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Research Article

Construction of Security System of Flipped Classroom based on MOOC in Teaching Quality Control

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Abstract

As a new teaching mode that changes the traditional roles of teachers and students, flipped classroom is a classroom teaching form which is being explored in the teaching reform. In this paper, we study the teaching of the course based on MOOC, and explore how to use the course resources of MOOC to apply to the teaching of flipped classroom. On this basis, through questionnaire survey, the current situation of MOOC quality monitoring and guarantee in some universities are investigated. It is found that the quality standard of MOOC course construction is not perfect and the teaching quality monitoring and guarantee system is not perfect. In view of the existing problems, a quality monitoring and security system for flipped classroom based on MOOC is constructed.

Keywords

Flipped Classroom • MOOC • Security System • Teaching Quality Control • Questionnaire

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At present, the teaching mode of higher education in the world is experiencing a historic change of network and digitalization. MOOC (Massive Open Online Course), a new type of large-scale and open online course (Kop, 2011; Seaton, Bergner, Chuang, Mitros & Pritchard, 2014; Jordan, 2015), has brought tremendous changes to learning in the Internet age. Because MOOC has the characteristics of openness, quality, immersion, interaction and fragmentation, the development of MOOC teaching mode and the application and promotion of MOOC platform in the field of global higher education are constantly emerging.

Flipped classroom (Mclaughlin *et al*., 2014; Min, Kim, Khera, & Getman, 2014) is a new teaching mode that changes the traditional roles of teachers and students and redesigns classroom time by reversing knowledge imparting and knowledge internalization. In the flipped classroom, students complete knowledge points independently or collaboratively before class. Teachers use different teaching strategies to help students internalize knowledge. Its main purpose is to improve teaching efficiency and stimulate the subjectivity and enthusiasm of students. Since the introduction of the flipped classroom in China in 2012, the research on the flipped classroom has gradually increased, it involves the teaching process design and application research in different educational stages and different disciplines.

The appearance of MOOC undoubtedly promotes the use of the flipped classroom. Relying on online teaching resources provided by MOOC courses, students can watch and learn learning resources such as teaching videos before class. Combination of MOOC and flipped classroom makes it possible for teachers and students to complete homework, answer questions, collaborative inquiry and interactive communication in class.

Although new teaching modes such as MOOC and flipped classroom have brought opportunities to the reform of teaching mode, the quality of education has become increasingly prominent. It is obvious that the traditional course evaluation methods cannot effectively evaluate the quality of these novel teaching modes. Especially, learners' online learning process cannot be effectively assessed and monitored. Therefore, the scientific evaluation of MOOC course quality and the establishment of an effective monitoring and security system are particularly important for the quality control of flipped classroom teaching based on MOOC.

In this paper, we attempt to explore the online and offline hybrid teaching methods of high education teaching, and to explore the design and application of MOOC-based flipped classroom teaching mode. On this basis, a quality monitoring and security system of flipped classroom teaching based on MOOC is constructed.

Related works

There are obvious differences between MOOC and traditional network course, one of which is that MOOC supports various learning styles. So different scholars had carried out research on the learning style of MOOC. Chang, Hung & Lin (2015) studied how learning styles affect the learning behavior of MOOC learners. Martin & Fred (2012) believed that the development of MOOC gave students more time to discuss learning problems or discuss different opinions, and MOOC was a way of learning that allowed learners to cooperate with each

other and shared knowledge, broaden the depth and breadth of knowledge. Baker, Bujak & Demillo (2012) studied MOOC from the perspective of learning effect, they believe that in order to improve students' learning effect, we should take learners as the center, pay more attention to learners themselves, establish good connections between learners and promote learning interaction among students.

