

The Comparison of Teaching Achievement Evaluation of Operating System Course

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Abstract. Operating system is the basic program for managing and controlling software and hardware system such as computers. It is the most basic system software that runs directly on the bare metal. Since its birth in the last century, it has been widely used in personal computers, servers, smartphones and other fields playing a vital role in our lives, work, and entertainment. Many universities in different countries offer operating system course, which provides a relatively complete introduction to the key functional modules of operating systems, from the history of operating systems to the implementation of core principles. This paper takes the operating system course of a foreign university as an example, and evaluates the teaching result of the operating system course from the aspects of the basic introduction, student training goals, performance evaluation standards and student feedback improvement measures, etc., analyzing and comparing with the actual teaching situation of this course in China.

Keywords: operating system, achievement evaluation, teaching feedback.

1. Introduction

The operating system is the fundamental course for computer major in higher education. The pilot course relies on C programming language and incorporates data structure, computer composition principles and other contents. It usually involves operating system overview, inter-process communication, exception and interrupt handling, input and output system, file management, and so on[1]. Taking the operating system for computer as an example, it provides the interface definition for user operation with the computer, and is also the interaction medium between the computer hardware system and upper-layer software. Compared with other courses, operating system involves a wider range of knowledge, whose content principles are relatively difficult to understand[2]. It usually adopts the teaching method that combines theory and practice, so that students can verify the theoretical knowledge they have learned by doing experiments while learning theoretical knowledge.

There are relatively small differences in the teaching focus of operating system course in different countries. Chinese and foreign operating system courses are generally arranged in the second semester of undergraduates, focusing on the use of operating systems, process mutual exclusion, IO software and hardware control, memory management[3]. The theory and the number of experimental class hours is relatively similar. The operating system used in the experimental courses is mainly GNU/Linux. The experimental chapters cover basic Linux commands, software package management, user and file system management, etc. It is usually installed inside the virtual machine software and backed up by prepared snapshot status, so that the experimental operating system can be restored to the correct state in time if corrupted by students, ensuring the normal conduct of the operating system course experiments[4].

2. The Comparison of Operating System Course

2.1 Training Goals

The training goals of operating system course in Chinese universities are usually to master the relevant concepts of operating systems, understand the implementation principles of key modules

and functionalities, and conduct corresponding experiments based on theoretical courses, so that students can understand the core principles of typical operating systems and prepare themselves for learning other software and hardware in the future with a solid foundation of knowledge[5]. An analysis of the selected operating system textbooks in some Chinese universities shows that there are currently a large number of textbooks that not only explain the basic knowledge of operating systems required by undergraduate students, but also focus on the training of students for postgraduate examinations. The training goals of different types of teaching materials have advantages and disadvantages for students learning operating system courses. Too much emphasis of postgraduate examination during the undergraduate stage has major disadvantages for this course. Students using such teaching materials are prone to deviating from fundamentals. They may be good at participating in various class examinations and assessments, but lack of understanding of the operating system itself, making it difficult to deal with various problems that arise in the actual production environment after entering the workplace.

However, the training goals of foreign universities are on solid operating system understanding, critical thinking and problem-solving skills, professional research and leadership thinking, self-reflection and summary, etc. For college graduates who have completed operating system course, they should have in-depth understanding and insights into the principles of the operating system itself, and be able to apply the knowledge they have learned to practical projects under the guidance of teachers. Critical thinking and question solving skills enable them to efficiently solve various problems, which is conducive to get comfortable at work environment as soon as possible after graduation, while daily self-thinking includes thinking about the past, the present and the future[6]. On the basis of facts, we should actively discover the potential existing problems and take measures in time to avoid the similar problems in future study and work.

