Research and Practice of Virtual Experiment Teaching Mode of Computer Courses Based on MOOC

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Abstract: Experimental teaching has always been an indispensable part of undergraduate training, which is related to the ability of engineering practice and engineering innovation. The practicality of computer courses is strong, and each course requires students to deepen their understanding of knowledge points through a large number of experimental exercises, so as to fully grasp the content of the course. Simple video learning or online testing can only effectively alleviate the problem of theoretical teaching, and help to improve the effect of experimental teaching is limited. In this paper, by building a virtual experiment platform for computer courses suitable for MOOC environment, we can give full play to the advantages of MOOC and virtual experiment environment, and gradually improve the teaching effect of computer online courses by providing a good virtual experiment environment and integrating well-designed experimental teaching content. To explore the virtual experiment technology and teaching mode under the environment of MOOC is not only of great significance to assist the teaching of online theory courses, but also the innovation and change of offline experiment teaching in response to the impact of MOOC.

1. Introduction

In recent years, the teaching mode represented by MOOC + SPOC is rising gradually. Through short video online learning, online interactive discussion and other means, this mode effectively solves the problem that learning is limited by time, space, teachers and other aspects. However, the practicality of computer courses is strong, and each course requires students to deepen their understanding of knowledge points through a large number of experimental exercises, so as to fully grasp the content of the course. Simple video learning or online testing can only effectively alleviate the problem of theoretical teaching, and help to improve the effect of experimental teaching is limited. Experimental teaching has always been an indispensable part of undergraduate training, which is related to the ability of engineering practice and engineering innovation. Therefore, to provide a good virtual experimental environment and well-designed experimental teaching content is helpful to effectively improve the teaching effect of computer online courses, and it is urgent to explore the virtual experimental teaching mode to adapt to the MOOC environment.

At present, some virtual experiment systems have been applied in the experiment teaching, such as the chemical subject virtual experiment system developed by Oxford University and the Electronic Science Virtual Experiment of Johns Hopkins University in the United States, etc. learners can conduct online experiments through open Internet remote access sites. Compared with foreign countries, the research of domestic universities in this field started late.

At present, there are still many difficulties in the virtualization of experimental teaching and its integration into the MOOC environment. Using literature retrieval, no mature system has been found that can be applied. Referring to the design and architecture of other virtual experiment platforms, this paper constructs a virtual experiment platform for computer courses in MOOC environment, which can give full play to the advantages of MOOC and virtual experiment environment, and improve the

quality of online teaching. At the same time, if the platform is extended to offline experimental teaching, it can also make up for the shortcomings of traditional experimental teaching.

2. Problems in the Experimental Teaching of Computer Courses in Our College

The core courses of computer in our college, such as data structure, operating system, Oracle database, Java application, etc., have all built online open courses on the superstar platform. Due to the limitations of MOOC and SPOC's own teaching mode, such as the low proportion of teachers and students, the lack of a unified curriculum experiment platform, etc., both sides of teaching still face many difficulties in question answering discussion, homework correction, curriculum experiment, etc., especially in some courses requiring more hands-on practice of students, such as computer programming language, operating system, database operation, etc. The main problems are as follows:

Students get a lot of knowledge and information from online course videos, but they lack immediate response and high-quality learning feedback, poor hands-on practice ability and sense of acquisition.

- Single learning method (mainly watching video) leads to low average retention rate of learning.
- After class, students use their own computers as the experimental environment. They do not have the same software and hardware configuration, nor can they meet the hardware requirements of distributed course experiment. In many cases, both sides of the teaching spend a lot of energy on the deployment and configuration of the experimental environment, but they cannot focus on the content of the course, resulting in the experiment with strong platform correlation is often not very good To complete.
- The code in the homework submitted by the students comes from different development environments, which increases the difficulty of automatic correcting homework.

3. The Exploration of Virtual Experiment Teaching Mode of Computer Courses in MOOC Environment

3.1 Construction of Virtual Experiment Platform for Computer Courses in MOOC Environment

The virtual experiment platform mainly uses the existing equipment of the virtual desktop of the experimental teaching center of the school of human information management, and reasonably deploys through the open-source cloud computing management platform open stack. After the completion of the platform, it mainly serves for the information management and professional students of our school, and can ensure that each student has its own virtual machine, and can directly log in to the virtual machine for operation in class, and can put the cloud into operation after class The host is "on the go" and can be used as long as it is logged in the campus network. The platform not only provides virtual machine to meet online experiment teaching, but also can develop online experiment submission platform in the later stage to realize online assignment arrangement, submission and feedback. The virtual experiment platform is online at any time. It has high requirements for power supply, backup, heat dissipation, ventilation and other environments. After construction, its safety should be fully evaluated. The flow chart of virtual experiment platform is shown in Figure 1.

