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Research and Practice on Bilingual Teaching of Major Courses Based on MOOCs

-A Case Study of the Course of Introduction to Computer Science

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***Abstract*—Although bilingual teaching of professional courses has been carried out widely and achieved great success in many universities and colleges in China, it still faces some challenges for various reasons. With the development of MOOCs, a good way is provided to solve the problems faced by bilingual teaching. By providing online teaching videos, online tests and exercises, online discussion and evaluation, and the integration with the teaching models of flipped classroom, MOOCs will be an important complement to traditional bilingual teaching and promote the cultivation of innovative talents. The outcomes of the bilingual teaching reform project of the course of Introduction to Computer Science carried out in Jingchu University of Technology have showed that the proposed methods and measures are effective and practical.**

Keywords—Bilingual teaching; MOOCs; Teaching reform; Introduction to computer science

I. INTRODUCTION

As early as 2007, China's Ministry of Education promulgated the "opinions on the implementation of undergraduate teaching quality and teaching reform project" [1]. It is required to promote bilingual teaching in colleges and universities, to improve the use of bilingual teaching in general and major courses in colleges and universities.

The important role of bilingual teaching in undergraduate education lies in the following three aspects: (1) enable students to not only acquire the knowledge and skills of their major but also improve their foreign language application ability; (2) learn from advanced teaching methods of foreign countries, introduce advanced teaching resources from abroad to make China's higher education more international; (3) cultivate compound talents with international vision, international competitiveness and international cooperation.

At present, although most of the universities in China have carried out bilingual teaching and made many achievements , there are still some challenges facing bilingual teaching: the bilingual teaching method is too simple and poor, the scarcity of teaching resources and high-level bilingual teaching teachers, which have a direct impact on the development of bilingual teaching [2-3].

Since 2012, Massive Open Online Courses (MOOCs) have become very popular all over the world, and received the great attention of the Ministry of education, colleges and the public, which provides a good opportunity for bilingual teaching in Chinese universities and colleges [4].

The theory and technology of computer related majors mainly come from English speaking countries, and the most widely used programming languages and technical materials about computing are also mainly in English. As a language of computer and Internet industry, English has the irreplaceable role of other languages [5]. Therefore, bilingual teaching in Chinese and English for students majoring in computing is a natural course for computer majors.

In 2016, the Computer Engineering school of Jingchu University of technology began to carry out the practice and reform of bilingual teaching in majors such as computer science and technology as well as information management and information system, and has made certain achievements over the past two years.

II. CHALLENGES FACED BY BILINGUAL TEACHING

Although bilingual teaching has achieved some success, there are still some problems to be dealt with.

A. Lack of Good English Speaking Environmentions

For the bilingual teaching of computer major courses, a good English speaking environment is essential. In the present practice of bilingual teaching, English is mainly used in class by the teachers. During this process, a few students can hardly keep up with the pace and cannot fully understand the relevant courses. At the same time, both in class and after class, most students can only use Chinese to communicate with teachers, which means that lacking a good atmosphere and environment for learning English, the effect of bilingual teaching is greatly affected.

B. Lack of Interaction between Teachers and Students

In the field of software development, many programming languages and software are compiled in English. Therefore, the learning and applying of computer technology needs a strong English foundation. At present, many Chinese students can pass the College English Test of band 4 and band 6, but

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there are still a lot of problems in the actual use of English for programming and reading English documents. It shows that many students have a strong ability to test English instead of applying English. Therefore, we should find a suitable way not only to help improve students' English application ability, but also to promote their computer professional knowledge and skills at the same time.

Bilingual teaching is often carried out in natural classes. The number of students in a class is generally more than 30 (the upper limit of the number of foreign language classes at Jingchu University of Technology is 30), which makes it very hard for every student to have enough time to interact with the teacher in class. On the other hand, the students' foreign language level is uneven and it is difficult to carry out effective classroom activities. The lack of classroom activities makes the classroom mainly dominated by the teachers instead of the students, which will gradually make students lose interest in the exploration of major courses.

