The Application of Flipped Classroom in the Teaching of Programming Courses
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Keywords: Traditional curriculum, Higher vocational education, Flipped classroom, Programming courses, Teaching mode.

Abstract. The emergence of the flipped classroom provides a new approach to college teachers, but different types of courses have their own difficulties in the implementation process of flipping the classroom teaching due to different teaching objectives between the courses. The most important objective is how to play the role of flipped classroom, to overcome the defects of the traditional curriculum for presenting unique advantages, to increase student satisfaction of the curriculum and improve the learning ability of students? This paper is based on years of teaching experience, combined with the specific practice of flipped classroom in recent years for the higher vocational programming courses "advanced interactive animation" teaching as an example, aimed to study the empirical research on the application of flipped classroom teaching mode in higher vocational courses in the teaching of programming courses in term of analysis of the production of MOOC, processes of teaching implement, the students' satisfaction and influence on the students' test scores.

1 Introduction
In the teaching process of software programming courses in higher vocational colleges, teachers often find that students feel the curriculum content is monotonous and difficult to understand, so the students' learning enthusiasm is not high. Through the questionnaire study we found that the main problem: (1) some students thought it was difficult to understand basic grammar; (2) some students can understand when the teacher explained, but still cannot write code himself when encountered similar problems; (3) a lot of student does not have the complete logical thinking, so they cannot achieve specific requirements in the actual project.

In order to explain the above problem, we do some research and analysis in the traditional classroom teaching mode. Then we found that teachers spend much time on programming grammar in the classroom, but ignore the cultivation of programming ideas, and students passively accept knowledge, lack of independent thinking of the time because of the curriculum itself and the difficulty of curriculum restricted class period. According to the survey [1], there are significant differences between active learning and passive learning in the learning effect and the retention rate of learning knowledge, as shown in Figure 1 below.
In order to solve the above mentioned problems, enhance the enthusiasm of students, help the students turn passive learning to active learning, this study discussed flipped classroom teaching mode and how to apply it to software programming courses aimed to construct the learning process and make the students learn real knowledge. First of all, in order to solve the restricted class period, basic knowledge will no longer be placed in the classroom. Teachers prepared learning video, documents, PPT, operation, etc. in the case of learning materials for MOOC platform of students' autonomous learning at home or bedroom, and then back to the classroom to and interact with teacher. At the same time in the classroom teacher no longer do mechanical explanation, but the analysis and discussion, guide the students to gradually form their own programming thinking, ability to solve problems independently, and improve the application level of occupation.

2 Basic Ideas of Research

"Advanced interactive animation" is a programming course of professional required concentrated on interactive animation design. Students are required to master the ActionScript 3.0 language to make interactive animation works. The course require students should not only learn the theoretical knowledge, more than important is to know the operating mechanism of programming language by programmed learning, and how to solve the practical problems in the project. So in the teaching process we must fully mobilize the students' interest in learning, guide college students to carry out discussions and research, explore and solve the problem, carry out practical activities around the problem by using task-driven [2]. In order to the smooth implementation of the flipped classroom teaching mode, the main ideas of the research group are divided into the following five steps:

(1) we put forward the necessity of constructing the MOOC teaching model based on the flipped classroom in the investigation of the college students before and after class learning habits and the students' learning ability and knowledge summary, and analysis of the use of the existing network teaching platform of our college.

(2) we analyze the feasibility of the research according to the results of the previous research, combined with the specific situation of the students and teachers in our college.

(3) we discuss to design flipped classroom teaching model based on MOOC, and put forward a perfect teaching evaluation methods.

(4) we prepare to do the MOOC video shooting, professional post-production, and then make the final course go on-line.

(5) we practice the flipped classroom in two classes: experimental class and comparative class. The experimental class practices the flipped classroom teaching mode, the comparative class practice traditional teaching mode. Then after the end of each unit, the unit test was used to evaluate the teaching effects of the two classes, and the teaching methods and evaluation methods will be improved according to the feedback of the students.
3 Mooc Producing Method

MOOC is not only move the traditional classroom online, but redesign the classroom for online learning by the outstanding teachers and professional team [3, 4]. Table 1 below shows the production process of the MOOC course content.

Table 1. the production process of the MOOC course content.

