Research and Practice of Micro-course Teaching Mode in the Era of "Internet +"

-- Take the Advanced Mathematics Course as an Example

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Abstract. In view of the "more construction and less utilization" of the micro-course construction, the article took the knowledge point "curvature" as an example to analyze the teaching design of the advanced mathematics micro-curriculum in detail. By putting forward the problems, guiding the inquiry and solving the problem, the enthusiasm of the students' learning was mobilized. This kind of problem-oriented teaching with the student-centered inquiry, could more effectively connect the traditional classroom and the micro-course teaching, so as to achieve the optimal teaching effect.

Introduction

In recent years, micro-course has attracted the attention and research of scholars at home and abroad because of its advantages in various teaching fields, especially the flipping mocro-course teaching mode of advanced mathematics. Micro-course is a kind of classroom form which comes into being in response to the times [1]. In domestic micro-courses of humanities and social sciences, the open courses of network started earlier and the contents were the most abundant. However, the micro-courses of advanced mathematics started relatively late, and few winning works of micro-courses of higher mathematics were found in all kinds of micro-courses competitions. For this reason, we should start from the role of micro-course teaching in the "Internet Plus" era in the development of high-number teaching in the new period, and discuss four problems: the design of mining micro-course, the deepening of example, the application of knowledge and the improvement of classroom efficiency. This will improve the quality of micro-courses in higher mathematics, and enhance the interest and application of the classroom [2-3].

The Importance of Micro-Course Teaching in Advanced Mathematics

Micro-course is the integration of information technology and education technology, and also is an integrated innovation. According to the current research, the technologies related to micro-courses mainly include network teaching platform technology, video courseware making technology, learning and analysis technology, mobile Internet technology, distributed cluster technology, cloud computing and big data technology. The technology closely related to the front-line teachers is mainly network teaching platform technology and video courseware making technology.

First, the network teaching platform refers to the software system which is based on the Internet and provides comprehensive support and service for online teaching. The sharing and super-temporal nature of the network teaching platform can effectively improve the teaching methods of the teachers and the students' learning methods, and greatly improve the information literacy of the teachers and students [4]. By using the improved web-based teaching platform, the fragmentation of learning content and the fragmentation of learning time will be more conducive to the mobilization of learners' spontaneous learning motivation and the regulation of their own learning goals. Second, video courseware making technology should be learned by every micro-course teaching designer so that to improve and innovate the teaching mode. The course requires the teaching form to be the main of the video courseware, and the extension of the teaching content in other media forms. The micro-course is not only a learning resource, but it should also

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have a complete teaching structure, including the teaching content organized by a certain teaching target, and the teaching activity and progress arrangement designed according to a certain teaching strategy [5]. Therefore, how to design the course knowledge point as "a small course that uses less time and clear teaching objective with short content, focusing on explaining the problem, and deeply integrating advanced teaching ideas, methods and means" has become the trend of teaching research in colleges and universities.

Teaching Design of Micro-course of Advanced Mathematics in the Era of "Internet +"

Design principle. A good micro-course, its teaching design is not allowed to be small. In the micro-course design, we need obey the principle of the student-centered, and the "short, small, and delicate". Namely, the video is short, and the capacity is small; moreover, the content is good, and the interaction is strong, so that the initiative of the student's study can be mobilized. The following aspects are shown in the following:

First, in order to define the teaching background, the goal and the teaching process of the micro-course, students should be guided to study according to the teaching goal.

Second, in the design of micro-course, the questions should be asked properly. The basic questions, the unit questions and the core questions should be arranged properly, and a variety of questions should be flexibly used to promote the students' thinking.

Third, we should pay more attention to the design of teaching activities and strategies, but not to the teaching of teaching contents.

Design content. In order to further explain the teaching model of advanced mathematics based on micro-course set up by our research group, the author takes the knowledge point "curvature" as an example, and introduces the teaching design method of high-number micro-course in detail, as shown in Table 1.

Table 1 Teaching Design of Curvature Micro-course

Direction	Task and content
Teaching background	The curvature is the last section of the third chapter of the advanced mathematics, and the previous sections have studied the application of the derivative in judging the functions of monotonicity, asperity and extreme value. The curvature is the amount of curve bending, which is one of the geometric applications of the derivative.
Teaching goal	Understand the concept of curvature, and grasp the curvature calculation formula, and understand the practical application of curvature; ability goal: stimulate students' interest in learning mathematics, and cultivate mathematical modeling ability, and realize the beauty of mathematics.
Teaching goal	Ask questions, and guide inquiry, as well as answer questions, summarize and extend
Teaching evaluation	Exchange problems in micro-teaching, evaluating teaching methods, processes and effects.

