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# Development and Research of Flipped Classroom Based on Modern Information Technology and MOOC

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***ABSTRACT.*** *In recent years, with the development of education information, MOOC as a new teaching mode has received widespread attention at home and abroad, however, MOOC has some limitations .Based on modern information technology and MOOC, this paper introduces flipped classroom and PBL project-based teaching mode to form an optimized combination and create a dynamic and efficient high-quality classroom. This paper puts forward the teaching mode of flipped classroom based on modern information technology and MOOC, and applies it to the teaching design of engineering courses.*

***KEYWORDS:*** *Modern information technology; MOOC; Flipped classroom; Pbl; Teaching mode*

## 1. Introduction

Educational informationization has become the consensus of global educational reform and development. The Internet can provide massive educational resources for learners. Building and making good use of online educational resources can not only meet learners' personalized learning needs, but also promote the whole society to update educational concepts and innovate educational means. At present, the curriculum teaching mode of colleges and universities all over the world is undergoing a historical change of digitalization, networking and globalization.

In recent years, MOOC (Massive Open Online Course) has been popular all over the world, which has a profound impact on reshaping global education. However, MOOC teaching has some limitations, but flipped classroom can solve this problem.

## 2. Research and Development of MOOC

MOOC is a kind of online classroom that aims at the public to learn through the Internet through open education resources.In recent years, MOOC has been popular all over the world, which has a profound impact on reshaping global education. MOOC curriculum has also received great attention in China. By 2018, the number of online MOOCS in China has reached nearly 10000, becoming an important way to realize the internationalization of higher education. At present, China's total number of MOOC, number of participating schools and number of learners are all in the leading position in the world, and China has become the world's largest MOOC country. More and more middle school students begin to use MOOC to study university courses in advance. The new online education model represented by MOOC provides unprecedented opportunities and help for those young people who have strong desire to learn. However, there are some limitations in the simple MOOC teaching, such as the traditional teaching mode, the lack of face-to-face communication, the incomplete learning experience, the difficulty in evaluating the learning effect and the difficulty in ensuring academic integrity.

## 3. Research and Development of Flipped Classroom

Flipped classroom refers to readjusting the time inside and outside the classroom and transferring the decision-making power of learning from teachers to students. In this teaching mode, students can focus more on active learning in the precious time in the classroom, research and solve more in-depth and more challenging problems, so as to get a deeper understanding. Teachers no longer occupy the time of class to teach information, which requires students to complete self-study before class. They can watch video lectures, listen to podcasts,

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read e-books, discuss with other students on the Internet, and consult the materials they need at any time. Teachers also have more time to communicate with everyone. After class, students plan their own learning content, learning rhythm and learning style, while teachers use teaching method and collaborative method to meet the needs of students and promote their personalized learning, whose goal is to let students get more real learning through practice.

The traditional teaching mode is that teachers give lectures in class, assign homework, and let students go home to practice. Different from the traditional classroom teaching mode, under the “flipped classroom teaching mode”, students complete knowledge learning at home, and the classroom has become a place for interaction between teachers and students and between students and students, including answering questions and solving doubts, using knowledge, etc., so as to achieve better education effect. The popularization of Internet and the application of computer technology in the field of education make the “flipped classroom” teaching mode feasible. Students can use high-quality educational resources through the Internet instead of relying solely on teachers to teach knowledge. The role of the classroom and teachers has changed. Teachers have more responsibility to understand students' problems and guide them to use knowledge. The interaction between students and teachers is more personalized, and teachers' guidance to students is more targeted.

## 4. Flipped Classroom Based on MOOC

There are some defects in the simple MOOC teaching, such as the traditional teaching mode, the lack of face-to-face communication, the incomplete learning experience, and the difficulty in evaluating the learning effect. However, flipped classroom can make up for the shortcomings of MOOC and become the focus to solve these limitations. Therefore, the sustainable development of MOOC needs to be realized by flipped classroom.

The flipped classroom based on MOOC can meet the individual needs of students. Students can complete the learning of course related knowledge before class, and can choose different levels of related resources according to their own characteristics to expand and deepen the knowledge points. In order to deepen the understanding of knowledge and seek solutions to practical problems, we can choose different topics or projects to carry out in-depth discussion in class. MOOC deconstructs the teaching and learning behavior chain in the traditional classroom face-to-face communication system, reconstructs the interaction system based on the Internet, and realizes the linkage of platform, teachers, learners and learning resources. The orientation of MOOC has realized the upgrade from curriculum resources centered on content sharing to open courses centered on learning. By changing the traditional teaching process, flipped classroom requires learners to complete the independent learning of knowledge points based on video and other educational resources before class. In the classroom, teachers and students mainly conduct interactive Q & a discussion, which brings about the advance of knowledge transfer and the optimization of knowledge internalization, thus realizing the role reversal of teachers and students in traditional teaching. They should be combined organically, develop their strengths and avoid their weaknesses, break the passive and dependent teaching mode of students, cultivate and improve their innovation ability, independent thinking ability, learning ability and execution ability.

For engineering students, excellent professional quality is the ability to survive in the future. The mastery of professional quality should be guided by solving practical engineering problems, which requires students not only have professional theoretical knowledge, but also have high practical ability. Using the flipped classroom teaching mode based on MOOC and PBL project-based teaching mode, the rich online courses before class make students fully independent in learning and accumulate rich professional background knowledge. Students in class can choose to participate in classroom cooperative exploration activities, further deepen professional knowledge through discussion, exchange, evaluation and other learning activities between teachers and students, and carry out practical training to transform pre class accumulation into engineering practice, and conduct in-depth discussion and thinking again for problems encountered in the practice process. This will realize the expansion and internalization of knowledge system, and then realize the application practice of knowledge externalization by solving practical problems, so as to realize the application of knowledge and independent innovation.