<table>
<thead>
<tr>
<th>Production steps</th>
<th>major work</th>
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<tbody>
<tr>
<td>(1) Subject selection</td>
<td>The members of the research group discussed the teaching content, knowledge goal and ability goal</td>
</tr>
<tr>
<td>(2) Curriculum planning</td>
<td>The teaching content system of the course, the teaching method and the examination method</td>
</tr>
<tr>
<td>(3) Knowledge point design</td>
<td>Identify the knowledge points in each chapter and subdivide the knowledge points</td>
</tr>
<tr>
<td>(4) curriculum design</td>
<td>Confirm if the establishment of curriculum system is based on task, competency or performance?</td>
</tr>
<tr>
<td>(5) Course shoot</td>
<td>Shoot the content of the course, including the content of the teacher explained or specific steps or the contents of the computer screen displayed</td>
</tr>
<tr>
<td>(6) Post production</td>
<td>Edit video clips, if necessary, add special effects, used to enrich the screen; the fragmentation process of the knowledge points, or add some small animation, so that the content is more intuitive, easy to understand</td>
</tr>
<tr>
<td>(7) Auxiliary data</td>
<td>Prepare all teaching materials, lesson plans, PPT, electronic documents, homework, exam information, study manual, project development manual</td>
</tr>
<tr>
<td>(8) Promo Shoot</td>
<td>Shooting a promo for the course, including the main content of the course, course design, etc.</td>
</tr>
<tr>
<td>(9) Course on-line</td>
<td></td>
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4 The Design of the Flipped Classroom Teaching Mode Based on Mooc

Flipped classroom teaching based on MOOC will reform the teaching mode based on the traditional teaching mode, break through the traditional teachers' class evaluation mode. The application of electronic resources of classroom teaching and reflection after class will have more pertinence and effectiveness. For students, MOOC can better meet the needs of students according to the knowledge points of different disciplines and personalized learning. MOOC can also strengthen and consolidate the knowledge, which is an important supplement and expand resources contract to the traditional classroom learning. Especially with the popularity of mobile digital products and wireless networks, mobile learning, distance learning, online learning, ubiquitous learning based on the "MOOC" will become more and more popular, “MOOC" will become a kind of new teaching mode and learning style.

In this teaching mode, the basic knowledge should be mastered before or after class, and the classroom is the best place for teachers and students to communicate, discuss and debate. In the classroom they will solve the problem which is usually the most difficult. The following figure 2 is the design of the subject: flipped classroom teaching model based on MOOC class.
5 Evaluation Methods

In order to verify the effectiveness of the research results and the specific application of the project, this paper mainly uses the following two methods:

(1) Students’ questionnaire

In order to implement the results verify the flipped classroom teaching mode, the project group of teachers send questionnaires to students for evaluation of courses and teachers. Evaluation content mainly includes the design of teachers' curriculum objectives, occupation goal understanding and teaching attitude, teaching methods, teaching effect etc. The analysis of the survey results show that the overall evaluation satisfaction of the curriculum and teacher is more than 90% in the experimental class, this data is higher than that of the comparative class scores. The analysis of students' suggestions submitted show that the experimental class of the flipped classroom teaching mode has higher acceptations than the comparative class. They think it can help to understand the basic knowledge, have independent thinking time and more freedom in the classroom. They also can arrange their homework according to individual learning ability to complete "passive learning “converting to "active learning".

(2) Unit test score analysis

Considering the questionnaire alone does not reflect the students' actual programming ability and the ability to solve problems, we have a unit testing for the two classes at the end of each unit. Because "advanced interactive animation" is the programming courses, the most important ability of students is to solve the actual problems, write code to achieve a specific event mechanism, and complete the man-machine interaction in response to the user's operation. So the teachers design 4-5 programming problems in the unit test. In the problems we describe the specific problems to solve and provide specific animation material, and then require students to write their own code to the implement interactive animation. These kinds of problem can exam students' practical ability, independent thinking and problem-solving abilities to the maximum extent assessment. At the end of the course, we found that the average scores of the experimental class were significantly higher than that of the comparative class through the analysis of the two classes’ unit test score. In addition to results, teachers also found that students' attitudes of two classes on unit testing are entirely different. The comparative class is at a loss as to what to do for unit tests, many students said they
did not know how to write code to realize the function and confidence hit. The experimental class can combine with the knowledge of the subject to achieve the requirements of the test because of more independent thinking ability with good programming thinking. In the unit test, they are more confident or more sense of accomplishment after the test.

6 Conclusions

The application of flipped classroom teaching mode to the specific courses based on the MOOC class, will greatly improve the teaching effect, promote the curriculum construction of professional college, and play a promoting role in the reform model of talent cultivation. "Flipped classroom" develop the ability of autonomous learning. The Flipped classroom teaching mode based on MOOC class will change the structure of classroom teaching, break the limitation of time and space of the traditional classroom teaching, develop students’ learning ability, cognitive thinking and problem solving skills, enrich the learning process and emotional experience, and establish learning confidence.

7 References


