Construction of Modern Educational Technology MOOC Platform Based on Courseware Resource Storage System

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Abstract—With the development of Internet era, distance education has become a fashionable educational mode. More and more teaching functions can be implemented via this platform. Hence, an online teaching platform with complete teaching functions becomes an essential development trend in the whole higher educational mode. Based on connectivism theory, multimedia real-time storage technology and five-dimensional evaluation model of blended learning, a MOOC platform of Modern Educational Technology was constructed in this paler by combining multimedia resource storage technology. Besides, the design was implemented from 2 parts: functional structure of the platform and each module of the platform. Meanwhile, the effect of the MOOC platform was tested through five-dimensional evaluation model of blended learning from three aspects: learning attitude, learning process and learning effect. Results demonstrate that the score of participation degree is 4.94, interaction degree is 2.14, fitness is 4.13, satisfaction is 4.29 and effect degree is 4.375. These findings indicate that the MOOC platform can well promote students' learning and is a good platform.

Keywords—MOOC platform, multimedia storage technology, 5-dimensional evaluation model, modern educational technology

1 Introduction

With the development of Web internet technology, an increasing number of teaching functions can be implemented via this network platform. Thus, MOOC emerges at the request of higher education development. With the high-speed development of internet information technology, MOOC has developed into a modern online network education platform which integrates multiple functions [1]. MOOC is also called Massive Open Online Course which is an emerging online course development mode [2]. MOOC is a shortened form of Massive Open Online Course, where M represents Massive. The word "Massive" means the large number of users who use this online educational platform. Through this platform, anyone can learn relevant knowledge with the corresponding account. The first O represents Open. Open means anyone can participant in the course on the platform. The second O represents online. Online represents the most outstanding feature of MOOC platform – online teaching.

Through the internet, we can learn corresponding knowledge anytime anywhere. C represents Course [3].

MOOC platform is an important foundation of MOOC teaching. The students only need to register an account and log in the account so as to select and learn corresponding courses. For this platform, each course is maintained by the corresponding teacher. On this platform, teachers can provide such services as teaching and answering questions. Therefore, MOOC platform is highly open with the function of multi-course management. A large number of students can learn online simultaneously.

2 State of the art

There are mainly three successful MOOC platforms overseas, including Coursera, Edx and Udacity. Coursera is a non-open-source MOOC platform which was co-developed by American venture investment developer and many American famous universities. It includes the courses of computer science, humanities & social sciences, economics, medical science, engineering and machinery etc. Students can gain corresponding paid services. The teachers who cooperate with Coursera can evaluate and score the students. After passing the course, the students can gain the diploma [4]. Edx is an open-course MOOC platform which was co-developed by Massachusetts Institute of Technology and Harvard University. The MOOC platform provides 8 MOOC courses for free, including the courses of computer science, chemistry and electronics. Meanwhile, this platform also supplies corresponding paid services. The students who obtain the paid services and complete corresponding courses can be provided with corresponding certificate [5-6]. Udacity is another non-open-source MOC platform. It was co-developed by a professor from Stanford University and a venture investor. This platform provides 18 online courses in total, including the courses of computer science, natural science, mathematics and programming. Udacity not just provides corresponding course-completion certificate for students after they pass corresponding courses. The students who learn on Udacity can transform the course score into corresponding credit. Udacity can also recommend corresponding jobs for the students who pay [7]. In China, Peking University and Tsinghua University cooperate with Edx to launch MOOC platform. Fudan University [8] and Shanghai Jiaotong University [9] cooperate with Coursera to develop the MOOC platform suitable for Chinese university education.

At present, the most important factors hindering MOOC platform development contain: (1) users click online videos of MOOC in quantity and play them, which will increase the load of the whole server; (2) as the number of users and the courses of MOOC increase, the hardware investment of the whole server needs to increase; (3) rich multimedia resources are the foundation of MOOC. Effective storage and multimedia resources of MOOC are needed; (4) the evaluation of students' learning process by different teachers on the MOOC platform is only limited to examinations, and fragmentization feature of MOOC learning is ignored. Thus, the pass rate of examinations is low, and the students are lost [10]. For the problems of traditional online education form and the problems which hinder MOOC platform development, a multi-

media real-time storage technology was proposed in this paper to solve hardware problem of MOOC platform. Besides, a five-dimensional evaluation model of blended learning was chosen to effectively elevate learning effect of MOOC students, in the hope of providing the reference for improving and evaluating MOOC system.