The quality of course is an important factor affecting learners' learning sustainability (Fox, 2013). Therefore, many researchers and institutions are actively involved in the formulation of online course standards and quality security system. Group (2013) believed that the quality evaluation of MOOC needs to face many challenges. High-quality online education can maximize students 'learning potential and prepare them for a successful career life. Pajares (1992) believed that a good MOOC platform should not only satisfy users' learning on different mobile devices, powerful social functions of the platform, rich and comprehensive course resources, but also it must satisfy users' requirements for interface and simple operation. Margaryan, Bianco & Littlejohn, (2015) evaluated 76 selected courses based on Merrill's primary teaching principles: problem-centered, stimulating, demonstrative, applied and integrated evaluation framework. They found that the overall quality of the teaching design of the course was not high, and they believed that the quality of the course should be improved from the teaching design theory of the course. Quality Matters Rubric Standards (Hoffman, 2012), published by the Maryland Network Education Alliance in 2014, contains eight quality standards and specific standard points: course overview and introduction, learning objectives, evaluation and measurement, teaching resources, interactivity, courese technology, learner support and ease of use. The course standard is one of the most commonly used course quality security frameworks in the United States. It has also been used by many scholars in the research and assurance of the quality of courses. Fernández, Silvera & Meneses (2015) established a comprehensive evaluation index system which combined general and non-general evaluation dimensions to evaluate the quality of the course. Among them, the general evaluation dimension included teaching design, training resources and learning activities, tutoring lessons and technology and digital learning environment, while the non-general evaluation dimension included the cognition, learning methods, acceptability and virtual classroom environment of employability training. Yousef *et al.* (2014) divided the quality assurance criteria of MOOC into two levels: teaching level and technical level after literature research on online learning, open education and MOOC. The teaching level included two secondary indicators: instructional design and assessment. The technical evaluation criteria included four secondary indicators: user interface, video content, learning and social tools, and learning analysis. Detailed key indicators were given in order to effectively and objectively evaluate the quality of education.

Coursera, edX and Udacity as the representatives of the MOOC platform attach great importance to the quality control of the MOOC course (Bulfin, Pangrazio & Selwyn, 2014). They had established quality labels, and schools will check the quality of courses according to the quality labels. In the aspect of students 'learning monitoring, these MOOC platforms mainly adopts the way of cooperation with the Training and Examination Center to supervise the final examination of students' courses, so as to ensure the authenticity of students' learning results.

Design of MOOC-based flipped classroom teaching method

Flipped classroom teaching based on MOOC

Face-to-face teaching under flipped classroom mode is a process of students' questioning, solving problems and internalizing knowledge. It is also a process in which teachers make full use of situational, cooperative and conversational elements to give full play to students' subjectivity, and guide students to solve problems.

The emergence of MOOC provides an important opportunity for flipped classroom to improve the quality of course and re-orientate self-worth of learners. In the flipped classroom based on MOOC, teachers do not explain knowledge points in the traditional way, but on the basis of re-combing the knowledge points explained in the pre-class video, supplement other forms of learning resources to meet the students' various learning needs. One of the most important points is to solve the difficulties students encounter in the process of video learning before class. After sorting out knowledge points and answering questions, teachers should set aside enough time for group discussion, cooperative learning, project-based inquiry classroom or problem-based discussion classroom learning to complete group tasks. In this process, teachers need to strengthen the organization and guidance of group discussion among students, expand students' cognitive structure step by step according to the content of video learning, promote students' ability to transfer knowledge while completing knowledge learning, and improve students' ability to think and analyze problems. Teachers also need to provide students with personalized learning opportunities, according to each student's learning level, learning habits and personality characteristics of targeted guidance.

The integration of MOOC and flipped classroom teaching mode aims at realizing the complementary advantages of classroom teaching and online learning. The structure of the teaching mode is shown in Figure 1.

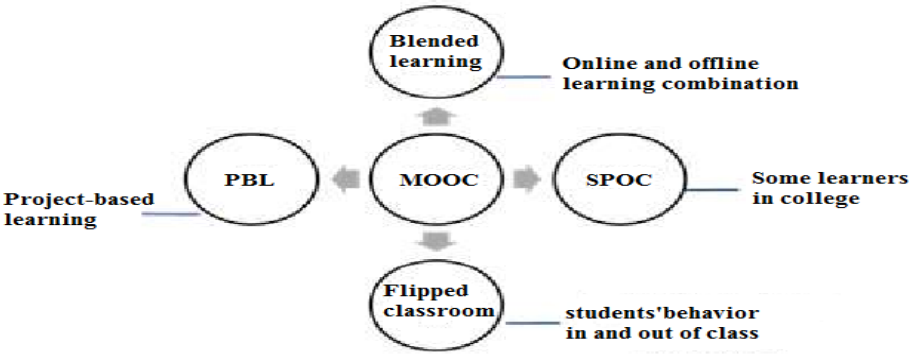

Figure 1. The structure of the teaching mode

The model not only plays the leading role of teachers in guiding, inspiring and monitoring the teaching process, but also fully reflects the initiative, enthusiasm and creativity of students as learning subjects. It is a typical mixed teaching model.

Through the flipped classroom teaching mode based on MOOC resources of "online and offline learning" and "student-centered", "task-driven" and "project-oriented", digital technology is introduced to improve the

teaching mode and provide new ideas for the teaching of university courses.

