

Discussion on the Application of the Flipped Classroom Mode in the Program Design Course in Colleges and Universities

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Abstract. This paper firstly analyzes the characteristics of the program design course of computer speciality in Chinese colleges and universities and some problems existing in the current teaching mode of colleges and universities. Then this paper puts forward the application of the flipped classroom to the teaching of the program design course, and expounds the implementation link, which greatly improves the classroom teaching efficiency and effectiveness, promotes the students' learning initiative, maximizes the role of the teacher, helps students to form professional comprehensive quality and ability and meets the needs of the society for computer software development talents.

Features of Program Design Courses

The training goal of the undergraduate computer major in our university is to enable students to master the basic theories, basic methods and skills of computer software and hardware, and to engage in the maintenance and application of simple software and hardware of computers. The program design is the core of the software part, and this kind of course occupies an important position in the basic teaching of computer speciality in colleges and universities. From machine language, assembly language to advanced language programming, each has its own features and strengths. From the perspective of the talent training, they have common requirements for students. It is required that students should master the grammar rules, methods, ideas and programming thinking of some programming language, and cooperate with database, network and other technologies to achieve the application of some automatic functional software. From above, it is not difficult to see that this kind of curriculum is closely related to reality, and it is necessary for students to actively participate in it and do it in person. Therefore, the suitable teaching mode and the scientific teaching method are beneficial to the program design curriculum.

The Current Teaching Mode in Colleges and Universities

There are similar problems in the teaching mode of the program design courses in the computer major education of most colleges and universities in China.

Backwardness of Teaching Methods

The teaching method commonly used in the program design courses of ordinary universities is the form of the teaching of the teachers and the students' experiment on the computer. Students' computer experiments can only test and verify simple examples on book. They are not real development experiments, nor are they really able to exercise students' ability to analyze and solve problems.

The general planned teaching hours in colleges and universities are less, which directly leads to the lack of theory and practice hours in the actual teaching. Teachers can only imbue the students with most basic theoretical knowledge, and the students can only passively acquire knowledge and

operate computers based on the weak theory. In this way, the teaching effect can be imagined, and the teaching goal is difficult to realize.

Teaching is out of Practice

The current program design courses often use short program segments for example, which facilitates students' understanding, but are divorced from the reality of software development.

In actual work, a complete program system needs a certain scale of code to implement. Usually, a software development project is divided into several modules, which are written by different people, and the structure of each module is composed of multiple code files. Programmers should complete their code parts smoothly and seamlessly connect with the code modules of other people on the team. To do this, students have to repeat the training of large code. If students only contact the short program examples during the learning phase, they will struggle to cope with the complexity of the future work.

In addition, the short program teaching is difficult to reflect the importance of standardized wiring code, and the technical documentation supporting the software development is also a very important part in programming. These students do not have standard code writing habits. Although the written code is able to execute correctly, it has poor readability, so the software maintainers and developers are not easy to understand the code, which will hinder the subsequent work.

Lack of Student Interest and Enthusiasm

The course features of the program design doom the boring learning process. And the large indoctrination by teachers in the classroom lets students have less time and energy to carefully digest the contents of the class. On the basis of the lack of macroscopic understanding of computers, students' doubts gradually accumulate along with the progress of courses, and they gradually lose their enthusiasm for continuing to explore and study. Obviously, this is not conducive to the implementation of teaching and the realization of the teaching effect.

The Application of the Flipped Classroom in Program Design Courses

From the analysis of the problems existing in the current teaching mode of programming course in universities, it can be seen that the traditional way is not suitable for effective teaching implementation of the courses and the characteristics of the courses. In order to solve the problem and improve the teaching effect, the new teaching mode of the flipped classroom is applied to the teaching of the program design course.

Flipped Classroom Mode

The flipped classroom reconstructs the traditional learning process of the "information transfer" in class and the "absorption and internalization" after class. The "information transfer" is carried out by the students before class, and the teacher provides teaching video and online tutoring. The "absorption and internalization" is accomplished through interaction in the classroom. Teachers can understand students' learning difficulties in advance and give effective tutoring in class, and the interaction between students is more helpful to promote the absorption and internalization of students' knowledge.

The Application Design of the "Flipped classroom" Teaching

The design of the teaching plan, teaching process, classroom experiments, classroom discussion directions, task settings, micro video scripts and other links of the "flipped classroom" is the key to the application of the innovative teaching mode.

The basic premise of "flipping" is the setting of the micro video. According to the syllabus of program design courses and the corresponding knowledge system, the knowledge structure is split, the single point of knowledge is taken as the unit to design the video script, the network system between relevant knowledge points is constructed, and the teaching cloud platform is used to realize the systematization and networking of "fragments", such as micro course and micro video. On this

basis, the recording of micro video is achieved, and the network video resource is integrated to form the video database of flipped classroom teaching, which provide the resource guarantee for students' independent study before class.

The "flipped classroom" mode must be combined with the corresponding teaching methods and means in the classroom, so that it can really play a good role. On the basis of the learning feedback before the class, the teacher designs the method and application of the class to help the internalization of the students' knowledge and the improvement of their ability.

