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Research on Circuit Teaching Based on Flipped Class in MOOC Era

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Abstract
MOOC can solve the problem of uneven distribution of educational resources, and flipped class transforms teacher-centered teaching mode into student-centered learning mode,emphasizing the "Learning outside the classroom,Practice in the classroom."and the combination of the two method, can realize the complementary advantages .This paper discusses the necessity and feasibility of integrating MOOC and flipped classroom in circuit teaching, and designs a flip classroom teaching mode based on MOOC, which can provide reference for the related teaching of the same time.

Keywords
Circuit,MOOC,flipped class,online teaching platform, mixed teaching mode

I. Introduction

MOOC (Massive Open On-line Course) is a networked, platformized, resource-based, open, shared, and interactive teaching model. Content-sharing-centered curriculum resources are upgraded to a learning-centered open curriculum, with open accessibility and scale scalability being the main features. In 2012, Udacity, Coursera and edX three global MOOC platforms were established. In China, Tsinghua University and Peking University cooperate with edX in the United States, Fudan University and Shanghai University cooperate with Coursera in the United States. Beijing Normal University cooperates with the MOOC team of the University of Upton in the UK to build an open MOOC course platform to achieve online quality courses. Sharing and implementing MOOC-based education and teaching reform.

Flipped Class, based on information technology, produces instructional videos through educational technology to enable students to complete knowledge acquisition before class and teachers to provide opportunities for students to learn and communicate by providing opportunities for students to achieve knowledge. Learning, which influences the learning environment of students, and makes students become a new teaching mode for the masters of real learning.[1]。It happens to reverse the traditional teaching mode, so it is called "flip classroom". The circuit is an important professional basic course of electrical engineering. It has many contents and less class hours. Since 2013, the school has applied the concept of flipping classroom to the teaching of circuits, and it has achieved initial results. Teaching micro-video, course boutique website, online teaching exchange platform, online self-test assessment platform have been completed, in the face of the impact of MOOC on the traditional teaching methods of colleges and universities, this paper discusses the integration of online learning and flipping classroom teaching in the "circuit" teaching. The necessity and feasibility of the design of the flip classroom teaching mode based on the MOOC.

II. Necessity analysis

MOOC is characterized by large-scale and open-ended, free and free access to resources, breaking the limitations of time and space, and its emergence will bring a digital, networked, globalized historical change to higher education worldwide. However, there are obvious deficiencies in the MOOC. First of all, there is a lack of control over the students, and it is difficult for students to maintain their interest in learning[2]. Second, face-to-face communication is absent. In addition, the learning experience is incomplete, the learning effect is difficult to evaluate, and academic integrity is difficult to guarantee.[3]。 It can be seen that online learning based on MOOC can not only completely replace school classroom teaching, but also need to integrate into the flip classroom, and establish an online and offline mix of resource sharing, student self-learning, teacher supervision, and face-to-face interaction between teachers and students. Teaching mode. The "Circuit" course is a basic course for university students. However, due to differences in schools, teachers, and geography, the degree of education received by college students is uneven. The emergence of the MOOC can provide students with a wider range of high-quality resources, overcome the limitations of time and space, and be able to learn the platform of their thoughts even if they are not in their school, especially to be able to learn the explanations of foreign teachers, the absorption of knowledge and Understanding has a great help.

III. Feasibility analysis

"Circuit" course construction has achieved good results in many universities, and our school applied for the Shandong Circuit Excellence Course in 2011, adding video teaching, online Q&A, online testing, simulation lab, etc. on the basis of the original teaching. With sufficient resources, integrating and sharing resources can form a new environment of three-dimensional participation media, providing a wide platform and a good opportunity for the combination of MOOC and flip classroom mode. The research of flipping classrooms in circuit teaching has been carried out in various colleges and universities, and has achieved stage results. Since 2014, our school has adopted a flipping classroom teaching mode for part of the circuit, selecting knowledge points, making micro-videos and electronic teaching materials, creating communication platforms, pre-class/in-class/after-school post-class interactions, after-school testing, and learning. The effect is good and the enthusiasm of the students is unprecedented.