MOOC's elaborate instructional design function urges teachers to review and re-integrate teaching content repeatedly. For example, short videos based on information processing theory, interactive instant thinking based on behaviourism and cognitivism, discussion based on social construction and behaviourism, question-answering space, experience/situational teaching, integrated simulation exercises based on constructivism, peer evaluation based on open homework and so on.

Because of the change of teaching mode, teachers must sort out the contents of courses more systematically and devote more time and energy to teaching design and research, so as to promote the improvement of teaching effect and quality.

The model is a student-centered, ability-enhancing-centered personalized teaching model. The mode fundamentally realizes the teaching concept of "student-centered, teacher-led", which enables teachers to truly become inspirers and motivators of learning from a lecturer, while students are also free from passive knowledge inculcation and can actively learn knowledge. It would make learning more efficient and personalized.

Course construction of flipped classroom based on MOOC

In the early stage of off-line construction, before video shooting, teachers need to draw up course outline, unit planning, unit teaching objectives, knowledge points, key and difficult design, including PPT production, etc. After video shooting, teachers need to examine the samples and add subtitles. Teachers should fully consider how to present pictures, how to switch different lenses, when to insert pictures, text and video materials, and how to present these materials in order to better explain knowledge points. Every step of offline video production is particularly critical, because the quality of video will be affected by the scripting before shooting, the effect of shooting and the quality of picture, sound and scene of post-production video. High-quality video is one of the most important elements of the course construction of flipped classroom based on MOOC.

Before the online of MOOC course, there are still a lot of preparatory work, including web pages design, filling the questions database and assignments database, etc. When the whole MOOC course is offered to the students, the teachers need to carry out daily online course maintenance, including regular unit issuance, homework issuance, organizing discussion and answering questions online, etc.

Students are required to watch videos and other resources provided by the teachers, participate in discussions in the forum, or participate in exchanges and interactions among local discussion groups, and complete assignments and tasks assigned by the teachers. In view of the problems existing in the learning process, students can solve them by communicating with their classmates, teachers or other learners who are interested in learning, or by asking questions in class.

Teaching quality control security system of MOOC-based flipped classroom teaching method

Relevant components analysis of teaching quality control

The meaning of the term "quality standard" originates from the field of production and refers to the important

basis for the formulation of specific institutions to ensure the production, inspection and quality evaluation of products. Then it was cited in the field of education. As for the definition of course quality standard, it is considered that course quality standard is the scientific basis, action guide and goal of course teaching, and it is also an important means to measure the quality of course construction. Therefore, as an online course in university curriculum, MOOC is also of vital importance to establish course quality standards with its own characteristics.

At present, the most concerned evaluation criteria for the quality of MOOC courses are the Quality Matters of the United States and the open up Ed quality label of Europe. The quality standards of the United States had undergone four revisions so far. Today's quality standards for MOOC mainly include eight first-level indicators, namely, course overview and introduction, learning objectives, evaluation and test, teaching resources, learning interaction and participation, course technology, learner support and accessibility. Therefore, when we construct the security system of the teaching quality of MOOC, we mainly include two aspects: one is the evaluation of the teaching quality of MOOC with teachers as the main body of evaluation, the other is the evaluation of the learning effect of MOOC with students as the main body of evaluation.

Relevant components of MOOC teaching quality control should include the following aspects:

The evaluation indicators should be scientific. The following principles should be emphasized in the formulation of the evaluation indicator of the teaching quality of MOOC. The first one is the directionality principle. The evaluation of teachers' teaching should be consistent with the educational policies issued by higher education administrative departments, which is conducive to improving the quality of teachers' teaching and enhancing the competitiveness of universities. The second one is the comprehensiveness principle. The evaluation of teachers 'teaching quality in MOOC includes not only traditional evaluation indicators such as teaching attitude, teaching content and teaching methods, but also teaching team and teaching technology. The third one the feasibility principle. Because various factors such as manpower, material resources and financial resources should be taken into account in the process of evaluating the teaching quality of MOOC, the evaluation indicator of teaching quality of MOOC should be very simple, practical and operational. The fourth one is the scientific principle. Each teaching quality evaluation indicator is independent from each other, so as to ensure the reasonableness of teaching quality evaluation results.

