

Practice and Research on Blended Teaching Mode of Computer Operating System Course

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Abstract: Since MOOC initiated the era of distance digital education, the blended teaching mode has attracted wide attention from the society. The course of computer operating system is one of the most difficult courses to teach and learn in computer major because of its many contents, wide coverage, abstract concepts and difficulty to understand. In order to effectively mobilize the enthusiasm and initiative of students in learning the course, this paper designs a suitable online and offline blended teaching mode from the perspectives of teaching concept, teaching content, teaching methods and blended teaching platform construction, so as to improve the efficiency of teaching and learning of operating system course.

Keywords: Blended teaching mode, Computer operating system, Teaching platform construction, Curriculum ideology and politics, Assessment criteria.

1. Introduction

The course of computer operating system is one of major courses of computer science and technology, with a total of 64 class hours and 4 credits. It is the foundation for understanding the basic concepts and implementation principles of cognitive operating systems, as well as the design methods and implementation techniques of operating systems. It is also a course that emphasizes both theoretical and practical aspects.

Although the traditional offline teaching mode has integrated multiple elements such as multimedia, the teaching resources are relatively single and the teaching mode is rigid, making it difficult to expand and explore the breadth and depth of course content; Relying solely on online teaching can easily lead to a lack of face-to-face communication opportunities and difficulty in evaluating learning outcomes. The blended teaching mode is a breakthrough in traditional teaching mode, guided by constructivist learning theory and utilizing modern information technology means to develop, integrate, and utilize diverse teaching resources, deeply integrating traditional offline classroom teaching content with online teaching implementation [1][2]. By blend teaching mode, we can leverage the advantages of both and improve the quality of teaching. To implement a blended teaching model, the following issues need to be considered:

(1) Build rich and high-quality computer operating system course resources, including course introduction, introduction of responsible person team, course announcement, syllabus, teaching calendar, teaching plan or presentation, guidance on key and difficult points, online homework, online test, teaching materials, reference materials and course teaching videos;

(2) Realize process assessment and thematic assessment in the blended teaching platform, and support the continuous improvement mechanism of teaching effect. Through a reasonable and effective feedback mechanism, teachers can obtain the degree of achievement of students, so as to reflect on teaching activities and continuously improve teaching methods;

(3) Explore the methods of ideological and political education under different teaching contents and teaching

modes in online and offline teaching, so that the ideological and political teaching in the two ways complement each other.

In order to effectively mobilize students' enthusiasm and initiative in learning the course, we have comprehensively design blended teaching mode to reform the teaching mode of the course, dividing it into a blended teaching mode that combines online and offline teaching.

2. Design of Blended Teaching Mode

The implementation of the online and offline blended course construction for computer operating system courses includes four parts: teaching concepts, teaching content, teaching methods, and the construction of a blended teaching platform.

2.1. Teaching Concept

Teachers not only need to improve their educational and teaching abilities in theoretical knowledge of the curriculum, but also in ideological and political education. They also require the integration of professional knowledge with ideological and political education, as well as emotional education of national sentiment, in the teaching process.

2.2. Teaching Content

In theoretical teaching, conduct in-depth analysis of the theoretical knowledge of the course, sort it out in a "horizontal and vertical intersection" mode, and establish a clear framework for the content of the operating system course. Organize teaching content vertically based on the course knowledge system, forming a knowledge system centered on process management and centered on resource scheduling to form the course; Horizontally, expand the teaching content with knowledge points as clues, emphasizing both foundational and cutting-edge aspects, adding directions and dynamic introductions to the forefront of domestic operating systems, integrating the latest scientific research achievements such as cloud computing and artificial intelligence, and expanding knowledge. At the same time, attention should be paid to the correlation with the curriculum system of computer science, helping students form a knowledge system of "single program ->computer global ->network structure ->distributed structure".

On the basis of theoretical teaching, practical teaching aims to cultivate students' abilities at the four levels of cognition, analysis, system, and innovation. The following experiments are designed:

(1) Validation experiment: Observing phenomena in the operating system and mastering the rules within them. Including: operating system startup, process creation, thread creation, process communication, and other experiments;

(2) Improvement experiment: Analyze the shortcomings of existing algorithms and make corrections and improvements. Including experiments on process synchronization and mutual exclusion, time slice rotation algorithm, memory management, etc;

(3) Innovative experiment: Complete the whole functional modules, encourage features and innovation. Including experiments on process managers and resource managers.

2.3. Teaching Methods Design

Table 1 provides course content and class hour allocation in blended teaching mode. We divide the key knowledge structure of computer operating system chapters into: concept memory category, abstract understanding category, application practice category, and comprehensive innovation category. Different teaching contents adopt different teaching modes:

(1) Conceptual memory category: Using online guidance methods. Based on online teaching resources, self-study through micro videos, multimedia courseware, and textbooks;

(2) Abstract understanding category: Classroom intensive lectures are the main focus. Learn online through micro videos and course courseware, and comprehensively use methods such as analogy, case study, inspiration, charts, disproof, and comparison in course teaching. Analogy can use specific knowledge that is close to life to help understand process concepts and relationships between processes; Case method can integrate critical areas and critical resources into practical examples; The heuristic method can help students actively think and discover the essence of inter process

relationships; The chart method can present the process of program execution in detail; The method of counter evidence is used to understand the consequences of using P, V primitives and semaphores incorrectly; The comparative method allows users to grasp the correlation and differences between different process relationships.

