

Research and Application of Mixed Teaching Mode in C Language Course

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Abstract: The current situation of “C language programming” course in our school is characterized by wide teaching scope, more students in class, heavy teaching tasks and so on. In recent years, the curriculum reconstruction and teaching reform have been carried out in the aspects of teaching mode, platform selection, resource utilization and feasibility. The research results in the “C language programming” course have been adjusted and improved, and then applied to teaching. The application results show that the mixed teaching approach based on independent SPOC, which integrates online and offline platforms and multiple teaching methods, can achieve great teaching effect. The new teaching mode fully integrates the advantages of different platforms. It not only guarantees the teaching effect in such a special period, but also provides novel ideas and ways for the future teaching reform.

Keywords: Mixed Teaching Approach; Independent SPOC; Teaching Mode; C Language Programming.

1. Introduction

In the past 20 years of higher education curriculum construction, there have been processes such as new century online courses, quality courses, video open courses, resource sharing courses, online open courses, virtual simulation experimental teaching, and first-class undergraduate courses. Among them, the "Opinions of the Ministry of Education on Strengthening the Construction, Application, and Management of Online Open Courses in Higher Education"[1] and the "Implementation Opinions on the Construction of First-Class Undergraduate Courses"[2] issued by the Ministry of Education have highlighted the modern education concept of student-centeredness, combined with information technology to reshape the curriculum structure, and improve the teaching quality by improving the teaching content and methods, and realize the open and sharing of high-quality course teaching on the Internet through the integration of teaching services and course platform services. Different online teaching models such as the "Bay Area Model,"[3] "Precision Online Teaching + Home Learning Model,"[4] and "One Body and Three Wings" ideological and political online teaching models [5] have been proposed. Based on the guiding ideology of the Ministry of Education, our school has applied the online and offline mixed teaching mode and the concept of "Internet + Education" to the "C Language Programming" course, and carried out course innovation and teaching reform, applying the advantages of distance teaching in teaching practice during the special period when students cannot start school normally, and implementing the teaching guidance of the Ministry of Education. [6]

2. Background of Mixed Teaching Construction

"C Language Programming" is a compulsory general education course for non-computer majors in our school, with a large number of students and a wide range of professional involvement. However, due to the uneven levels of students, it leads to a large amount of teaching work and heavy tasks

for teachers. In view of the problems existing in teaching, the team of teachers has carried out teaching research, course construction, and teaching reform, aiming to improve the teaching quality and teaching effectiveness.

Existing research data shows that online teaching has the problem of insufficient scientificity and applicability of teaching plans [7]. Therefore, in the setting of teaching plans, we have adopted a mixed teaching form that integrates online and offline, multiple teaching methods and modes. The main teaching methods include: creating independent SPOC courses on the Chinese University MOOC; recording micro-video courseware; live teaching through Rain Classroom (Chaoxing Learning, Huawei Cloud Live, etc.); using online platforms to publish assignments and tests; using online discussion forums, WeChat groups, QQ groups, and other communication tools for Q&A; and synchronously conducting online and offline computer practice.

With the emergence of MOOC, SPOC, Micro-Courses, and Flipped-Classrooms, their characteristics and advantages have been borrowed and widely used in traditional classroom teaching. However, different courses have different characteristics, and different modes also have their shortcomings in teaching implementation. Although MOOC can provide learning anytime and anywhere, its non-differentiated teaching is not convenient for individualized teaching, and its teaching form is not suitable for courses with strong practicality. Micro-Courses are student-centered, with short class hours and lack of interaction between teachers and students. Flipped-Classrooms are conducive to students' independent learning and can effectively solve the problem of insufficient class hours, but cannot guarantee learning effectiveness.

In view of the characteristics of the "C Language Programming" course, combined with the characteristics of different online and offline teaching modes, we have fully explored and integrated the advantages of traditional classroom teaching in the use of online teaching resource platforms, and formulated a teaching plan that includes PPT courseware, electronic textbooks and learning guides, SPOC courses, online video courseware, live teaching, online Q&A,

and offline practice.