3 Theoretical basis

3.1 Connectivism theory

Connectivism expresses a learning mode which adapts to current social structure change. Learning is no longer internalized personal activity. When the new learning tool is used, people's learning style and learning purpose also change. Connectivism can be understood in this way: the rapid change of knowledge foundation leads to decision change; the new information is gained continuously; the ability to distinguish important information and non-important information is crucial. The starting point of connectivism is individual. Individual knowledge forms a network which is compiled in all kinds of organizations. In turn, the knowledge of various organizations is fed back to individual network so as to offer individual continuous learning [11]. The structure chart of connectivism theory is shown in Fig.1.

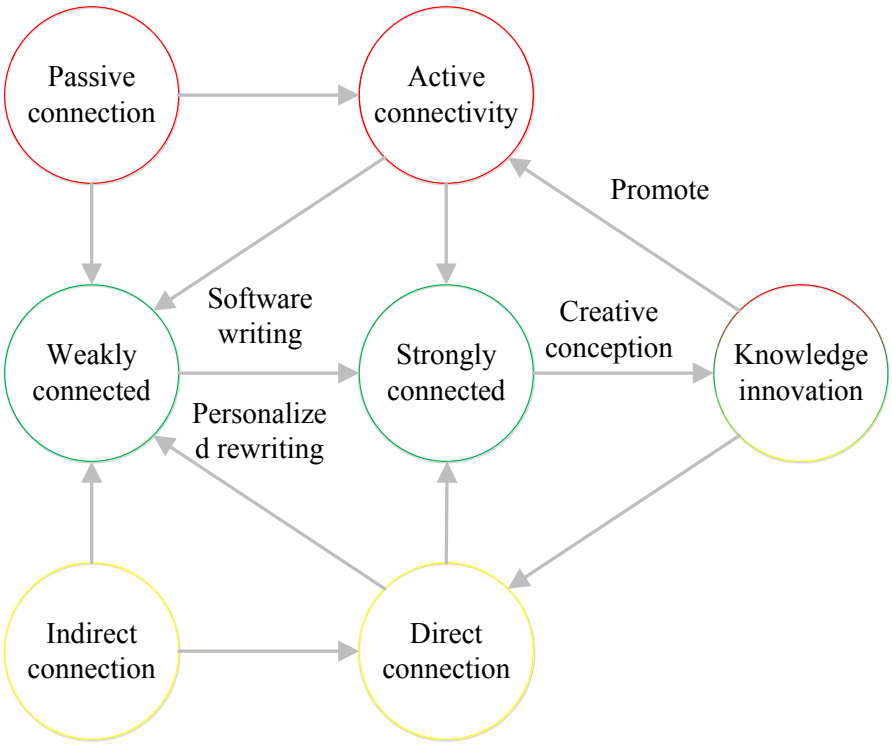

Fig. 1. Structure chart of connectivism theory

3.2 Multimedia real-time storage technology

The multimedia real-time storage technology aims to recognize multimedia resources used in MOOC teaching and compress the recognized multimedia resources after they are classified and packed. With the multimedia real-time storage technology, multimedia resource space can be reduced effectively, and the service life of MOOC platform hardware can improve. Meanwhile, the stability of MOOC platform resource playing can be promoted, and resource copying and transfer become convenient. The operational process of multimedia real-time storage technology is shown in Fig.2.