C. Lack of Good Review Platform for Students

For the bilingual teaching, the third problem is that students cannot have a good way to review and practice after class. In class, teachers teach the students in English and a few students cannot master all the knowledge and skills due to the problem of English listening. Since the classroom teaching is not replicable, when these students want to review these knowledge after class, it is very difficult. Therefore, it is very important for bilingual teaching to provide students teaching videos to replay after class.

III. BILINGUAL TEACHING DESIGNING BASED ON MOOCS

MOOCs is one of the hot topics in recent years in educational circles at home and abroad. It is said that MOOCs triggered the "second revolution in education". This kind of education makes it possible to implement large-scale online learning. On the platform of MOOCs, students can obtain the required learning resources, use the computer to design personalized learning goals, and communicate with different learners online in order to promote the learning effect. MOOCs enables learners from all over the world to share high-quality educational resources [6].

Its main characteristics are: (1) teachers teach students using the network; (2) it supports a large number of students take the online lectures at the same time; (3) students can use e-mail and other methods to interact with teachers and so on. The teaching video is generally short, and it supports the learners to study at any time. Each video is equipped with tests, and the students are tested to let the teachers and students know to what extent they have master the knowledge.

Introduction to Computer Science is the first major basic course for students in computer-related majors to study. It gives a summary of the sub disciplines of computer science and technology, including the basic principle of computer, data and coding, operating system, database system, computer network, computer security and so on [7]. The basic knowledge is to broaden students' horizons, cultivate students' interest in computing, and master the basic skills of computers.

Taking the course of Introduction to Computer Science for example, the following is some detail of the design of MOOCs.

A. The Basic Online Resources

The basic online resources of the course includes teaching video, audio, teaching plan and presentation, which are carefully designed and made. The content is accurate, systematic and complete. The teaching content, teaching method and teaching means are integrated, and the application effect should be good. It helps to improve the students' interest and improve the teaching effect. Table 1 shows the detail of the online resources of the course of Introduction to Computer Science.

TABLE I. ONLINE TEACHING RESOURCES OF THE COURSE OF INTRODUCTION TO COMPUTER SCIENCE

Online Teaching Resources	**Detail**	**Language**
Introduction to the course	document	English
Introduction to the textbook	picture	English
Introduction to the teaching team	picture/document	English
Syllabus of the course	document	English/Chinese
Teaching schedule	document	English/Chinese
Learning guide	document	English/Chinese
Electronic courseware(PPT)	PPT (a total of 21 unit)	English
Teaching video	MPEG (a total of 21 unit, the time of every unit no more than 20minutes)	English/Chinese
Test & Exercises	quizzes assignments unit test (more than 1000 questions)	English/Chinese

B. *The Teaching Modles of Flipped Classroom Based on MOOCs*

Flipped classroom refers to the readjustment of classroom content and the transfer of learning from teacher-dominated to student-dominated. In this teaching mode, the valuable time in class can be more focused on active project based learning, so that a deeper understanding can be achieved by the students [8].

First, according to the syllabus and teaching plan, teacher arrange the teaching content of the bilingual course of Introduction to Computer Science. Before class, the teacher upload the video and questions to the online teaching platform for students to prepare in advance. Most of the test questions are at the cognitive level, which are mainly used to test the students' understanding of the knowledge points in the teaching video, so that the teacher can arrange the teaching progress and content in this chapter according to the students' self-study effect.

In class, students enter the classroom with questions. The problem is a main thread that runs through the flipped classroom teaching. The teaching content is presented in the form of problems and is generated in the process of problem solving. On the basis of answering the questions provided before class, teachers extend and expand the knowledge points in the video, guide students to ask questions and discuss independently, to share results, and to deepen understanding of the knowledge points.

After class, students can ask questions on the Internet for the unknown points of knowledge and seek the answers from teachers and students. Teachers can provide the test questions on the network teaching platform again. These after class test questions are mostly at applying level, which are used to test the students' grasp of the knowledge points, which determines whether the teaching has achieved the expected effect.

Fig.1 illustrates the steps and contents of flipped classroom teaching mode based on MOOCs.