(3) Applied practice category: mainly focused on online practice. Learn and understand online through micro videos; Cooperate with experimental practice to explain and teach.

(4) Comprehensive innovation category: combining online and offline. Adopting flipped classrooms and setting up special topics for discussion and learning; Collaborate with multiple stages such as course design and innovation plan training.

2.4. Blended Teaching Platform Construction

Building rich and high-quality online learning resources to achieve the construction goals, the implementation methods are as follows:

(1) Build rich and high-quality online teaching resources to achieve effective extension of teaching venues. By utilizing MOOC platforms and others, we will transition the traditional teacher centered approach to a teaching model that combines pre class guidance, in class intensive learning, and post class extension. The teacher assigns videos of the course content and the issues to be discussed in class to the students in advance. The students preview and learn the course content in advance, master basic knowledge and easily understandable content, and complete their homework. Teachers have more time in the classroom to explain the difficulties and key points of the course to them. The students ask questions in the classroom with the questions and doubts they encountered in the previous online learning, and the teacher answers the students' questions and doubts. At the same time, the latest progress of domestic and foreign operating systems, typical cases of domestic and foreign universities, and open source operating system experimental resources will be added to expand the breadth and depth of course content.

Table 1. Course Content and Class Hour Allocation

Chapter	Class hours	Teaching content	Teaching Mode
1. Introduction	3	Functions, features and structure of the operating system	Classroom Teaching
	1	Development of Domestic Operating System Application of Artificial Intelligence in Operating System	Online learning
2. Process management	12	Basic concept of process, state transition of process, process synchronization mechanism, PV operation Thread management	Classroom Teaching
	3	Classical process synchronization problem Process and Thread Management in OpenHarmonyOS	Online learning
3. Processor management	8	Basic concept of scheduling, scheduling queue model, process scheduling algorithm, real-time system scheduling Basic concept of deadlock, deadlock prevention, deadlock avoidance, deadlock detection and recovery	Classroom Teaching
	2	A Processor Scheduling Algorithm for Real-Time System Multiprocessor scheduling algorithm	Online learning
4. Memory Management	6	Program loading and connection, partition management method, page management method, and segment management method Virtual storage	Classroom Teaching
	2	Memory Management in OpenHarmonyOS	Online learning
5. Document management	4	File concept, file structure, file storage space management, file directory, file sharing and protection	Classroom Teaching
	1	File type, file allocation table in OpenHarmonyOS	Online learning
6. Equipment management	4	I/O system architecture, buffering, device allocation, Disk management method	Classroom Teaching
	2	I/O control mode	Online learning

(2) Introducing online discussions, learning the latest scientific research literature, and innovative experiments, using students' online learning situation as an important source of process evaluation, forming a process assessment, including assessment of basic indicators such as learning attitude, homework, research results, and classroom tests; And thematic assessments, including assessments of high-level indicators such as comprehensive design practice projects, literature research demonstration projects, and cutting-edge innovative projects [6]. Table 2 provides proportion of assessment methods in blended teaching mode.

(3) Implement ideological and political education in courses suitable for blended learning. Adhering to the teaching principle of "moistening things silently" in the teaching process, the computer operating system knowledge is organically combined with ideological and political education in a subtle and subtle manner. Deeply exploring the elements of ideological and political education in computer operating systems and implementing detailed courses is the starting point for ideological and political education. Firstly,

it is necessary to combine the real-time social hot issues that students are concerned about, clarify the principles from the perspective of computer software majors, and enhance students' value judgment and rational thinking; The second is to start with important issues that have been overlooked by students and clarify their value and significance through professional interpretation; The third is to solve students' confusion in learning from the perspective of computer software majors and stimulate their enthusiasm for learning. E.g, important knowledge points such as the characteristics of concurrency systems, mutual exclusion of processes, the concept of deadlocks, and avoidance will be integrated into the teaching process of scientific ideological and political concepts and craftsman spirit. Through online case teaching, such as an introduction to the development of OpenRuler and OpenHarmonyOS, and the use of videos and other materials to organically integrate patriotic sentiments and professional qualities into ideological and political content, online teaching has become an important venue for ideological and political education.

Table 2.

Serial number	Review type	Proportion of achievement(%)	Explain
1	Online academic performance	5	Homework
		5	Frontier literature learning
		5	Thematic discussion
2	Offline usual results	5	Classroom interaction
3	Computer practice	12	Engineering realization capability
		8	Experimental report writing
4	Written examination results	60	The final exam

3. Conclusion

Blended teaching mode has changed the time and space constraints of classroom teaching under the traditional teaching mode, combining online and offline resources, and giving full play to students' subjective initiative, which has become one of the research hotspots in the current teaching reform of colleges and universities. Taking the course construction of "Computer Operating System" as an example, this paper designs the teaching concept, teaching content, teaching methods and blended teaching platform construction in the blended teaching mode, which provides a good theoretical guidance and construction ideas for future teaching practice.

Acknowledgment

Supported by funding for undergraduate education reform and research projects at China University of Mining and Technology (Beijing), Project No. J22ZD11.

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