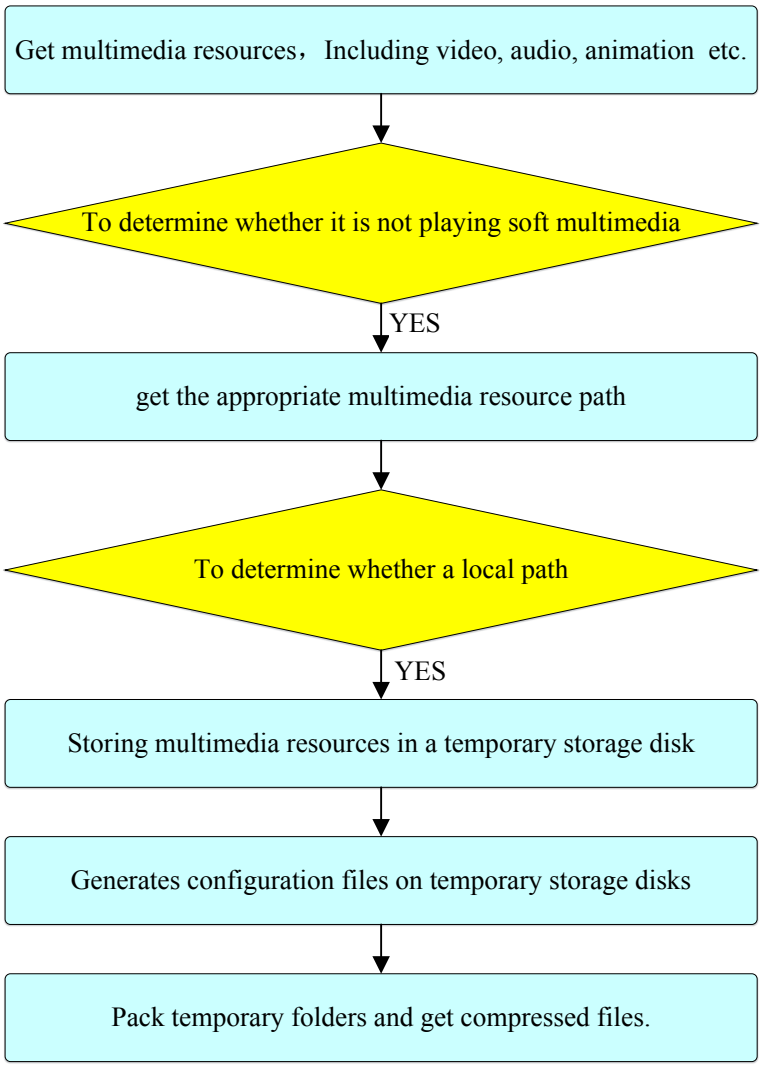

Fig. 2. Operational process of multimedia real-time storage technology

3.3 Five-dimensional evaluation model of blended learning

In the whole MOOC learning, blended learning is the main means. Hence, the learning effect of MOOC was comprehensively evaluated from three aspects: learning process, learning result and learning attitude. According to the three aspects, the effect of blended learning was divided into five dimensions in this paper:

Participation degree. From the beginning of MOOC, the students need to participate in course learning. So, the participation degree of online learning should be evaluated in accordance with multiple aspects.

$$D = \sum_{i=1}^{5} \frac{D_i}{D_i^r \times S} \tag{1}$$

The computational result of the formula is the completion degree of theoretical value calculation. If the value of completion degree D is 1, the participation degree of MOOC reaches the theoretical goal. If the value of completion degree D is less than 1, the completion degree goal of the MOOC is not completed. As the users increase, the calculation of completion degree will be more accurate.

Interaction degree. To judge the interaction degree between teachers and students and among students is another aspect of judging learning effect.

$$E = \sum_{i=1}^{5} \frac{E_i}{E_i^r \times S} \tag{2}$$

The calculation mode of interaction degree is similar to that of participation degree. If the value of theoretical completion degree is equal to 1, this means the theoretical goal has been reached. If the value of theoretical completion degree is less than 1, this shows the theoretical goal is not reached.

Fitness. Fitness aims to judge whether students can adapt to the new learning mode, learning task and teamwork according to their own knowledge and capability and to know the process of acquiring knowledge and improving ability by MOOC students.

Satisfaction. The evaluation of students' response in MOOC training is mainly based on satisfaction. Satisfaction evaluation aims to judge students' response to training theme, training course, trai9mnign teacher and the whole MOOC training system.

Effect. How to evaluate learning effect of MOOC students so as to fully know students' learning process and ability and to make corresponding feedbacks and suggestions according to their learning progress?