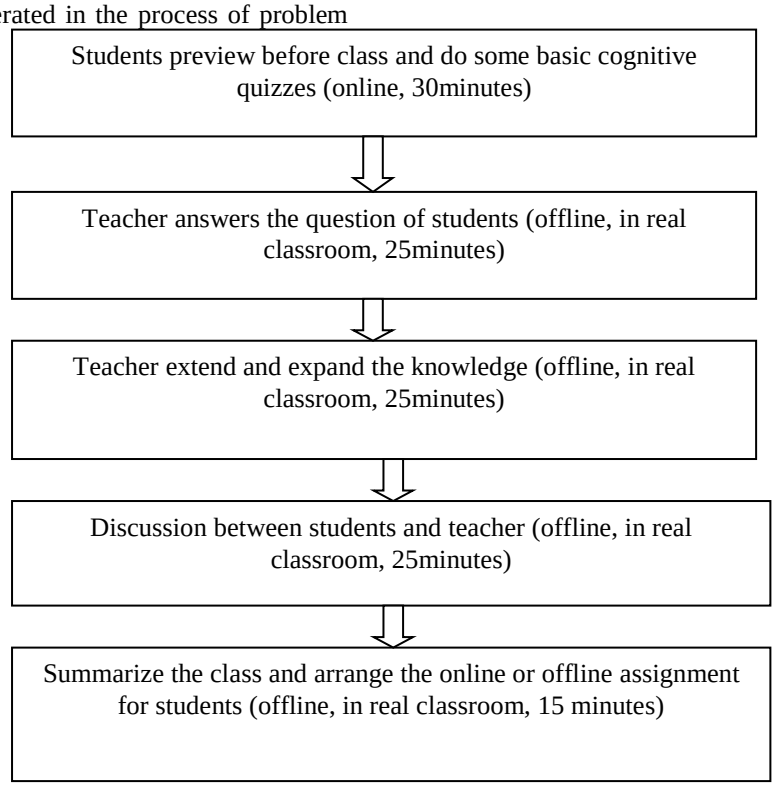

Fig. 1. Steps and contents of flipped classroom based on MOOCs

C. Exercises and Tests

For bilingual teaching based on MOOCs, we divide exercises into three different levels in terms of their difficulty.

The first level: is the easiest level, which is to master of the core English words involved in each unit of the courses. In order to make students learn from the scattered time, we developed the online testing system of the bilingual basic knowledge on the website. The system supports the access of the mobile phone. It is convenient for the students' self – review and self - test.

The second level: is teachers' offline homework and online homework, both in Chinese and in English. The goal of this kind of exercise is to mater the basic theories and principles of the course of Introduction to Computer Science.

The third level: is comprehensive exercises and is the most difficult level because this kind of exercises is in English completely. This kind of exercises is mainly for some excellent students to improve themselves and not required for every students (this exercises can be downloaded from our MOOCs website).

D. Evaluation of Bilingual Teaching Based on MOOCs

The evaluation of bilingual teaching is a critical step to reflect whether the desired objectives of bilingual teaching has been fulfilled.

The total score is made up of two parts: usual performance (takes up 40%) and final examination (takes up 60%). The usual performance also consists of two parts: usual online performance and usual offline performance. Both take up 50% of the score of usual performance. Fig.2 shows the details of the evaluation model of bilingual teaching based on MOOCs.