The evaluation content should be diversified. Due to the great difference between the MOOC and the traditional course, first of all, in the evaluation of teachers, MOOC emphasizes learners' autonomous learning, and pays attention to the communication and interaction in the course of learning. Therefore, we should pay attention to the evaluation of the teaching quality in the aspects of teacher's teaching interaction, the clarity of teaching videos, the making of teaching courseware and the integrity of teaching materials. Secondly, in the aspect of student evaluation, colleges should not only measure students' learning situation by examination results, but also consider the whole process of students' learning. In addition, the evaluation of students 'learning quality should not only pay attention to the learners' knowledge mastery, but also to the changes of students' higher-level skills, emotional attitudes and so on.

Evaluation methods should be variety. On the one hand, in the subject of teaching evaluation, besides teachers' self-evaluation and students' self-evaluation, teaching evaluation activities are conducive to

comprehensive understanding and reflection of teachers and students. There are also many evaluation subjects in the teaching evaluation of MOOC. Different subjects can evaluate from different angles, which can make the evaluation results more objective. On the other hand, in the form of student evaluation, we should not only take course tests and examinations, but also adopt more realistic evaluation methods, such as the completion of course tasks, the number of interactive discussions among students and so on. We should evaluate the learning effect of learners by synthesizing various contents.

Table 1
The Specific Indicators of Teaching Quality Control Security System

First-level indicators	Second-level indicators	Indicator connotation
Teaching team (15 points)	Lecturer (10 points)	The main observation points are teaching level, academic level and teaching experience.
	Team members (5 points)	The main observation point is the overall structure of the team.
Teaching content (25 points)	Course introduction (5 points)	The main observation points are the basic contents of the course.
	Course objectives (5 points)	The main observation points are rationality and clarity of objectives.
	Teaching plan (5 points)	The main observation points are the rationality and completeness of the plan.
	Teaching syllabus (5 points)	The main observation points are systematic and clear outline.
	Teaching interaction (5 points)	The main observation points are the number and form of interaction.
Teaching skills (15 points)	Teaching attitude (5 points)	The main observation points are the enthusiasm and correctness of attitude.
	Teaching method (5 points)	The main observation points are teaching methods used.
	Teaching tool (5 points)	The main observation point is the modern educational technology means used.
Teaching resources (10 points)	Textbook (5 points)	The main observation point is selection and construction of textbooks.
	Teaching materials (5 points)	The main observation point is selection and construction of teaching materials.
Course anagement (25 points)	Course test (5 points)	The main observation point is the form and difficulty of the test.
	Coursework (5 points)	The main observation point is the form and difficulty of the coursework.
	Course discussion (5 points)	The main observation point is the form and difficulty of the course discussion.
	Course examination (5 points)	The main observation point is the form and difficulty of the course examination.
	Course certificate (5 points)	The main observation point is the acquisition and use of certificates and credits.
Policy support (10 points)	Institutional support (5 points)	The main observation point is the construction and effect of the system.
	Financial support (5 points)	The main observation point is the matching of funds.

Construction quality standard of teaching quality control

According to the characteristics of MOOC, the evaluation indicator system of MOOC abroad is studied and

analyzed, teaching quality control security system of MOOC-based flipped classroom is constructed. It mainly includes six first-level indicators and 19 second-level indicators, such as teaching staff, teaching content, teaching skills, teaching resources, course management and policy support. The observation points of scoring are established for each indicator. The specific indicators of teaching quality control security system are shown in Table 1.

According to the established course quality standards and the total score of each course, the course quality is divided into four grades: excellent, good, qualified and unqualified. 90-100 points is excellent, 80-90 points is good, 60-80 points is qualified, those below 60 are not qualified.

Teaching application of teaching quality control security system

According to the proposed teaching quality control security system, a questionnaire survey was conducted among the students studying MOOC in two universities. Questionnaires are mainly distributed and recovered face-to-face and combined with electronic distribution and recovery. A total of 860 questionnaires were distributed. The questionnaire recovery rate is 95.2%, and the questionnaire efficiency rate is 89.7%.

Retest method was used to test the reliability of the questionnaire, the specific method of operation is to randomly select 20 students from two universities for two tests, and we send out questionnaires at 15 days intervals before and after the two tests. The subjects of the two questionnaires are the same. Finally, all the questionnaires were collected, and the correlation coefficients of the two questionnaires (84% and 82% respectively) were R1 = 0.89 and R2 = 0.87, respectively, which showed that the reliability of the questionnaires was high and the questionnaires were credible.

The gender and grade distribution of the respondents is shown in Table 2. It can be seen that the number of male and female participating in the survey is relatively small, covering all grades from freshman to senior, which is more reasonable.