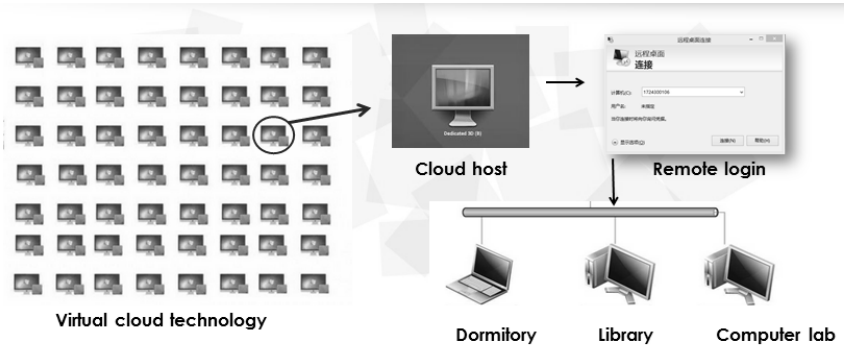

Figure 1. Flow Chart of Virtual Experiment Platform

3.2 Reorganization of Experimental Teaching Content System

The structure of the existing online open courses is generally based on theoretical knowledge. The construction of the virtual experiment platform can decompose the requirements of the experiment outline into the corresponding theoretical learning modules. Online homework and thinking questions are no longer limited to theoretical knowledge. Students can learn and practice through virtual experiments, and share multiple teaching modes, so as to effectively improve the knowledge retention rate. Because of overcoming the limitation of time and space, more comprehensive design experiments can be carried out, which is helpful for the cultivation of students' innovation ability in engineering application.

3.3 Integrating Practical Course Teaching Resources into Virtual Experiment Platform

Combined with the construction of practical courses, the practical course teaching resource base is integrated into the virtual experiment platform, such as new technology courses and examples, well-known Forum blog explanation, competition guidance, etc., to provide students with a broader learning space.

3.4 Collection, Analysis and Utilization of Experimental Data and Behavior Characteristics of Students

The traditional experimental teaching mode, the experimental data and behavior characteristics of students in the experimental process, are difficult to be effectively collected and accumulated. The online virtual experimental mode students' behavior will be recorded. Through statistical analysis, the teaching content and methods can be continuously adjusted and improved.

The integration of MOOC platform and virtual experiment platform is an effective way to realize online experiment teaching. The scheme can support MOOC learners to complete the experimental content of the course, reasonably share the experimental environment, collect and analyze the experimental data and behavior characteristics of online students, and promote the continuous reform of experimental teaching. The virtual experiment platform under the MOOC environment can not only provide experimental support for online education such as MOOC or SPOC, but also can be used as an alternative to offline experiment teaching to solve the problems in traditional computer software experiment courses.

4. Teaching Practice and Effect Analysis

In the teaching practice, we choose the Oracle database course of 17 level information management and information system major as the pilot application object.The experiment tradition of Oracle Database Course in our college is carried out under the operating system and DBMS environment prepared in advance on the PC in the laboratory. Because the lab PC is configured as network startup, the software environment will be reset every time the computer is restarted, and the results of the students' previous experiment cannot be saved. In addition, students usually install the experimental environment on their own computers, which is used to complete the unfinished part of the experiment in their spare time. This makes students spend a lot of time on the preparation of

experimental environment, and also increases the workload of tutors, reducing the efficiency of students' experiment.

Before the experiment course, the teacher team creates the virtual machine template which is ready for the course, including the windows operating system, DBMS, basic programming software and all the supporting materials needed for the experiment course, creates the personal account for the students, and creates the virtual machine for the students using the virtual machine template of the Oracle Database experiment course. The virtual machine serves as the local database service at the same time Client and database access client. All the experiments of the students are carried out in the virtual machine environment. Because these virtual machines last for a semester, there is no need to configure them after the initial application, and the continuity of the operation of the experiment class is better guaranteed. At the same time, students can log in to the virtual machine at any place in any free time outside the classroom to continue the experiment. In the process of students' experimental course progress, the tutor can complete the tutoring work by logging in the virtual machine and other ways, and can query the statistical information such as the length and time period of students' using the virtual machine, so as to better grasp students' learning situation. After a semester of pilot application, the statistics of the login and use time of the virtual platform show that the students study on the virtual machine for more than two hours per week, far more than the extracurricular learning time of other courses. The experimental efficiency of the students is significantly improved, and the teaching effect is also improved.

5. Conclusions

In the era of MOOC and under the background of new engineering, the requirements for computer courses are to cultivate engineering practice ability and engineering innovation ability, and require students to understand the principle, emphasize practice and attach importance to sense of acquisition. It is the trend of online education development of computer courses to build a virtual experiment platform, provide a unified experiment environment, deeply integrate the existing online open courses with the quasi experiment platform, and reorganize the experimental teaching content system to integrate the practical course teaching resource database in the virtual experiment platform. It is also the content that must be considered to improve the online education quality of such courses. In order to become a mobile desktop for students to study and realize ubiquitous learning, the virtual experiment platform of computer courses must ensure the stable work of the platform. Different from the traditional computer room opening on time, the virtual experiment platform is online at any time, and has higher requirements for power supply, backup, heat dissipation, ventilation and other environments. How to reasonably and efficiently use the existing resources of the experimental teaching center, especially the operation and security of the server, is also the key problem we need to solve.

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