Exploration and Practice of “Electronic Technology Experiment” Course in SPOC Mode

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ABSTRACT

In view of the shortcomings in the traditional teaching process of electronic technology experiments, this paper tries to reform the teaching of experimental courses in colleges and universities with the idea of SPOC mode. The reform and innovation should be carried out from the aspects of teaching resources, teaching methods and assessment methods to stimulate students’ enthusiasm and initiative in learning and form a student centered initiative learning model, so as to improve students’ engineering application ability, team cooperation ability and innovation ability.

KEYWORDS
SPOC; Electronic technology experiment; Teaching mode

INTRODUCTION

SPOC (Small Private Online Course) is the small-scale restricted online course [1,2,3]. The concept was first proposed and used by the Professor Armand Fox of the University of California, Berkeley. Harvard University, University of California, Berkeley, Massachusetts Institute of Technology and other world famous universities have carried out SPOC experiments and promotion, and the response is good. SPOC is a kind of curriculum education model which applies MOOC teaching resources, such as micro video, learning materials, training and testing, machine automatic scoring, station forums, to small-scale physical campus (not limited to campus). Its essence is to combine high-quality MOOC curriculum resources with classroom teaching, so as to flip the teaching process [4, 5], change the teaching structure and improve the teaching quality. It can not only give full play to the advantages of MOOC [6,7], but also effectively compensate for the weakness of MOOC and the shortcomings of traditional teaching.

The “electronic technology experiment” is divided into “analog electronic experiment” and “digital electronic experiment”. It is an experimental course in the aspect of electronic technology for undergraduates majoring in automation, electrical engineering and automation, measurement and control technology and instrumentation, and communication engineering, and it is of great significance to improve students’ practical ability. Because of many concepts and short hours, students are required to have a solid theoretical foundation and strong practical ability.
The traditional education model relies only on classroom teaching time, and it cannot meet the requirement of training students’ innovative ability. The students reflect that the key and difficult problems are too late to think. They cannot understand and do well in class, and they can’t learn by themselves after class. Therefore, we hope to explore a new teaching model and introduce SPOC model into teaching.

PROBLEMS EXISTING IN TRADITIONAL TEACHING

After years of curriculum teaching practice, we sum up the “electronic technology experiment” course. There are five main problems:

The first one is that the classroom teaching model is too monotonous to enlighten students’ creative thinking ability [8]. Most of the experimental projects are teacher-oriented teaching mode. Before the experiment, the teacher will explain, and then the students conduct the experiment.

The second one is the lack of multifarious, interesting and comprehensive experimental projects [9]. Students’ interest in learning cannot be transferred.

The third point is that the evaluation mode of the course experimental examination is monotonous. The exam method of the course is mechanized and the final score of the final exam is high (50% of the total score), ignoring the dynamic evaluation in the process of student learning.

The fourth point is that the contents of the experimental teaching resource library are few.

The fifth point is that there are fewer hours in the classroom experiment. The comprehensive training combined with the actual application of the project cannot be completed entirely through the limited classroom teaching, so that students’ enthusiasm for learning outside the classroom is not well mobilized. In order to carry out the large-scale comprehensive experiment, the classroom teaching must be extended beyond the classroom teaching to achieve practical results.

In order to solve the above problems, we hope explore a new teaching mode from the aspects of teaching resources, teaching method, experimental projects and so on. The purpose is to improve the initiative of students’ learning, and do the preview work well before class. Thus, each time the experiment task can be completed efficiently, so as to improve the enthusiasm of students’ experimental learning, let students become the main body of the teaching process, and form a virtuous circle.

CURRICULUM TEACHING REFORM IN SPOC MODE

The Main Contents of the Reform.

1. Online pre-class teaching
   The first one is that teachers design and develop teaching resources.
   The teachers should design, develop and produce SPOC teaching resources in advance, including SPOC micro video based on knowledge point interpretation, supplemented by SPOC micro case, micro project, micro experiment and other micro material training resources. Also they should take the SPOC “micro homework” as the main, supplemented by learning feedback of online answering, online testing, online statistics and other independent learning activities. The teacher should upload the teaching resources to the network and arrange the students to study autonomously before class.
The second one is that students watch micro videos and learn new knowledge. According to the teacher’s requirements, students browse the learning resources on the Internet, and watch the SPOC micro video with their own learning time, schedule and method.

The third one is the student’s training test. After using SPOC teaching resources, students can make a brief training and test by using the simulation software, and verify the experimental content.

The fourth one is the evaluation of communication between teachers and students and also between students. In the course of the training test (or after the end), for the problems that the students can’t understand, they can release them through forums or micro-blog, social networking sites and other exchange platform, and discuss them with teachers and other students.