Table 2
Gender and Grade Statistics of Student Samples

Grade Gender	**Male**	**Female**	**Total**
Freshman	76	68	144
Sophomore	158	159	317
Junior	116	169	285
Senior	**7**	12	19
Total	357	408	765
Percentage	46.7%	53.3%	100%

As an online course different from traditional courses, many people will pay attention to the learning effect of students in MOOC course. A survey on the effect of course quality was conducted among the students studying MOOC course, the results of the survey are shown in Figure 2.

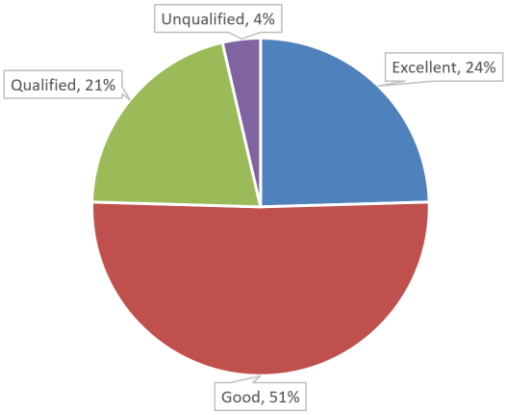

Figure 2. Quality evaluation of students for MOOC course

The ranking results of the influencing factors on course effectiveness are shown in Figure 3. According to the results of the survey, the students believe that teaching content and teaching resources play a key role in the learning effect of the MOOC course. Due to the higher requirement for learners 'autonomous learning ability, teachers' less interaction and inadequate guidance will affect the learning effect of the MOOC course. The second important factor is course management, such as the upload of teaching materials and the operation and management of courses, it will affect students' learning effect. Therefore, for students who are not motivated enough to learn, it is important for universities to strengthen and establish a sound teaching monitoring and security system. For learners, no matter what type of course, the most important thing is that learners themselves spend more time and energy to master the learning methods in order to achieve the desired results.

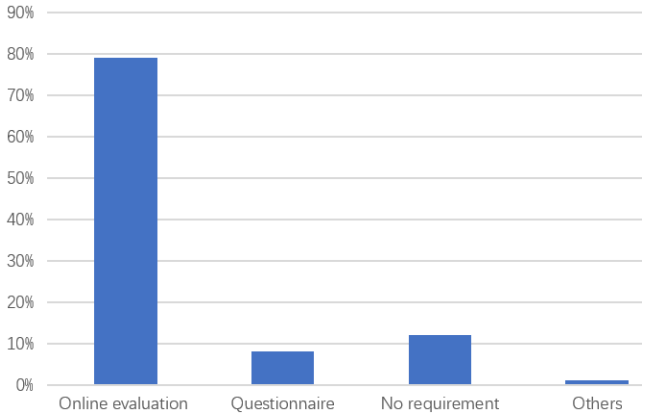

Figure 3. The ranking of influencing factors on the quality of MOOC course

The results of the survey on the evaluation methods of the teaching quality of MOOC are shown in Figure 4.

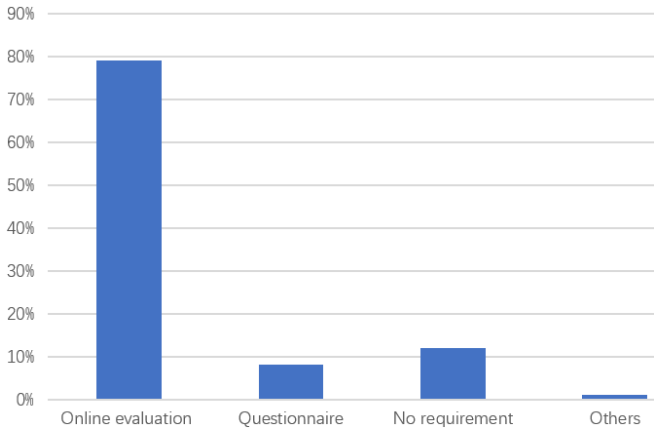

Figure 4. The method of students' evaluation for teaching quality of MOOC

Conclusions

Under the general trend of educational informationization, how to create, use and manage high-quality teaching resources is an unavoidable problem. As a new teaching mode that changes the traditional roles of teachers and students, flipped classroom is a kind of classroom teaching form being explored in university teaching reform. Through the flipped classroom, a student-centered and autonomous research-based learning is established. Using MOOC + flipped classroom hybrid learning, that is, the combination of online and offline learning, it can better mobilize students 'learning enthusiasm and cultivate students' autonomous learning ability. Security system of flipped classroom based on MOOC can guarantee the effectiveness of the implementation of this model.

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