The Research of the University Physical Experimental Curriculum System which Combine Online with Offline Teaching Systems

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Abstract. In this paper, the massive open online course (MOOC), micro learning resources, small private online course (SPOC) are introduced into teaching of physics experiments which can help students to carry out learning at anytime and anywhere. In the teaching process, MOOC and SPOC build a new blending teaching mode like “online learning + classroom teaching + experimental operation”. And it can help students get rich learning resources, stimulate their interest and improve the quality of teaching.

Introduction

The university physics experiment course is not only the public elementary course for the science students but also the important way to train students master the experimental skills. Moreover, it is the efficient way to improve basic science understanding for the science students.

The Current Situation and the problems of Physical Experimental Curriculum System

Nowadays, the teaching of physics experiments of many universities has not been paid enough attention in China. The course physics experiments course which has the problem of lack innovation is similar to most students. Many students are not interested in this course. The Chinese Government has set forth the strategy of invigorating the country with science and technology and education, has increased the investment in education, and made remarkable achievements in recent years. Enlargement and multiform development in higher education requires the physics experiment changing teaching contexts and methods. The physics experiment teaching should be taken some improvement in order to come up with the times.

According to the inquired questionnaire results, there are several problems of teaching of physics experiments. Firstly, many students who have little study motive are not interested in physics experiments. Secondly, the differences in basic physics knowledge and learning strategies of new students lead to fast polarization of their study performances. Thirdly, many students today respond badly to traditional methods of teaching. Finally, because of the limitations of teaching facilities and the effect of traditional teaching model, many students do not have enough understanding of experimental principle and experimental procedure.

The Conditions of Constructing the Physical Experimental Curriculum System which Combine Online with Offline Teaching Systems

The modern information technology, which has multi-media and network technology as its core, has made important impact on the education. As information technologies bring about profound changes in education environment, education informatization is becoming the inevitable trend of education reform and development[1]. There are many kinds of online teaching systems which include MOOC, micro learning resources, SPOC and so on. The MOOC helps enrich the teaching contents, raise the teaching efficiency and promote the renovation of educational concepts. The MOOC is a platform of teaching resource base on the web and share these resources with others,
can resolve these problems effectively and improve the quality of physical experimental teaching[2]. The MOOC is important for supporting and sharing the high quality teaching resources. It has become an important part in the construction of excellent physical experimental course in many universities. Furthermore, it is also important to find an appropriate method which can combine the traditional offline teaching with the MOOC more efficiently [3]. It has been regularly carried out in classes and has proved to be effective both in examining the students’ effectiveness in physical experimental learning and in arousing their enthusiasm for it. Student-centered teaching mode shifts the focus from the teacher to the students, which means students should more learning responsibility or develop their learning autonomy through the MOOC and SPOC system.

The physical experimental course can be diversification and standardization to the students by using the MOOC system. So the online teaching system which includes SMOOC, SPOC and so on is the direction of reform in physical experimental teaching in China. In addition, with the maturity of the technological condition, it is possible to combine online and offline education resources.

**Design of Constructing the University Physical Experimental Curriculum System**

The general ideas of constructing the university physical experimental curriculum system are the modularization which the teacher should design the different course contents and give more choices for the different major students and the modularization which there is a clear orientation how to training students of each level. And there is the order which means the beginning level is the foundation to the higher level.

**The Base Module**

The basic goals of university physical experimental curriculum system are teaching students to understand of working principles of physical experiments, the ways how to use experiment devices and the way to write experimental studies. And the students from different majors can improve the level of their basic experiment skills after the training of several basic physical experiments. And it is very helpful for the new students who have little experience of operating physical experiments through the way of teaching them with details and examples by the teacher in this module. Moreover, it helps the students to overcome the fear of difficulty and mobilize their initiative in the study. Furthermore, it can lay a foundation for the integrated module.

**The Professional Module**

It is necessary to set up different professional modules for different majors based on the differences of major’s emphases. For example, the requirement of the same physical experiment is different to the students from different majors. So the teacher should introduce the overall background of the major to them. And let the students know what knowledge they should master and what they can do in the future. It helps to establish physical thought and arouse students’ enthusiasm for their major.

**The Integrated Module**

The students should have basic knowledge about physical experiments after learning from the base module and the professional module. So there are some integrated physical experiments which are more complicated in this module. For example, the teacher should provide the experiment topic and the goal of experiment to the students. And the students should design the whole experimental scheme which includes the selection of instruments and the way to operate the experiment.

**The Application of Innovative Module**

Nowadays the technology provides new space, platform and possibility for teaching innovation, and enriches the forms and diversity of teaching. And the research of innovative experimental system and the construction of practical platform are important contents of innovative education. The application of innovative physical experiment which is based on the integrated module should
combine characteristics of different majors with innovation abilities of students to improve the level. Additionally, it integrates with research-based learning and Internet platform to create innovative atmosphere and practice chances for students. The students will rely on this platform to interact theory study and practice teaching processes, and their operation ability, engineering viewpoint and innovation consciousness can be trained.

The Design of the Physical Experiment SPOC System

The physical experiment SPOC system use system design method which transform from the principle of learning and teaching theories into teaching objectives, teaching conditions and teaching method to design specific systematic process.[4] So the overall design of physical experiment SPOC system based on the each physical experiment which have specific contents. There is a strong correlation between different contents of the experiment which focus on the principles and method of the experiment. These characteristics are helpful to design SPOC system. And at the same time, they can help to remove time and space limit by using the combined mode between online and offline learning system. This system can be seen as complementary to the traditional learning system.

The Practice of Physical Experimental Curriculum System Based on Combining Online with Offline Mode

As the smartphones and the other mobile devices spread, the experimental curriculum system based on combine online with offline mode is widely accepted by the students. The multi-user mode and various teaching modes are appropriate for the university physical experimental curriculum system which has integration advantages of laboratory teaching. In the past, the preparation and the design of the experiment is completed by the teacher. Nowadays the students can use MOOC learning system to achieve the goals of the university physical experiments. Firstly, the students should sign in the MOOC system and gain access to the courses. Secondly, the students can watch the video which shows the whole physical experimental process through their university SPOC system. It can help the students have a deeper understanding about the experiments. Thirdly, the students can discuss the physical experiments with each other by using SPOC system. Fourthly, the students can do the online test about the experiment and upload the experimental reports to the teacher directly. Finally, the students can operate the experiment by themselves in the laboratory room. And at the same time, the teacher should help the students to operate the experiment and find the shortage of the design of the experiment. So the students can get instant feedback and correct their mistakes. Furthermore, the teacher gives their students professional reviews and guidance based on the data of recording and experiment reports. After that, the teacher grades their students based on their performance and the completion of the experiment in online and offline systems. It can achieve the goal of the physical experimental learning through this kind of mode which combined online and offline teaching systems.

Summary

The university physical experimental curriculum system which based on combining online with offline mode triggers the development and innovation of physical experiment learning contents and methods. Furthermore, it has performed very well as a practical online learning system which breaks the limit of time and space in the educational resource sharing and courseware fast making and it is of great value. Moreover, it is more student-centered learning techniques and let the students more fully into the physical experimental learning. And it helps the university to cultivate application-oriented talents, at the same time, to create conditions to the students for further studies.
References