{OS}$  is the first choice for many universities teaching and experiment.  $\mu\text{C}/\text{OS}$  have total 5000 lines of code, it not only can let the students check the source code of TCB(like PCB mentioned in course), but also can let the students modify code including task create, task schedule, application program and so on.

### **3.1. Choosing the reasonable teaching material**

A suitable teaching material should be chosen based on students' real situation, that have a very important effect on teaching result. Considering the teaching environment and the actual situation of students in our school, we adopt "computer operating system" (version 3) written by Tang Xiaodan. At the same time the latest research results of the operating system is introduced into the teaching process in order to broaden students' horizons. To further students' understanding of operating systems theory and classical algorithm, "The principle and application of the embedded RTOS  $\mu\text{C}/\text{OS-II}$ " (version 2) written by Ren Zhe is recommended to students as auxiliary material. The supplementary teaching materials using open-source  $\mu\text{C}/\text{OS-II}$  as the core, introduce the implementation details of the task creation, task scheduling and management, the communication between tasks, the memory management, etc. The book takes  $\mu\text{C}/\text{OS-II}$  transplantation as a final goal. The students can modify the core program or classic algorithm which they are interested in, and

design a simple operating system belonged to themselves.

### 3.2. Reform of teaching method

(1) The renewal teaching idea, building guidance teaching

When the teacher impart theoretical knowledge, more vivid examples should be often used to let the students understand the professional vocabulary from the common things in life as much as possible. For example, when telling the differences between program and processes, the main problem is to make the students understand the process is a dynamic process, has a life cycle. The process could be demonstrated as a person: person's birth is like a process is created; a person in the world is like a process in the system by scheduling; a person's death is just like a process is finished. For every person has their own records, and there is PCB for every process. Those examples can make the students understand the concept of process easily instead of learning concept by rote when they are asked.

(2)Cases teaching method

If the students can understand the theory knowledge described in the book, more important is to let them put the abstract theory into a specific project practice, and feel the knowledge in the book is an actual function in operating system. In this process, teachers can adopt case teaching method. According to the course content cases should be designed, and the knowledge is blended in them. Here are some designed experiment content, as shown in table 1.

Table 1

OS chapter	Designed experiment
The second chapter Process Management	① $\mu\text{C}/\text{OS-II}$ task control block and list structure ② $\mu\text{C}/\text{OS-II}$ task create、suspend and terminate

	③ $\mu\text{C}/\text{OS-II}$ using of semaphore
The third chapter CPU schedule	④ $\mu\text{C}/\text{OS-II}$ task ready tables and task schedule ⑤ $\mu\text{C}/\text{OS-II}$ task priority informations
The fourth chapter Memory Management	⑥ $\mu\text{C}/\text{OS-II}$ memory control block and dynamic memory allocation ⑦ $\mu\text{C}/\text{OS-II}$ dynamic memory management
The fifth chapter Device Management	⑧ $\mu\text{C}/\text{OS-II}$ porting on 51 MCU ⑨ Driving programe design of LED digital display
The sixth chapter File Management	⑩ $\mu\text{C}/\text{OS-II}$ system integrated design and project demonstration

(3)The group discussion teaching method

For the algorithms and procedures introduced in the book, we suggest the method of group discussion to make the students actively communicate with each other and solve the problems together. After that, the represent of team should show the understanding of the whole  $\mu\text{C}/\text{OS-II}$  project. The represent also points the deficiencies and the improvement of project. The other students could give their suggestions and solutions of some problems. At last the teacher give comments about the team's job. It can active classroom atmosphere and makes students spark of innovation in thinking.

## 4. The end

The teaching methods guided by the project are the teaching activities by the implementation of a complete project. The purpose of that is to put the theory draw close to the practice in class and cultivate students' ability of using

knowledge to solve practical problems. Through applying  $\mu$ C/OS-II project to class, the students will understand the content of the course deeply in the learning process. They also look up information on project after class. That's better than passively accepting knowledge. The teaching methods guided by the project has important significance to improve the teaching quality of OS course and to

improve students' comprehensive quality.

## 5. References

- [1] Fu Sha, Yang Bo "Research and Discussion on Teaching Reform of Computer Operating System", *Computer Era NO.3*, pp. 32-35, 2010.