Teaching development. First, it is asking questions-Advertising introduction. By importing TV ads for curved surfaces, the question is: why is "3000R Supreme curvature" more expensive than "4000R Gold curvature" for two different types of curved TV? The examples of curved surface TV designed by our research group are popular and can keep pace with the times so as to stimulate students' interest in learning.

Second, it is the curvature definition-guiding study. Because the curvature represents the degree of the curve, several geometric figures are first displayed, so that the students find that the straight line is not curved, and the bending degree of each point on the circle is the same. Moreover, the small circle is larger than the bending degree of the large circle, and an irregular curve is different at different points. By the visual sense of these figures, it is necessary to describe the degree of

curvature of the curve at any point in order to describe the curvature of the clear curve. Then we can let studwnt to think the question as following: how to characterize the degree of bending at a point? It is suggested that the students can draw lessons from the average speed to the instantaneous speed, and then describe the average of the curves. The degree of bending, and the redraw limit, can obtain the degree of curvature of the curve at a point [6-7].

Third, it is the problem solving - layered application. Example 1(mathematical example): find the curvature of a circle with radius R. Using the definition formula of curvature, the curvature k=1/R at any point on the circle is calculated, which verifies the intuitive feeling in front: the degree of curvature of the circle is the same everywhere, and the smaller the radius is, the greater the curvature is. Namely, the circle is more severely curved. Example 2 (advertisement regression): why is 3000R supreme curvature more expensive than 4000R golden curvature? According to the conclusion of example 1, both 3000R and 40000R refer to the radius, so 3000R has greater curvature. Namely, It is greater bending degree, so 3000R has higher manufacturing cost and higher price. In order to enable students to master the definition and application of curvature, the application of the concept of curvature is not only to memorize a limit definition by rote, but also to cultivate students' awareness of mathematical application, reflecting the use of hierarchical teaching.

Fourth, it is summary and extension. We want to insert a variety of surface of object images, including railway tracks, Bridges, construction steel, automobile transmission structure, machine tool axis, and even space travel, etc. At the same time, this also leads to the next lesson on continuous discussion of the engineering practice about complex calculation of curvature, and the curvature has a more intuitive and comprehensive understanding, thus lay solid foundation for subsequent curvature calculation teaching.

Considerations. The first is to choose the appropriate teaching content. Not all of the advanced mathematics content can be or is suitable for teaching in the form of micro-course, so it is necessary to choose the key and difficult points in the course of teaching, and it is necessary for the students to continue to study after class, and the teacher's board books can't be made.

Second, carefully record micro-courses video. Micro-course production is a complex process, including the concept of micro-course development, development process, theme selection, teaching design, video content presentation design, application of micro-courses, learning and feedback, and so on [8]. Therefore, the design and development of micro-courses, should be studied from a systematic point of view, so that to improve the quality of teaching [9].

Third, reasonable using micro-courses can achieve flipping teaching. Because the advanced mathematics curriculum needs a great deal of theoretical deduction and numerical calculus, it is necessary to adopt the mixed teaching mode, which combines the traditional classroom teaching and the micro-course teaching. For the theoretical content focused on the traditional classroom model, we should make the abstract difficult point clear. As for the easy understand content, focused on the micro-course teaching model ,we should let students learn independently, and discuss and sum up in the classroom [10]. The proper application of micro-course can make the teaching mode of micro-video carry out smoothly.

Summary

In 2012, with the emergence of online video courses, big data bring the education reform. The micro-courses prompted by micro-video also joined the reform without suspense. It can be said that the micro-course is an important component of the online micro-courses. The development of micro-courses brings challenges and opportunities to college teachers. The high-quality teaching resources and teaching design in micro-courses platform come from the classroom teaching experience of front-line teachers, which has become the most important task in the development of advanced mathematics teaching in the new era. Based on the curvature teaching case of micro-course, this paper designed the "segmented" teaching process, broke through the important and difficult points, and trained the students' logic thinking ability and mathematics application consciousness. We can adopt different feedback means, and can really solve the contradictions, so

that to reach the perfect realm of "the class is finished, but the intention is not finished".

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