4 Construction of Modern Educational Technology MOOC platform based on courseware storage system

From the aspects of functional structure of the platform, multimedia storage technology was proposed in this paper. Modern Educational Technology was chosen as the object of study to construct the whole MOOC platform.

4.1 Functional structure design of the platform

The MOOC platform includes five main functions: massive online student data management, independent course data management, pressure bearing design of course video, online test score statistics and title setting, course resource data management. The five functions need to be operated by different roles. The administrator can operate user management and maintain public information of courses. Teachers can operate course video management, course outline management, course resource management and online test management. Students only own such rights as browsing, proposing questions and answering the online test questions. The integrated functions of MOOC platform are shown in Fig.3. According to the five-dimensional evaluation model and design features of MOOC platform, the MOOC platform based on courseware storage system includes the following four modules: user management module, course outline module, multimedia resource module, and test management module.

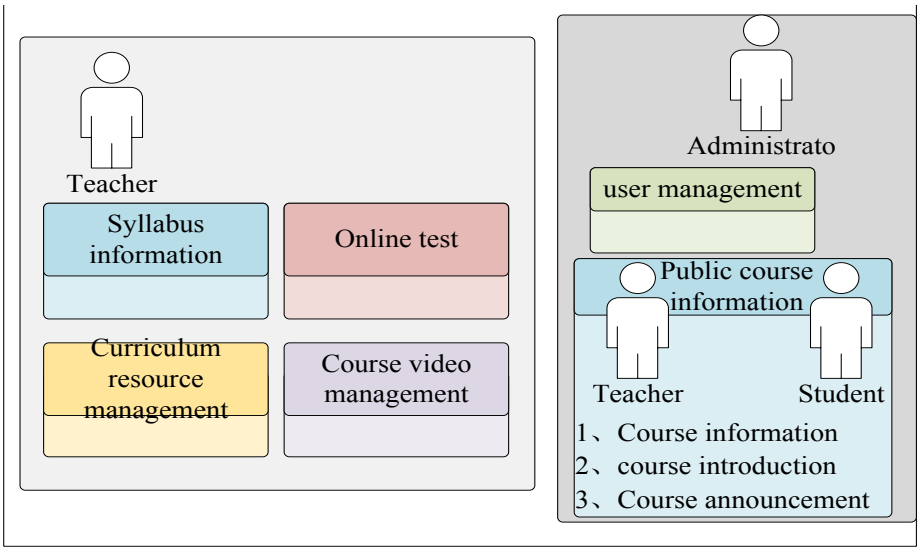

Fig. 3. Integrated functional structure of MOOC platform

4.2 Design of each module of the platform

Demand analysis of user management module. The administrator with three roles can manage teachers and students. Teachers can publish and set courses. Students can only browse course content and propose questions online. The three roles can visit the pages within the limit of rights. User management structure chart of MOOC platform is shown in Fig.4.

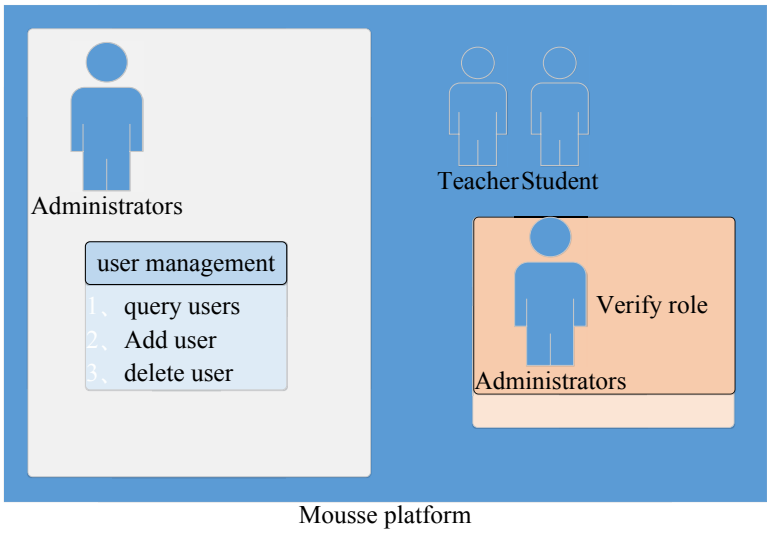

Fig. 4. User management structure chart of MOOC platform

Main interface design of the platform. Main interface layout of the platform is composed of navigation frame, top frame and main window frame. The top frame is mainly used to display the login information of users. The navigation frame is at the left side of the page, and it is mainly used to display the list of functions that users can operate. The left main window frame is mainly used to display the corresponding operation interface of each function.