The flipping classroom has changed from a teacher-centered teaching model to a student-centered learning model, emphasizing "learning outside, learning", micro-course videos, online courses, social software, etc. can be used to flip the classroom.[1] With the platform of MOOC, you can take the world's quality courses

and achieve a wider range of resources. In the world of MOOC, the video course is divided into micro-courses of 10 minutes or less. There are many small problems interspersed and connected. Only the correct answer can continue to attend classes, just like the customs clearance design in the game, which can mobilize students to the greatest extent. The enthusiasm of learning. Based on this, this study proposes the basic framework of the flip classroom teaching model based on the MOOC, as shown in Fig. 1.

1) Front end analysis

The front-end analysis takes the teacher as the main line, including analyzing the teacher's own teaching philosophy, teaching ability and teaching conditions, so as to select the teaching content; also includes analyzing the learner's learning ability, learning environment and related knowledge links, and making reasonable calculations. Applicable to the teaching objectives, syllabus, teaching content and assessment outline of the MOOC.

2) Online teaching platform

The online teaching platform is spread out and interspersed with two main lines. Teacher online activities mainly include recording and publishing micro-videos, publishing PPT and electronic lesson plans for the course content, optimizing and integrating various teaching resources, then classifying learning groups according to the learner's situation, assigning learning tasks, setting problem levels, and formulating Evaluation criteria, participation in online Q&A and guidance.

The learner's online activities include completing the video learning of the MOOC, answering the customs clearance questions, participating in the MOOC forum or group discussion, and communicating with the classmates, teachers and other learners in the forum for the problems existing in the study, and then completing the homework and testing.