## 5. Design of Teaching Mode--Taking Engineering as an Example

### *5.1 Pre-Class Instructional Design*

Make full use of the advantages of MOOC and flipped classroom, optimize the combination of MOOC and flipped classroom, and create a dynamic and efficient high-quality classroom. First of all, according to the training objectives of the course and the characteristics of students' learning, the teaching objectives and contents

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are defined. Then, based on the diversified, multi-dimensional and all-round knowledge sources such as actual project demonstration and construction process video, we will create professional MOOC resources with strong professionalism, wide range of knowledge, diverse forms and strong interaction for students to accumulate professional knowledge before class. In addition, we should pay attention to the needs of different levels of students for professional background knowledge to achieve differentiated teaching and personalized teaching. Rich online MOOCS make students fully independent in learning, so the requirement for learners' autonomous learning ability is higher. To ensure the effect of students' autonomous learning in the virtual learning environment, we must design a rich online activity and assessment guarantee system, such as watching MOOCS course video and completing the corresponding homework or task. In view of the problems students encounter in the learning process, teachers should also undertake the work of online Q & A and guidance. For the more concentrated and valuable questions put forward by students, teachers can systematically answer them in the form of text or micro video. After the completion of online learning, the online test is completed and an evaluation report is formed to feed back the learning effect, which is convenient for students to find out and fill in the gaps.

### *5.2 Design of Classroom Instruction*

Classroom teaching is mainly a process in which students raise questions, solve problems and internalize knowledge. It is also a process in which teachers make full use of such elements as situation, cooperation and practical training to give full play to students' subjectivity and organize and guide students to solve problems. Teachers should carry out project-based inquiry class or problem-based discussion class according to the unit content and the problems existing in students' online MOOC learning process. Teachers should sort out and strengthen the difficulties or key points appropriately according to the students' online learning situation; or group the students to show the results of the tasks assigned by the teachers in the form of reports, debates, competitions, etc.; or organize the students to discuss and deepen the relevant issues; and then carry out the practice and practice of the actual engineering projects. The exploration and discussion in the classroom is the soul of the teaching mode, which is the fundamental reason for it to subvert the traditional teaching method which is mainly taught by teachers.

### *5.3 Pbl Project Teaching Mode*

PBL (project-based learning), also known as “project-based teaching”, is a kind of teaching method that enables students to carry out research and exploration for a period of time and devote themselves to solve a complex problem, difficulty or challenge with innovative methods or solutions, so as to acquire new knowledge and skills in these real experiences and experiences. The purpose of PBL teaching method is to cultivate students' creative thinking, innovative ability, independent learning ability and critical thinking ability.

The training goal of engineering students is to cultivate professional application talents. The mastery of professional quality should be guided by solving practical engineering problems. Using the flipped classroom teaching mode based on MOOC, combined with PBL project-based teaching mode, design and introduce practical engineering projects, focus on training students' practical ability and professional practice ability, so that students can solve a certain challenging problem in a real situation. The classroom takes the real practical engineering cases as the starting point to stimulate the students to solve the practical engineering problems with the extensive knowledge background accumulated by MOOC before class. In the process of practice, they will encounter difficulties or challenges, mainly in the form of group discussion and brainstorming to solve the problems, so as to deeply stimulate the students' high-level thinking, creative thinking and innovation ability. Through the process of discussion, analysis, debate and verification, students can realize deep understanding of knowledge points and complete practical application.

The flow chart of teaching design of flipped classroom based on MOOC is shown in Figure 1.

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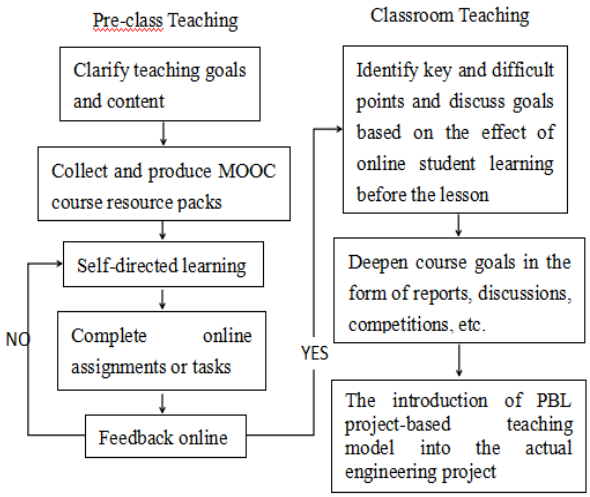


*Figure.1 Instructional Design Process of Flipped Classroom Based on MOOC*

## 6. Conclusion

It is an important goal of higher education to deepen the reform of teaching system and cultivate innovative and applied talents to meet the development requirements of the new era. The popularity of MOOC has a profound impact on the reconstruction of global education, and also brings new opportunities and challenges for higher education reform. Based on the limitations of MOOC itself, flipped classroom has become the focus to solve these limitations. Therefore, the sustainable development of MOOC needs to be realized by flipped classroom. The flipped classroom based on MOOC combines the advantages of MOOC and flipped classroom, and introduces PBL project-based teaching mode to create a dynamic and efficient high-quality classroom, so as to cultivate students' self-study ability, independent thinking ability, innovation ability and practical application ability. It can better promote the reform of higher education system and make a positive contribution to the training of high-quality talents and the construction of engineering and other disciplines.

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