The Implementation of Teaching Activities

This part depends on student's autonomous participation and teacher's full cooperation, and can produce positive and negative feedback to the early teaching application design, which is mainly divided into three stages.

(1) Pre-class learning

In the course of the pre-class learning, teachers integrate the network data, record micro videos and upload them to cloud platform, and arrange the study subjects and contents before class of students based on the teaching cloud platform one week in advance. The students independently arrange their own learning progress before the deadline according to their own situation. This realizes the individualized learning of the students, and the students question the teachers through the feedback mechanism of the platform. Teachers should answer the questions online before the class, and determine the corresponding forms and methods of the classroom teaching according to the students' learning situation fed back from the cloud platform.

(2) Classroom teaching

According to the characteristics of program design courses, in the course of classroom teaching of the flipped classroom, teachers need to apply different teaching methods accordingly to help students consolidate their knowledge before class. In view of different "knowledge points", teachers design different types of curriculum resources, such as task based learning, case based learning, and situated learning. Different roles are set according to different teaching objectives, such as concept teaching, knowledge learning, problem solving, difficult problem exploration, after-class exercises and so on. And also according to the learning content and students' learning situations, teachers use different teaching methods, such as problem based learning, team based learning, strengthening research-based learning, "sandwich" teaching method and so on.

The teaching of program design courses can be divided into three stages according to the depth of knowledge, and the suitable classroom teaching method is used.

The first stage is the introduction of the foundation of the program design. At this stage, students have a preliminary contact with the program design. They are mainly familiar with the basic theories of programming environment and language grammar. In the classroom, teachers' guiding, and group discussion and communication of students are adopted to consolidate the knowledge points before class and integrate them. Or, teachers can make analysis, demonstration and debugging of programming cases to help students understand theoretical knowledge in practical cases.

The second stage is the familiar stage of programming. Through the first stage of learning, students already have a certain basis for the design of the program. At this stage, the teacher answers questions in class, and designs problems in view of the difficulties in pre-class learning and explain them. Or the teacher asks the students to do the experiment in the lab and asks the students to carry out the design and complied executing of the code alone, and meanwhile, the teacher assists to explain questions. At the end of this classroom teaching, the teacher announces the standard code and explains the code meaning properly, and compiles and displays the results of the code execution. In this process, teachers need to ask students to refer to the standard code and develop good programming habits. This stage can continue until all the teaching materials are taught.

The third stage is the stage of programming practice. It takes the form of grouping tasks. Firstly, teachers arrange a software design task, such as requiring students to write a software similar to Microsoft calculator, which explicitly requires the basic functions of software, and requires codes to

be standardized, beautiful and practical. In the class, the students are divided into groups according to their will, and the number of each group is determined according to the complexity of the specific task. In order to connect with actual software development, the member roles of each group can be set up with reference to the standard organization structure of the software development project. They are PM(project manager), TL(team leader) and DE(development engineer). The teacher acts as a PM, responsible for the plan of each unit program design task, the workload prediction, the assignment of tasks, and so on. The person in charge of each group acts as the TL of the group, responsible for a team's management task and led by PM. Members of the group (including the person in charge) act as DE, responsible for specific design, coding, testing, and they are led by TL.

The time of tasks can be calculated according to weeks. Each group takes turns to display the staged software results according to their progress in class, and introduces their creativity and basic functions and key codes. In the course of the student's demonstration, the teacher asks questions or comments properly, and marks the student's presentation as part of the final grade.

In this stage, the way of group work greatly stimulates students' participation in learning, improves their practical ability and enhances their team cooperation consciousness.

(3) After-class learning

Students consolidate and expand learning based on classroom learning situation and feedback to strengthen the skills and familiarity of programming. Teachers organize different forms of examination and test to evaluate the teaching effect of each stage.

(4) Evaluation of teaching effect

The objective standardized ability evaluation scheme should be formulated to evaluate and analyze the students' learning effect. Compared with the reference data of the teaching in traditional teaching mode of this course, the role of the "flipped classroom" teaching mode in improving the quality of teaching and enhancing the comprehensive ability of the students is tested.

① Content:

Formative evaluation: Pre-class test, analysis of learning behavior(cloud platform), and evaluation of participation in classroom activities.

Summative evaluation: Final exam, grouping task, and questionnaire

② Methods:

Student evaluation: self-evaluation and mutual evaluation; teacher evaluation: cloud platform large data analysis, questionnaire, and traditional examination.

Conclusions

If the computer undergraduate education in China's colleges and universities wants to achieve the established talent training goal: "training qualified professional applied talents and development talents to provide technical and intellectual support for the national software industry", the teaching mode of professional program design course must be innovated. The application of the flipped class mode extends the original limited class hours and improves the teaching efficiency and effect in the classroom. In addition, the process of classroom knowledge consolidation and internalization is designed according to the characteristics of majors and courses, which strengthens students' hands-on ability and effectively combines theory with practice. It gives full play to students' autonomy, stimulates students' interest and potential in learning, strengthens the communication in teaching process, maximizes the role of teachers, and contributes to the formation of students' comprehensive quality.

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