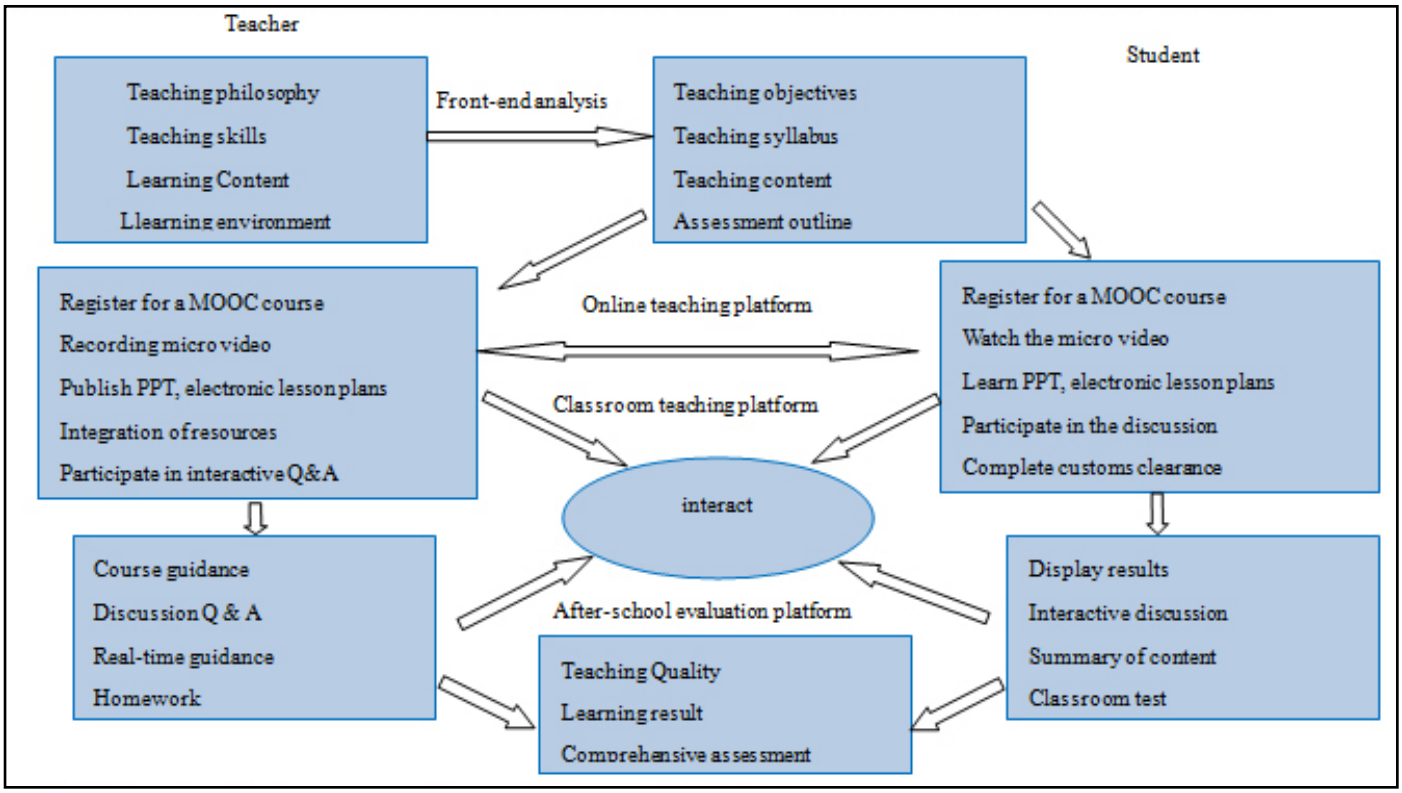

Fig.1 Based on the classroom teaching mode framework of MOOC

3) Classroom teaching platform[4][5]

This is the key to the successful implementation of the flipping classroom. It truly transforms from a teacher-centered to a student-centered, testing the wisdom of teachers and their teams. First of all, the teacher has an accurate grasp of the teaching objectives, teaching priorities and teaching difficulties of this lesson. Secondly, according to the online teaching platform, the learners are clarified, the difficulties and key points are reorganized, the curriculum guidance is guided, and the appropriate classroom organization form is selected. For the characteristics of the "circuit" itself, the organizational forms that teachers can adopt include:

(1) Role Interchange Method: In the process of teaching, the student temporarily acts as a teacher, and the teacher temporarily acts as a student, giving the initiative of the class to the students, allowing the students to fully participate in the classroom teaching.[1]。 For example, the equivalent transformation of the second chapter of the resistance circuit, the knowledge points are more, but relatively shallow, the series and parallel connection of resistors have been learned in high school. On the online teaching platform, the teacher divides the chapter into the equivalent of resistance string/parallel, the equivalent transformation of star/triangle, the equivalent transformation of voltage source/current source, and the input resistance. The micro-video, PPT The form of electronic lesson plans is released to students. In the classroom, let the students give a 10-15 minute explanation in the form of a group report. The students will conduct mutual evaluation, and the teacher will act as a comment, correct and supplement in time, and then make a summary review .

(2) Example explanation: The general method of analyzing circuits in circuit analysis is more systematic, but it is ever-changing in real applications. For example, in Chapter 3, the

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general analysis method of the resistance circuit, the mesh current method, the loop current method, and the node voltage method are difficult to master. After completing this part of the content, post an example on the online teaching platform, let everyone think about how to use these three methods to answer at the same time. In the classroom, three methods are used to explain, and then students are asked to discuss the advantages and disadvantages of the three methods. Finally, each group is asked to summarize the differences in the application of the three methods.

(3) Inductive deduction method: There are some common rules in circuit learning to guide students to discover the law. For example, in the time domain analysis of the first-order circuit in Chapter 7, after learning the three-element method of the RC transient circuit, the RL circuit can allow students to reason and interpret themselves, and then let the students demonstrate the results of the exploratory research. The test results were used in the field to test the results.