2.2 Evaluation Standards.

There are various differences for the evaluation standards of universities in different countries. The evaluation purposes of a foreign university can be summarized as encouraging learning, fairness and stability, skill demonstration, and unified standards. All evaluation standards must be based on encouraging students to learn this course, and the evaluation details should be fair and impartial with a certain degree of stability in results, and minimize the impact of accidental factors. In the process of teaching effectiveness evaluation, students should fully demonstrate and feedback the theories they have learned, so that teachers can evaluate their knowledge and practical skills based on their comprehensive performance. The evaluation standards should be strictly consistent and have a certain degree of professional authority. The specific score calculation method includes written test accounting for 50%, development practical assignments for 38%, classroom quizzes for 6%, and tutorial course examinations for 6%. If student fails to submit an assignment on time due to personal reasons, the maximum score for a late submission within 1 day will be 75% of the original score, while 2 days it is maximum 50% and 3 days it is 25% of maximum, but there is no longer given grades for this course if the late submission is more than 3 days. Only in special circumstances, such as diagnosis certificate with a doctor's certificate, an exception can be granted, but the prerequisite is that the course instructor needs to be informed before the original deadline of the course. The specific grade levels are divided into FNS, F, P, C, D, HD, etc., where FNS stands for Fail No Submission indicating that the homework has not been submitted and the grade for this course is none, F means it has failed if the grade range is between 1-49 points, P means that it has basically passed whose score range is between 50-64 points, C means credit with the score range between 65-74 points, D is for Distinction for the score range between 75-84 points, and HD indicates High Distinction, which is for students whose score is higher than 85 but lower than 100 points.

Chinese universities usually evaluate students learning results of this course by combining theoretical and experimental scores[7]. The theoretical scores are divided into two parts, which consists of daily homework and final examination papers. The experimental scores are the average

of multiple experimental scores of the operating system course. The final grade of the student's course is finally calculated according to a certain proportion. The proportion of each aspect in the final grade is flexible. It is usually determined by the teacher of this course. There is a lack of unified evaluation standards, and the evaluation relevance between different majors and schools is weak. The performance evaluation components of university courses usually include multiple factors such as attendance, homework, and class performance. Attendance usually accounts for a part of the daily grades. Teachers record student attendance through random roll call in class, electronic roll call or classroom camera inspection. Specific standards for attendance may include absence, lateness, early departure, etc. Besides, homework is an important part of evaluating daily academic performance. It reflects the student mastery of the course content and their learning attitude. Assignments may take the form of written assignments, lab reports, and classroom performance includes students' active participation in class, such as answering questions, participating in discussions, etc. The grading standards for this part are evaluated by the classroom teachers based on the actual performance of the students. In addition, it may also include other assessment items such as mid-term exams, practical teaching, special discussions, study notes, etc. The weights of these items will be determined by the classroom teacher based on the nature and requirements of the course. In general, the daily course performance assessment of college students is a comprehensive evaluation system designed to comprehensively examine students' learning processes and learning outcomes. Students should pay attention to every assessment link to ensure that they can achieve satisfactory results in the end. The following is another detailed example showing the performance evaluation methods of Chinese universities[8]. Daily grades are mainly evaluated based on student performance, homework completion, group discussion contribution, and experimental reports, which generally account for 20%-40%. The midterm exam is a test in the middle of the semester, which may include written exams, coding and practical operations, accounting for approximately 20%-30%. The final examination is a comprehensive assessment of the learning effectiveness of the entire semester. It is often based on closed-book written examinations, although sometimes open-book examinations are allowed as well, with code writing or other forms of assessment. The final examination usually accounts for the highest proportion, reaching between 40%-60%. In addition, some universities may use project works, or competition awards as supplementary evaluation criteria for performance, which has an influence on the final result. During the specific implementation process, each university and even each teacher may set different assessment rules based on their own teaching characteristics and course requirements. In order to ensure the fairness and accuracy of performance evaluation, Chinese universities are encouraged to implement strict examination supervision systems and scoring standards. At the same time, student performance is not only used to measure academic level, but is also related to important aspects such as scholarships and employment recommendations. Therefore, students and teachers attach great importance to the process and results of performance evaluation.

2.3 Student Feedback

Collecting student feedback and suggestions is an important method to evaluate the teaching effect of this course. Efforts should be made to achieve the three principles of objective evaluation, comprehensive and consistent evaluation, and clear guidance. There is little difference between universities in China and abroad on handling student feedback and suggestions, which are generally conducted in the form of voluntary anonymous questionnaires. Students should be aware of the importance of feedback on reflecting teaching results before giving feedback and suggestions[9]. After receiving the feedback for improvement suggestions, the academic affairs department will be responsible for analyzing and summarizing feedback analysis, and finally propose corresponding improvement measures based on the specific aspect of student feedback. The basic evaluation policy is that universities themselves carry out student satisfaction and participation evaluation activities, where all students participating in this course are free to choose whether to submit feedback suggestions. Corresponding improvement measures and methods are then obtained. For

