Research and practice of microcourse teaching in College Mathematics under the mode of flipped classroom teaching

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Abstract: With the rapid development of social economy in our country, College Mathematics has been greatly reformed to a certain extent. In the actual teaching process, it is very important for the students to stimulate their interest in mathematics learning and to cultivate their inquiry ability through the active practice of the flipped classroom teaching mode and the teaching in the form of microcourses. Therefore, Advanced Mathematics education needs to strengthen the application of microcourse teaching form.

1. Introduction
In College Mathematics teaching, it is helpful for students to cultivate their own choice through the integration of flipped courses. Based on this, students can understand the concepts and theorems in Mathematics more deeply. Under the guidance of the flipping course, the students can further preview the teaching content, and when teachers are designing microcourse, students can further preview the learning content of teaching materials before classes. In the design of micro-class, teachers can also have enough time to further explain the connotation and development of mathematical concept theorem, so that students can fully experience the emergence and development of mathematical concept theorem.

2. Introduction to flipped classroom mode
The so-called micro-class, whose carrier is micro teaching video, is specially designed according to the subject knowledge, the teaching method is mainly online network video. The flipped classroom originated in the United States, and the creator was a teacher of a school. In the process of creating, he found that the students’ interest in learning mathematics could be maximized by using micro-video in the process of making up classes for students who were absent from class. Students' learning effect has been improved significantly, so this teaching method has been effectively promoted. After that, some people began to do in-depth research on the flipped classroom. For example, in 2007, American Salman Khan specially established the Khan Academy website and placed more than 2,000 video courses on the website to facilitate students to learn online, thus effectively promoting the flipping class.

Flipped the classroom can effectively reform the traditional classroom teaching method, it can combine the learning knowledge in class with the after-class knowledge, and then reverse the teaching design. With the help of the network, the students can be provided with a certain amount of video online, so that the students can effectively consolidate the knowledge they have learned through online exercises. Teachers can answer questions about students online, which is an effective way of tutoring. teachers need to focus on the students in teaching, while students in the development of online learning can be in accordance with their own interests and personality characteristics, so as to help profoundly change the roles of teachers and students.
Before class, students can carry on the self-study by watching videos. In class, teachers only need a little guidance so that students can understand it. Teachers are mainly responsible for the guidance work and can truly answer questions and dispel doubts in the process of active communication and interaction with students [1].

Since the 21st century, more and more scholars began to study the teaching mode of flipped classroom, which greatly promoted the mature development of the teaching model and gradually got a strong promotion. The teaching work of microcourse in flipped classroom can divide each course into many knowledge points, and then complete a video recording for each knowledge point, that is, a video fragment of microcourse. The teacher is responsible for placing the video on the web for students to communicate and learn to help them digest and absorb what they have learned. In western society, this model has been widely respected and promoted the remarkable improvement of teaching quality.

3. The function of Microcourse in College Mathematics
In recent years, with the development of science and technology, information technology develops rapidly and is widely used in various fields of society. Its development complements with the Internet and is the carrier for people to carry out mobile learning, which is very consistent with the demand of students and social scholars for learning at present. It is actually a small piece of each skill and knowledge point in a course, with the following advantages:

3.1 Short time, short and concise, accurate
The video of the microcourse is relatively short, with a limit of 5 to 20 minutes, so try to use the least amount of time to explain all the knowledge points clearly. It's not a video lesson or a curtailment of knowledge points in a class, it focuses on making clear each knowledge point and solving each problem in the least time. At the same time, this time point coincides with the point at which the students concentrate. Usually for 5 to 20 minutes. In addition, the advantages of mobile internet can be brought into full play. for example, students prefer "fingertip" learning.

3.2 Videos are more attractive.
Microcourse uses various multimedia technologies to make videos, making full use of sound and animation, and the picture is very rich. to some extent, it can dilute the body language of teachers, and the teaching effect can be highlighted by sound, so that students can keep up with the rhythm of the lecturer, and finally can better digest and accept knowledge points.

3.3 Diverse learning groups
The key to learning microcourse videos is not whether they are college students or whether they master relevant basic knowledge, but to focus on the achievement of a certain learning goal. Therefore, teachers are required to explain accurately, vividly, concretely and clearly, and the emphasis is to provide individualized guidance according to the characteristics of each learner.