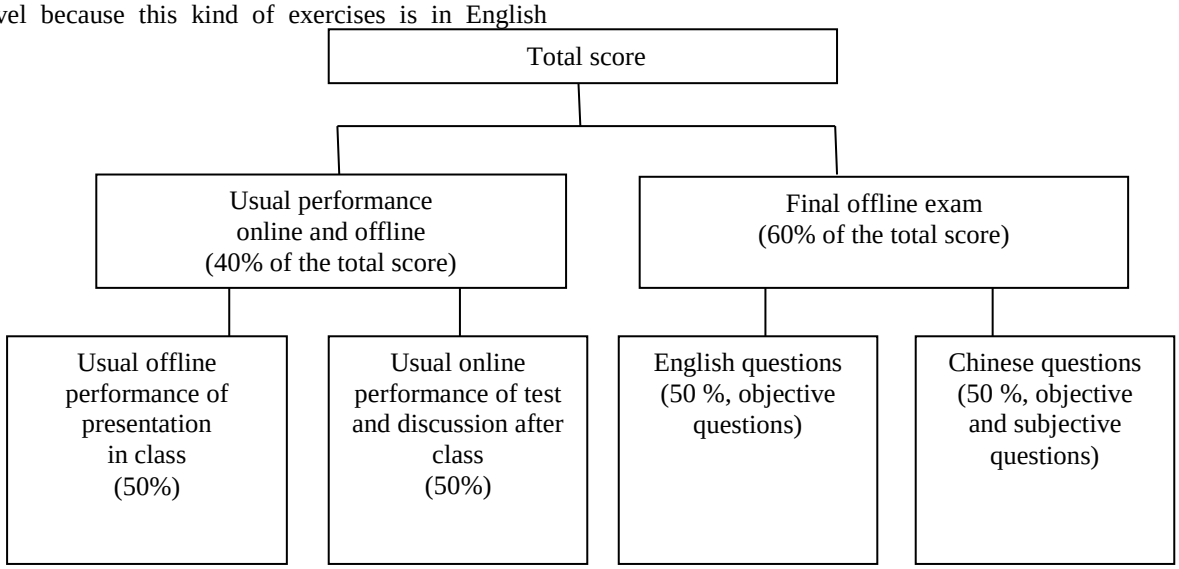

Fig. 2. Evaluation model of bilingual teaching based on MOOCs

IV. EFFECT AND CONCERNS OF BILINGUAL TEACHING BASED ON MOOCS

When MOOCs are introduced to the bilingual teaching of professional courses, it will solve some difficult problems of the bilingual teaching, and greatly improve the teaching quality and teaching effect.

A. Provide Personalized Bilingual Teaching

In the traditional bilingual teaching, teachers can only arrange courses according to the normal teaching schedule. Since different students may have different level of the relevant courses, some students would complain that they cannot keep up with the bilingual teaching, while others feel that the teaching progress is slow.

After the introduction of the MOOCs teaching model, teachers can focus on the study of the differences of individual student, and give students individualized guidance through online forum, online interaction and other modules. For students who cannot keep pace with the bilingual teaching, because teaching video can replay, it is very convenient for students to review the knowledge several times.

B. Improve the Interaction between Teacher and Students

The traditional bilingual teaching mode is difficult to break through the old teaching mode effectively. Teachers still adopt the teaching method of spoon-feeding and neglect the heuristic teaching method. However, teaching with MOOCs provides a good interactive platform for the students. The students can put forward their own ideas through the network platform, interact with the teachers, discuss with the students, which will promote their interest in learning and improve the quality of learning.

C. Problems need to be Concerned

As a new thing, teachers and students need a process to understand and apply MOOCs. Therefore, before the teaching reform, teachers and students are required to receive specialized training to know what MOOCs is and how to use it. Introduction to Computer Science, as a traditional major course in the major of computer science and technology in universities, has rich teaching resources. Local application-oriented colleges and universities can develop their own teaching resources with their own characteristics in combination with the characteristics of MOOCs.

In addition, teachers should strengthen their ability to use the teaching platform and make the teaching video. In the classroom teaching, the teachers should choose the MOOCs platform suitable for the school and make MOOCs become the supplement and extension of the classroom teaching, become a new model of classroom teaching and individualized teaching model. The students of local colleges and universities do not have a good foundation and their ability of self-learning is weak. In order to make MOOCs a real good platform for students to teach themselves, we should strengthen the students' habit and ability of self-learning.

V. CONCLUSION

In this paper, after analyzing the problems and challenges of bilingual teaching and the advantages of MOOCs, combining with our experience of bilingual teaching, we propose some measures and methods for bilingual teaching base on MOOCs. On the one hand, we should develop our MOOCs resources with our own characteristics. On the other hand, we should change the teaching modal from teacher-dominated to student-dominated by using flipped classroom.

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