teachers teaching this course, they are completely qualified to view and obtain the feedback submitted by students in this course, and make improvements to the inappropriate aspects of the existing course design in time. It is worth noting that since student evaluations are highly subjective, feedback suggestions that lack basis should be removed to avoid deviations in the direction of teaching management of this course due to individual reasons, or it may affect the realization of educational goals and the improvement of teaching quality. Therefore, student feedback and suggestions make it possible for teachers to understand various problems encountered by students during the actual learning. However, the executive department's evaluation of this course and teachers' professional capabilities should not rely too much on student feedback and suggestions, but should be based on comprehensive, integrated and professional analysis.

3. Achievement Analysis

The purpose of performing achievement analysis is significant in various aspects, where the most fundamental one is to ensure students to master the core theory of operating system. Other than the basic understanding, it is also important to make sure they can adapt to further technological development without severe problems. As for the teaching improvements, by analyzing the overall achievement results, teacher has better understanding of students learning process, adjusting the teaching goals and materials in time. Moreover, Analysis can reveal whether the course goal have been achieved or not achieved, thereby guiding teachers to make adjustments in future course outline[10]. This includes adding practical links, adjusting theoretical teaching content, or introducing new teaching technologies and methods. Usually a detailed achievement analysis contains every single one of the teaching chapters based on the teaching outline, and in each chapter there are judgement whether it is fulfilled or not, judging standards, existing problems, and the corresponding solutions.

For example, system call can be important in operating system course, to create achievement analysis for this chapter, the goal contains several aspects such as current running status, status conversion, returning principle, and embedded calls. There are two selections for judgement fulfillment, which is either complete or not complete. Judgement standard is mostly depending on daily evaluation including attendance, class performance, homework submission and the corresponding experiment result. In the final exam paper, this chapter is examined with fill-in-blank questions, program comprehension questions and coding questions, while multiple choice questions, however, take less importance. The overall result can be an important way to analyze the teaching achievement in this chapter of operating system course. With the outcome result, the next step is to find out existing problems while learning this chapter. Judging from the class performance, it is sort of relevant that the students with higher college entrance examination scores are more likely to have better understanding of system call theory, while those who have less experience of technology in high school, there is more efforts needed taken to master the way how system call works. Besides, some students with poor learning initiative find some difficulty in finishing class assignment independently and rely more on other students achievements. As a consequence of above behavior, students with less initiative of this course are also the ones with less class preparations in advance but start coding directly, causing the fact that during the experiment class, there are relatively limited amount of experiments that can be performed during class. After class, however, there is not sufficient conditions to perform experiments by themselves, leading to the poor course achievement of students. The last part of teaching achievement analysis is the improvement proposed by the teacher of this course. To solve the above problems, teacher is suggested enhancing the exercise class assignment, paying more attention to the assignment result, selecting the students with weak understanding of system call for a better after-class teaching. Moreover, it might be better if teacher works more on improving students learning initiative to make students themselves learn instead of depending on the teacher class teaching completely. For those who always rely on other students assignment, there should be specific principles to prevent

this from happening while for those who finished assignment and experiment themselves, they are supposed to be encouraged for their independent effort of making achievement.

4. Summary

This paper compares the teaching result evaluation of operating system course in universities from different countries and notices that the knowledge of operating system courses in various universities are relatively similar, but there are obvious differences in training goals and evaluation standards. By analyzing the operating system training goals of foreign universities, it can be concluded that foreign universities pay more attention to the cultivation of problem-solving abilities and leadership thinking. Based on the actual situation of our students, we may strengthen the cultivation of students' good subject thinking patterns, strong patriotism and other aspects. Establishing a complete subject thinking model is of great help to improve students' logical thinking level, where students see the essence through phenomena and use a combination of reasoning and analysis to improve their professional abilities in future work. At the same time, strengthening the cultivation of patriotism of students in operating system course can enhance the sense of national identity. In this course, teacher introduces the development history of Chinese operating systems so that students can receive patriotic education while understanding theoretical knowledge[11]. By organizing students to discuss in groups and express their thoughts, they can learn professional knowledge of operating system course, while keeping patriotism in mind and realizing the value of life.

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