Interface design of user management module. For the whole user management module, corresponding login interface is needed. After login succeeds according to the login type of users, the operation interface corresponding to user role will appear. The teacher is the course manager of MOOC platform. The administrator of MOOC platform owns the highest priority, and can manage teachers, such as adding, deleting and editing teachers.

Design of course outline module. This module design aims to display course publishing result and the concrete content of each MOOC, including the corresponding results of chapters. Students can effectively confirm their learning contents according to the results. For MOOC teachers, course outline module contains such functions as course publishing, course chapter management, course information editing and course announcement management. The structure chart of MOOC platform course outline is shown in Fig.5.

Design of multimedia resource module. The multimedia resource module can be added in accordance with course chapters of MOOC and bind multimedia resources uploaded by teachers with corresponding chapters. Since the course contains course chapter display, multimedia resource can appear on user operation interface in the form of chapter. Students can choose to play and download corresponding multimedia resource according to their demand. MOOC teachers can add, modify and delete corresponding multimedia resource.

Design of test management module. Test management module is used to implement the function of online testing students by teachers. This module can allow teachers to publish exercises and test questions. Meanwhile, it can allow teachers to carry out statistics of students' score distribution.

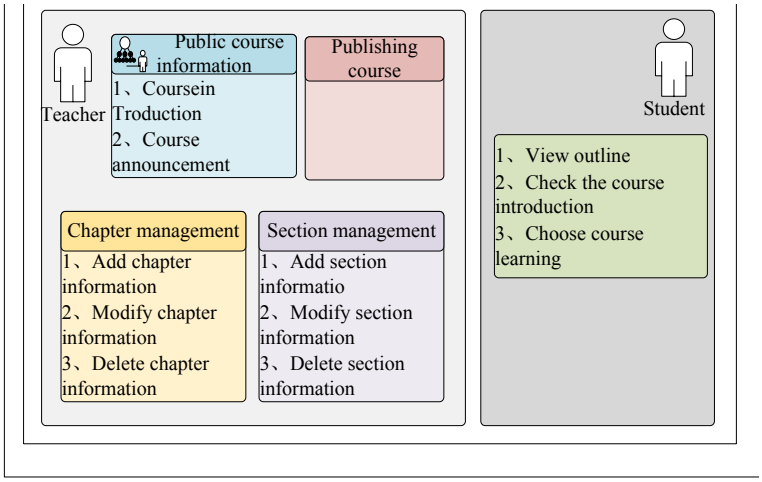

Fig. 5. Structure chart of MOOC platform course outline

Fig. 6. On-the-spot teaching of Modern Educational Technology MOOC platform

Fig. 7. Online learning screenshot of Modern Educational Technology MOOC platform

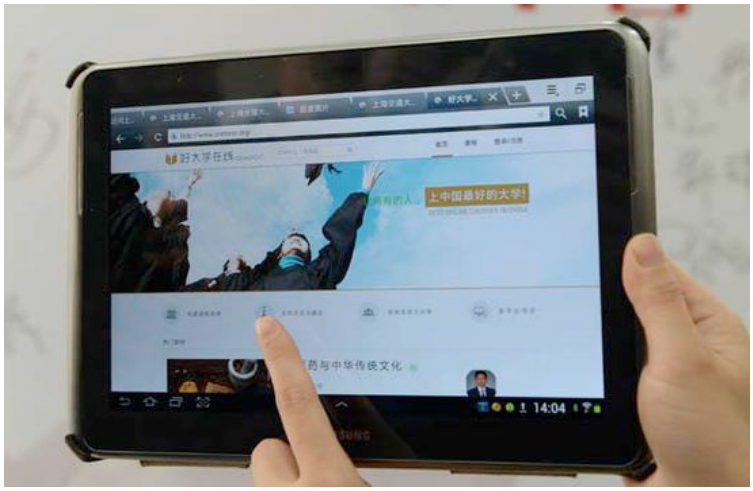

Fig. 8. Tablet PC learning demonstration of Modern Educational Technology MOOC platform

4.3 Effect check

103 students of Modern Educational Technology MOOC from a university in Shandong were chosen as the objects of study. The investigation results were substituted into the five-dimensional module to confirm the evaluation result in five aspects.