3.4 Establish one's own system
If a course wants to be uploaded to the internet in the form of microcourse, it needs to pay attention to the decomposition of the course, divide it into several knowledge points, and record videos accordingly, thus contributing to the formation of the video of the whole microcourse, furthermore forming mooc content for the construction of College Mathematics classes.

In a word, it plays an important role in the construction of College Mathematics class by recording the video of microcourse. First, by recording video animation, we can increase the vividness and visualization of knowledge points, and stimulate students' interest in learning mathematics to the maximum extent. Second, greatly improve the requirements of teachers, when uploading the produced video to the internet, it is necessary to accurately impart knowledge points, and it has a broad field of vision and a wide range of knowledge points. Third, teachers need to keep up with the trend of the
times, to strengthen the learning of multimedia production technology, to ensure that high quality video can be produced. Fourthly, through the implementation of microcourse videos under the flipped classroom mode, it is to a great extent helpful to build a good teacher-student relationship and facilitate better exchange and communication between the two sides on some issues. By watching the video before class, students can get a general understanding of the contents of the curriculum. Based on this, the teacher can explain the problems in the classroom and achieve twice the result with half the effort. Finally, they can solve the student's existing doubts patiently [2].

4. The application of flipped classroom teaching model in microcourse of College Mathematics
As a new teaching mode, flipping classroom is helpful to fully mobilize students' initiative, stimulate students' interest in learning, and help students get all kinds of effective learning resources in time. Students can play a main role in classroom teaching.

4.1 Changes in Teachers' original teaching concepts and changes in classroom structure
Under the influence of the traditional educational concept, the teaching mode of "teaching with words and deeds" adopted by most mathematics teachers in our country can not adapt to the mode of flipped classroom teaching. In recent years, with the development of the new curriculum reform, in order to adapt to the development of modern teaching, teachers need to change their own teaching concept and establish a student-oriented classroom structure. In organizing classroom teaching activities, students are regarded as guides, which can adapt to the reversed classroom teaching mode and promote the remarkable improvement of Mathematics teaching quality.

4.2 To adopt diversified and humanized teaching methods in the process of guiding students' study
The so-called humanized teaching mainly refers to the people-oriented teaching method, which fully considers the way of thinking and learning of college students. The diversity of teaching methods is to change the expression of classroom teaching to ensure that students can always remain interested in learning. In other words, under the push of flipped classroom teaching concept, teachers need to focus on the students, give full consideration to all aspects of the students' situation, and then choose the appropriate teaching methods.

4.3 Rational utilization of all kinds of teaching resources in and out of Class
The flipped classroom teaching mode itself contains a variety of teaching resources, and the teaching that makes up the whole classroom content is often collected and arranged by the Internet. Therefore, mathematics teachers need to improve their ability to collect and organize teaching resources. In order to promote the enrichment of classroom teaching content, they need to select more interesting teaching content.

4.4 Unification of practice and theory
As a kind of inquiry learning around students, the flipped classroom teaching mode can combine theory with practice organically. Aiming at the problems discovered by students in the process of practice, we can use theoriesto effectively verify them. On this basis, we can use acquired knowledge to correct their own wrong practice behavior, which is helpful to combine theory with practice and promote the formation of virtuous circle [3].

4.5 Improving classroom information density by means of modern multimedia teaching auxiliary tool
There is a high degree of agreement between the flipped classroom teaching mode and multimedia teaching. On the network, we can not only search for learning resources, but also watch learning videos by using computers. Thus, it can greatly improve the information density of College Mathematics class.
5. Teaching strategies of College Mathematics microcourse under flipped classroom mode

5.1 Effective design knowledge
In college mathematics teaching, we need to make full use of the microcourse form. Firstly, teachers need to design knowledge points scientifically and effectively, and design micro-videos according to each knowledge point when the important and difficult points are clear. Each micro-video focuses on the explanation of a knowledge point content. At this time, teachers need to consider how to use easy-to-understand language to explain each knowledge point clearly. The design of knowledge points can lay a solid foundation for the smooth development of micro-lesson teaching.

5.2 Ensure the appeal of video production
The attraction of microcourse to students mainly comes from the attraction of video. Therefore, when designing the microcourse video, we should not only make clear the knowledge points simply, but also ensure the artistic quality of the video design. That is, with the help of various multimedia technologies, the video will be full of rhythm, animation and sound, so that students can effectively absorb and digest knowledge points in the process of watching the video.