In addition to this, debates, competitions, etc. can be used. In short, in the flipping classroom, students become the main body of classroom teaching, and teachers become auxiliary roles. However, the importance of teachers has not diminished. In addition to paying attention to the design planning of the online learning platform and proper guidance in the class, it is also necessary to summarize and discover the weak points of students' knowledge structure through online and offline. The form is answered. Teachers need to have higher moral cultivation, professional cultivation, and stronger sense of responsibility, and they need to spend more time and energy.

4) After-school evaluation platform

After-school evaluation includes both evaluation of teachers and evaluation of students; both online and offline evaluations; both quantitative and qualitative evaluations. The focus of the evaluation should be on changing or promoting the content of teaching reform, such as the advantages and disadvantages of teaching resources, whether teaching activities and teaching methods are appropriate, whether it can mobilize students' enthusiasm for learning, and whether it is conducive to students' understanding of knowledge. Then the results are fed back to the front-end analysis, and the re-integration of various resources and methods is carried out.

IV. Circuit learning based on MOOC

After considering the students' actual level, the MOOC course and the curriculum resources of the school, this course selects Dr.BonnieH.Ferri's MOOC course "Cours" from the Coursera platform."Apply in teaching. This course is taught at 80 hours. After one semester of study, in order to understand students' perceptions of this teaching model, a questionnaire survey was conducted at the end of the semester. Top 10 of the questionnaireThe question is the five-level scale, and the last question is the open question. "What do you think is the biggest advantage of this type of teaching? What is the biggest deficiency? How to improve? To ensure the objectivity of the data, the survey was conducted in an anonymous form. For ease of analysis, all items are sorted by score mean, as shown in Table 1.

Table 1: "Study on the Application of Teaching Mode in the Teaching of Circuit Teaching in the Background of MOOC Class"

Item	Description of the item	Average score
2	The resources provided by MOOC are helpful for circuit learning	4.28
4	Satisfaction with the teaching design of the teacher	4.22
1	The learning experience of this course will help improve the self-study ability of English	4.13
5	The rationality of the teacher evaluation system	4.10
3	Interaction, communication and cooperation with classmates in class	3.98
9	Continue to take similar teaching methods and courses	4.62
7	Satisfaction with the teaching design of MOOC teacher	4.54
6	The effect of online interactive communication in the MOOC class discussion area	4.26
8	Rationality of the assessment mechanism of the MOOC course	3.91
10	The rationality of the mutual evaluation mechanism of the MOOC operation	4.90

Through the analysis of the questionnaire, it can be seen that the students highly recognize the learning resources provided by the MOOC course to help them learn, but the evaluation of the mutual evaluation mechanism, online interactive communication and the examination of the MOOC course. The mechanism and the teacher's teaching design are not satisfied. Due to the lack of supervision, learning and homework evaluation are all done by students themselves. It is difficult to concentrate because of the lack of interaction when watching videos. When peers are evaluated, some students will perfunctory things; teachers have no more design for the course. Experience can be used for reference, and it is inevitable that there will be omissions. Despite this, students are very much encouraged to introduce the way of MOOC to the classroom, to obtain more information, to effectively develop self-learning ability, and to improve their English application ability. The results of the questionnaire reflect the lack of the new thing in the class, but also the direction of improvement. I believe that it is one of the directions of university teaching reform to integrate the MOOC and the flipping classroom to make the two complement each other.

V. Conclusion

At this stage, MOOC is not likely to replace traditional higher education. After all, the "temperature" teaching of campus is difficult to replace online courses. However, taking the MOOC as an opportunity, accelerating the fundamental changes in university education and management, and achieving the integration of the two is an important gesture. The flipping classroom in the background of the MOOC has put forward higher requirements for teachers and students. For example,

teachers should have a stronger sense of responsibility, multi-method integration of teaching ability, teamwork ability, and science and education integration ability. Students' passive learning is active learning, with self-motivation, self-discipline, and self-regulation. Let the MOOC enter the study of university circuit, let the flip classroom be used in classroom teaching, make the classroom content connect with the world, and make sufficient preparation for cultivating international Chinese college students.

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