Result of participation degree. According to the investigation result and Formula 1, the score of participation degree is 4.94 which is close to the full score 5. So, the students of Modern Educational Technology can effectively promote their participation degree and learning enthusiasm to certain degree after MOOC platform is applied.

Result of interaction degree. The interaction degree is E=E1+E2+E3+E4+E5= 0.61+0.04+0.93+0.23+0.33=2.14. The full score is 5. Thus, the network interaction

features of MOOC students are very limited. This reminds that the teachers of Modern Educational Technology should pay attention to interaction design between teachers and students and among students, except course design.

Result of fitness. The investigation result is shown in Tab.1. The mean score of both classes is 4.13. This result shows most students have adapted to MOOC teaching mode and own high adaptation to MOOC assignments and examination method.

Result of satisfaction. The investigation result is shown in Tab.2. Students feel satisfied with MOOC platform. The mean score of each item is 4.29. Moreover, blended learning mode of MOOC platform differs little under different items. On the whole, the satisfaction is high.

Result of effect degree. The investigation result is shown in Tab.3. The total mean score of both classes is 83.66, and the test effect degree is 4.375. On the whole, the mean score of both classes exceeds 80. The mean score reaches a good level, which means the MOOC platform plays a good role for students' learning.

According to Table 1, the VR-based multiple teaching system is helpful for students to improve their theoretical knowledge reserve; besides, as shown in Tab. 2, it is also helpful to enhance students' self-regulation of learning, arouse students' learning interest, and improve classroom atmosphere, but there is still a large space for progress, which is because that the independent learning ability of the students who had received traditional "duck-stuffing" teaching mode for a long time has not been fully developed. It is worth noting that more than half of the students had got largely improved in performing capacity after receiving experiment teaching.

Table 1. Investigation result of fitness

Class	Learning mode	Material organization	Material presentation	Task difficulty	Evaluation mode	Team work
Class 1	4.06	4.23	4.25	4.12	4.16	4.23
Class 2	4.05	4.08	4.13	4.02	3.93	4.07

Table 2. Investigation result of satisfaction

Class	Learning mode	Experiment special	Learning resource	Assignment and feedback	Task difficulty	Evaluation mode	Interaction between teachers and students
Class 1	4.43	4.40	4.37	4.28	4.33	4.37	4.42
Class 2	4.38	4.47	4.34	4.18	4.28	4.13	4.29

Table 3. Statistical result of effect degree

Class	Audio material processing	Multimedia courseware design	Multimedia courseware making	Video material processing	Total score
Class 1	80.8	83.4	84.7	83.4	83.205
Class 2	81.2	84.5	84.3	84.9	84.115

5 Conclusions

In one word, design and implementation of MOOC platform were completed in this paper through studying the problems in existing online education platforms and analyzing domestic and overseas mainstream techniques. In this study, multimedia real-time storage technology was applied. Besides, five-dimensional evaluation model was used to evaluate students' MOOC learning. The new evaluation model was adopted to improve learning design and learning effect. Meanwhile, learning progress was visualized through network teaching platform. The data were quantified by referring to the five-dimensional evaluation model so as to facilitate students' learning.

Although the MOOC platform in this study well promote students' learning, the investigation result of interaction degree shows the whole MOOC platform still needs to be improved in terms of interaction degree. This reflects that blended teaching practice is not very sound on the interaction platform. Furthermore, the investigation of interaction degree should be based on relevant real-time class for corresponding tests and data acquisition. Seeing from teachers' classroom teaching observation and satisfaction survey of students' MOOC platform interaction, actual interaction result of MOOC platform is better than the direct measurement result. At the same time, MOOC students still need to improve their initiative in network course learning. The degree of students' participation in online learning is high, but they rarely take active part in offline learning and communication.

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