For the problems that cannot be solved through the network or the new problems, they can bring them to the class, and seek the help from teachers. In the process of discussion and exchange, there is also an evaluation result between teachers and students and also between students.

2. Offline class teaching

The first one is the classroom guidance: the teacher will provide questions for students to answer, including experiment principle, experiment operation, etc. After the students have answered the questions on time, the teacher will give specific explanation for the questions with high error rate. For the few students who do not past the examination, they will not take part in the experiments until passing the examination. This will not only help the students to prepare the lesson before class, but also improve the efficiency of class teaching efficiency (experiment, classroom).

The second one is the new method for experiment operation. The traditional experiment method is: the teacher will first explain the principle of the experiment, then give a demonstration for the experiment process, after that the students will do the experiments and ask advice from the teacher in case of problem. In the mode of SPOC, the students can integrate the online preparation, software simulation and offline experiment into one body. They can prepare lesson by watching SPOC video, verify the correction of the experiment using simulation software, and share their simulation results and interact with the teacher and other students through SPOC platform, and at last perform hardware connection in the lab and are checked by the teacher.

The third one is the classroom evaluation: the students will display their experiment in the group, and perform self evaluation, mutual evaluation and teacher evaluation, including online preparation, hardware connection and evaluation and offline summary.

KEY PROBLEM

The first point is that in order to improve the online teaching level and arouse the enthusiasm of students before the experiment, it is very important to record high-level SPOC micro video.

The second point is that whether it is to test the effect of online teaching before class, or to test the effect of offline teaching in class (that is to test the teaching effect
of “Electronic Technology Experiment” in SPOC mode). The premise and guarantee is to establish an effective teacher-student communication and evaluation mechanism.

SCHEME REFORM AND IMPLEMENTATION MEASURES

The overall scheme reform is showed in figure 1.

Figure 1. The overall scheme reform.

MEASURES OF IMPLEMENTATION

The first one is to record high quality SPOC micro-video. For the one thing, we should organize the research and discussion of professional teachers, determine the content of micro-video, and record it with the help of experienced professional teachers, so that the SPOC micro video is easy to be accommodated. For another, we should invite experienced SPOC teachers and experts to impart the teaching experience and methods by giving lectures, seminars, reports and carrying out the demonstration teaching on a regular basis. Additionally, we should convene young teachers of different subjects for group discussion, where targeted suggestions of
teaching are proposed. Last but not least, we should implement discussion among the students regularly and improve the content of video according to students’ feedback.

The second one is to establish communication and evaluation mechanism. First, we should apply the social network platforms such as BBS, microblog and other communication platforms to the timely communication between teachers and students. In this way, the teacher can record the learning situation of each student, and the frequency of a certain difficult problem. Combining the online communication with the offline feedback, the O2O mode is thus formed. Second, on the SPOC platform, a competitive mechanism is set up for teachers of the same research group. By means of competition, an optimal teacher can be selected as the main role for the recording of micro-video, supplemented by the other fellow teachers. Annually, an evaluation about his or her teaching ability and teaching effect is made (including assessment between teachers and the evaluation of teachers by the students). In case of unqualified result of the overall evaluation, his role of lecturer on the SPOC platform is terminated for the next year. Among the students, their own learning situation and status are evaluated anonymously through social platform and offline communication, while making suggestions to other students.

The third one is that teachers can showcase the most likely mistakes of the students in the experimental process, as well as the key step of experiments in the micro-video based on the teaching experience. A “laboratory manual” is thus made for the students to download for reference, in which various errors and problems of the students can be solved one by one. In the process of offline experimental operation, students are grouped (two persons in each group) for the experiments, cooperative exploration and problem research in groups. In the course of the experiment, the problems encountered by the students can be solved by independent thinking, mutual exchange, and joint discussion, or one-to-one or one-to-many communication with teachers. For those common problems, the teacher can demonstrate in groups or classes and solve them collectively. During the problem-solving process, the teacher can not only understand the online learning situation of students, but also add new problems involved in the experimental process into the “laboratory manual” for the formation of the mechanism of online-offline mutual promotion.

CONCLUSION

Through the use of modern educational technology and Internet information technology, the SPOC model reflects a learner centered initiative learning model. It is a kind of experiment teaching model which combines the inside and outside, the online and offline, and the individual and the team. The rich class form and online education characteristics not only meet the personality learning habits of post-90s university students [10], but also increase the interaction between teachers and students and stimulate students’ interest in learning, which is helpful to improve students’ preview ability, engineering practice ability, team cooperation ability and innovation ability.

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REFERENCES