5.3 Individualized guidance for students
In microcourse teaching, students can combine their own interests and personality characteristics to carry out individualized learning. In the design of microcourse video, we need to use various resources, and use clear, accurate, vivid and concrete language in the course of lectures, so that effective learning resources can be provided to the majority of students. In College Mathematics education, it is only the first step to start the microcourse teaching mode to make a good microcourses video. Next, we need to explain how to carry out personalized guidance to students and communicate actively with them online, so as to provide sufficient guarantee for achieving the ideal micro-class teaching effect [4].

5.4 Promoting the remarkable improvement of teachers’ professional and micro-course making accomplishment
In order to successfully popularize microcourse in mathematics teaching in colleges and universities, the requirement for teachers is very high. Besides the higher professional accomplishment of mathematics education, the skills of microcourse making must also be high. Therefore, teachers need to continuously learn the multimedia production technology, to promote the continuous improvement of the technical level, to keep up with the trend of the times and update their own knowledge system in a timely manner, and on this basis, to guide students more pertinentl and to answer and explain questions about students more pertinently.

6. Analysis of microcourse in Advanced Mathematics
College Mathematics teaching forms have certain flexibility and diversity, in the process of flipped classroom teaching, teachers can choose the appropriate microcourse form independently according to a certain knowledge point. Taking Advanced Mathematics as an example, this paper makes a teaching video of Lagrange mean value theorem.

6.1 Teaching background
Understand the Rolle mean value theorem, and extend it to the more general case, that is Lagrange mean value theorem.

6.2 Teaching objectives
Understand the conditions and conclusions of lagrange's mean value theorem and know its geometric meaning.

6.3 Key points and difficult points
Use Lagrange mean value theorem to prove equality and inequality. Master the idea of constructing auxiliary function by function deformation to prove the problem.

### 6.4 Teaching methods

Teaching methods include case method, analogy method and multimedia.

The teaching objective is clear, during teaching, teachers can display the geometric meaning of Rolle mean value theorem dynamically with multimedia in the form of microcourse. Through the simple transformation of the graph, the content of Lagrange's mean value theorem can be led out so that students can have an perceptual understanding of Lagrange's mean value theorem. Then we discuss the proof of Lagrange mean value theorem and use reverse thinking to construct auxiliary function to prove it by Rolle's theorem. The conditions and conclusions of Lagrange mean value theorem are emphasized. Then use case analysis to explain how to use Lagrange mean value theorem to prove equality and inequality. Analyze the problem, focusing on the idea of constructing auxiliary functions, so as to guide students to better understand the important role of reverse thinking in proving the mean value theorem [5]. Finally, teachers need to summarize the key points of the whole process when the micromourse video is coming to an end. Using short and pithy videos can help students better prepare and preview before class and through efficient interactive communication in class, they can achieve ideal teaching results.

### 7. Concluding remarks

It is urgent to innovate and design the teaching mode in College Mathematics teaching. At present, the teaching mode of flipped classroom is widely popularized and significant in the field of education, which can better promote the development of education. Through the active practice of this teaching model and the effective design of micro-courses, college mathematics teaching can stimulate the students' learning interest to the maximum extent, and realize the effective development of their autonomous learning and inquiry ability. And it is conducive to the overall improvement of students' mathematical literacy, so as to better train talents.

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**References:**

[1] Change Xiuling. Constructing flipped classroom to improve the teaching quality of College Mathematics [J]. Education Modernization, 2018, 5(18): 213-214.

[2] Feng Qianqian. Research and practice of flipped classroom teaching model of Advanced Mathematics based on microcourse [J]. Science & Technology Vision, 2018(01): 66-67.

[3] Wei Xing. Analysis of College Mathematics teaching mode under flipped classroom [J]. Tax Paying, 2017(33): 197.

[4] Ding Fangqing, Wang Zhongzhi. Reform practice of College Mathematics teaching mode based on MOOCs flipped classroom [J]. Journal of Anhui University of Technology (Natural Science), 2016, 33(05): 81-83.

[5] Wu Hui. The application of flipped classroom based on microcourse in Mathematics teaching in Secondary Vocational School [J]. Training in China, 2016(14): 165+167.