Electronic Technology Laboratory Course Based on the SPOC Model

Xueli Dong¹,a and Zhibin Ma¹

¹School of Information and Electrical Engineering, Harbin Institute of Technology (Weihai)
Weihai 264209, China
a dongxueli@hit.edu.cn

Abstract. In the Development plan of education informatization decade (2011-2020), proposals were put forward to accelerate the educational development by promoting the modernization with the informatization as the strategy. It laid stress on making the best use of modern information technique, advancing full and deep integration in information technology and education, and adopting information technique in Electronic Technology Experiment Teaching. According to this plan, the traditional teaching mode, which is unitary and teacher-centered, should be improved, in order to make the teaching and learning of Electronic Technology Experiment free from time and space restrictions to some extent, and change towards an open and automatic pattern. For this reason, the Flipped Classroom Model, forming by “Open Experiment Teaching Information Management System + Internet” based on the SPOC model, features the combination of the advantages of network teaching, flipped classroom and open class. There is no doubt that such a model can provide new ideas and solutions to the cultivation of innovative talents.

1. Introduction

Education informationization is to give the advantage of modern information technology to the full play and focus on the comprehensive integration of information technology and education, which will play a unique and crucial role in promoting education equity and achieving high quality resources sharing, improving the education quality and the learning society construction and promoting the change of the concept of education reform and cultivating innovative talents with international competitiveness[1].

SPOC is a kind of small-scale private online course which is formed by setting access conditions (primarily focus on students of the host school). Consisting of components like micro-videos, instant exercises, and interactive discussions and learning tests etc. SPOC achieves indigenization of MOOC. The curriculum model fits more for school students[2-5]. The concept was first put forward by Armando Fox in the University of California, Berkeley. He thought it can build up the instruction of teachers and the involvement and mastery of students through SPOC’s application in class[6].

Therefore, in the background of education informationized, this article has conducted a thorough investigation and study on the traditional teaching methods, in which it is preparing to find the existing problems, analyze the cause and put forward some reasonable suggestions. And then, the article tries to propose a flip of the classroom teaching mode which is based on “Internet + Open experimental teaching management platform” and set up the “Electric Technology Experiment” for the entire junior undergraduates in our university as a test course. This course processes with designing plan according to the SPOC mode and aims at establishing flipping class reaching mode mixed with web-based instruction, flipping class and open class in one, which will remarkably promote the reform of the university class and improve students’ learning efficiency[7].

2. Experimental curriculum and platform Construction

2.1 Curriculum Selection

Electronic Technology Experiment is a basic public experimental course established for low-grade undergraduate students by the Experimental Center. Through the teaching practice, it is found that the traditional teaching mode, in which teachers mainly teach and students mainly learn,
has many drawbacks. Firstly, it is too difficult for those in non-electronical major with inadequate professional basis, for they feel quite pressed when exposed to the electronic experiment for the first time. Secondly, such experiments involve the use of many new instruments. The complicated operating procedures are easy for students to forget. For teachers, there are too many students attending the basic experimental courses, the number of each class being about 60. Too many attends cause the problem that the teacher cannot take into account every student when teaching the experiment, and the teaching is limited to time and space. Furthermore, the teacher has little time to communicate with the students. The teaching quality is hard to monitor, the efficiency of class becomes low, and the development of experimental teaching quality is restricted.

2.2 Construction of the Open Experiment Teaching Platform

In the mobile network environment, using the Open Experiment Teaching Management Platform, provide the students with the courseware and videos which introduce the use of the instruments on their mobile devices. Open experimental teaching management platform includes the following features:

1) All the experimental project courses use the advanced multimedia courseware in order to enhance the experiment teaching methods. Students can download the courseware resources on mobile devices or on the PC in any time.

2) The open experimental teaching mode. Students can login into the system for real-time query and select experimental courses according their own condition.

3) The teacher can check the curriculum selection of students in every class and input the results of their experiment operation, reports and tests.

4) Statistical analysis of experiment teaching data. Make a statistical analysis of the curriculum selection data, the equipment utilization data, the course completion rates and check and analyze the process of the experiment. This subsystem can strengthen the process management of experiment teaching.

In conclusion, the platform function is completely conforming to the characteristics of network course platform. It can serve as the excellent carrier of “SPOC+ flipped classroom” combination.

3. Electronic technology experiment practice based on SPOC model

The electronic technology experimental teaching mode based on SPOC, with “the Internet + Open experimental teaching management platform” as the carrier, combines the online learning with the class organically. The online learning orients to students’ self-learning and self-test. But class learning is more emphasized on students’ operating practice and solving the practical problems. Both have achieved the deep combination of the information technology and education. The design chart of SPOC teaching mode is as shown in Fig. 1.

![Figure 1. SPOC teaching mode design block diagram.](image-url)
3.1 Online Learning

3.1.1 Courseware resources
Each experiment has corresponding multimedia courseware, and all the instruments in the laboratory have corresponding videos which introduce the use of them. This subsystem can realize the audio-visual combination and provide the sound, text and images together, making the teaching of experiments and the introduction of instruments become more vivid and reality. Moreover, the students can downloads the courseware and videos at any time and do automatic learning before class. Fig. 2 is the oscilloscope use video.

Figure 2. The oscilloscope use video.

3.1.2 Preview examination
Through the construction of question bank and intelligent test paper composition, the online examination system can check the preparation of students and ensure that students almost master the content of the experiment before doing it. Before conducting an experiment, the students have to pass the preview examination online, or they can’t carry out the experiment.

3.1.3 Experiment course ordering
In the home page of our laboratory center, students can look through "the laboratory booking table in recent time" and "the usage condition table of open laboratory". Thus, you can make the appointment for classes with all experimental projects according to your own free time. And everyone will have a separate user name and a password to log into the online course selection system (Fig. 3). When login on the web-interface of this system, there will be several modules including the preliminary assessment, online course ordering, scores inquiry etc. In the module of online course ordering, Students can see the experimental content of the project that he or she needs to complete and within the experimental cycle. When selecting an experiment, correspondingly, you should choose the experimental time and the place, which means that you have finished experiment course ordering.

Figure 3. The online course selection system.

3.2 Classroom learning
Via viewing classes online, students have possessed their own knowledge reserves correspondingly, which makes it the primary task in class to transfer what they learn online into the ability of hands-on practice. In the lab-based class, teachers should make the most of face-to-face chances with students to emphasize on those significant and complex problems. So that it will forms a complementary relationship with the online courses and enhance the teaching quality enormously. In this moment, teacher will play a tutor’s role replacing the previous character whose
main job is to guide and advise the problems appeared in the analysis of the experimental process and discuss the solutions to the problem.

4. Conclusion

This article is attempting to introduce SPOC teaching module in the reform of electronic technology experiment. Not only this module will have a positive impact remarkably on the teachers’ teaching methods, students’ learning style and the university experiment curriculum reform, but also apply the thought of education informationized “Internet + Education” into the experimental teaching.

Practice indicates that with “Internet + Open experimental teaching management platform” as the carrier and bringing the SPOC teaching module into the university’s experimental teaching, it will have an extremely important and positive influence on the electronic technology experimental teaching reform.

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