3. Implementation of Mixed Teaching

(1) Setting of Teaching Links

"C Language Programming" is the first advanced language programming course that students come into contact with. In the design of the teaching plan, we strive to apply the characteristics of different teaching modes to different aspects of the course. For example, in order to avoid excessive theory and boredom, we use the method of knowledge point disassembly in the recording of micro-video courseware, and record each knowledge point as a micro-video, with flexible video duration, which can be long or short, but generally not more than 15 minutes, to ensure that students can complete the learning of a video each time, and improve learning enthusiasm.

When planning online and offline teaching plans and teaching programs, we have designed differentiated teaching emphasis, learning content, and learning effect tracking for pre-class, in-class, and post-class, to ensure the smooth progress of teaching.

(2) Establishment of SPOC Courses

The establishment of SPOC courses requires the preparation of a large number of teaching resources in advance, such as recording micro-video courseware, making corresponding PPT courseware, homeworks, test questions, and the design of the overall framework structure, etc.

Students can join the course by authenticating their student identity through PC, mobile client (MOOC APP), etc., and learn the full video teaching content of the C language course, download the course PPT and other related materials anytime and anywhere. In order to ensure the efficiency and concentration of students' learning, a in-class test is set up during each video playback process, and students can continue to watch the video only after answering the questions. When each video courseware is released, the learning requirements of this part are specified, so that students can learn with a clear aim.

(3) Online and Offline Classroom Teaching Methods

According to the teaching outline, we use online weekly regular or pre-released video teaching materials, assign homework and organize online discussions. Students watch videos, have knowledge discussions, take tests, and complete assignments according to the guidance and time points.

At the scheduled time, the teacher conducts live classroom teaching and answers common questions. In the class, the teacher arranges questions for important knowledge points and answers the questions, while other students can supplement in the discussion area. This method not only highlights the key points in teaching, but also helps to solve difficulties, and also enlivens the classroom atmosphere, giving students a feeling of being in a traditional classroom.

In the teaching process, we have broken through the single form of "teacher lecturing and students listening" in live teaching, and used a variety of teaching methods and techniques, integrating the advantages of online teaching mode and taking into account the characteristics of traditional classrooms, giving full play to the role of online teaching platforms, and also being able to reasonably grasp the teaching rhythm and teaching effect.

(4) Online and Offline Q&A and Exercises

After the end of each chapter's video course learning in the SPOC course, corresponding unit tests and unit assignments are arranged to reflect the key and difficult points of each

chapter in the form of exercises.

The teacher checks the homework submission and completion status of each student through the background database, observes the video learning progress of each student, and the objective questions are automatically scored by the system, while the subjective questions are evaluated by students or teachers. This way, the students' daily grades are recorded fairly and objectively. Through online discussion areas, WeChat groups, QQ groups, and other channels, students can discuss and answer questions. In many cases, there are many questions in the discussion area and WeChat group that do not need the teacher's participation, and the students can solve them through mutual discussion. This method not only helps to stimulate students' enthusiasm for learning, but also helps to establish a mutual assistance relationship among students.

(5) Online and Offline Practical Teaching

In the process of remote teaching, in order to prevent the separation of theory and practice in online teaching, we take advantage of the strong practicality of the SPOC course in "C language programming" and adopt the teaching form of "online teaching, offline experiments". Through the teaching content and quizzes in the online course, as well as the chapter assignments, students can master the basic knowledge of C language. Then, through the method of assigning offline experimental content, students can personally experience the whole process of writing C language programs.

Through offline experiments, students become familiar with the use of C language compilation environment, and in the process of editing, compiling, and debugging, they continuously modify and improve the program, which better consolidates the classroom content. After completing the experiment, students need to submit an experimental report and exchange their experimental experience. The teacher can understand the problems that students have in programming through correcting the experimental report, and analyze them in the class to help students eliminate every knowledge blind spot, and provide a guarantee for the learning of the follow-up content of the course.

4. Summary

The "online classroom teaching + offline practical teaching + multi-platform Q&A and discussion" model is feasible and can fully guarantee teaching effectiveness.

However, there is still a need to supplement, improve, and perfect the online/offline mixed course teaching project currently under construction, such as how to urge a small number of students with poorer self-discipline to learn.

At the same time, under the condition of fully utilizing the advantages of online teaching, it is necessary to better integrate the advantages of traditional classroom teaching by means of information technology and methods to make the online and offline teaching models better serve teaching practice.

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