Exploration of Online and Offline Blended Teaching Mode for Higher Algebra and Analytic Geometry Course

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Abstract. With the popularization of network information, curriculum teaching faces reform and innovation, and the traditional teaching mode can't meet the teaching needs of contemporary college students. In this paper, we focus on the existing problems in the course of higher algebra and analytic geometry, such as the relative lack of class time, the lack of flexibility in teaching methods, and the single mode of assessment and evaluation etc., and give the specific design process of the course's informative online and offline blended teaching. This design process points the way for further implementation of blended teaching in higher algebra and analytic geometry courses.

Keywords: higher algebra and analytic geometry, online and offline, blended learning

1   Introduction

With the rise of a series of new online teaching modes such as boutique shared courses, university catechism, SPOC, and other new network online teaching modes, the traditional form of classroom lectures is facing unprecedented challenges, which forces various universities to compete in a series of changes in education and teaching methods and modes of teaching [1][2][3]. Nowadays, the state vigorously advocates the construction of gold courses, course ideology, and first-class courses, which gives teachers a broader choice of teaching modes. How to integrate online teaching resources with offline classroom education and teaching in-depth, stimulate students' interest in learning, so that students can improve the efficiency of course learning within a limited number of hours, and enhance their comprehensive application ability, which is a basic issue that university mathematics teachers must explore under the new situation. Based on the characteristics of the higher algebra and analytic geometry course, this paper explores the reform of online and offline blended teaching modes by utilizing the Super Star learning platform to provide a reference for the online and offline blended teaching reform.

2   Blended Teaching Model

Blended teaching, first proposed in foreign corporate training, the most representative definition of blended teaching in China, is proposed by Prof. He Kekang [4]. He pointed out that the so-called Blending Learning, that is, combines the advantages of traditional learning and E-Learning (i.e., digital or networked learning); that is to say, not only gives full play to the teacher's leading role in guiding, inspiring, and monitoring the teaching process but also to fully embody the initiative of students as the main body of the learning process, enthusiasm, and creativity. Blended teaching is not a mechanical combination of online and offline teaching but using intelligent teaching platforms such as Rain Classroom and Learning Pass to conduct teaching activities, thereby improving teaching effectiveness.

The blended teaching model [5] extracts the advantages of both offline and online teaching models to maximize the effectiveness of teaching and learning. Firstly, blended teaching highlights students' main position, expands the time for students to acquire knowledge and think actively, enhances students' enthusiasm to learn actively, and helps students learn cooperatively or independently. Secondly, blended teaching breaks the disadvantages of insufficient teaching resources of teaching materials broadens the channels for students to acquire knowledge, and the rich online quality course resources bring great convenience to students' personalized learning and targeted learning. Third, blended teaching greatly improves the status quo of the relative lack of teaching hours. Fourth, blended teaching is more convenient for designing teaching links for knowledge expansion and ability enhancement and pays more attention to cultivating students' innovative skills and ability to apply knowledge. Therefore, the online-offline blended teaching mode has become the preferred teaching mode of the teaching team.

3   Current Situation of Higher Algebra and Analytic Geometry Course

Higher algebra and analytic geometry is a professional basic course for freshmen majoring in mathematics, which is highly abstract, strictly logical, and widely applied. It is the continuation and improvement of secondary school mathematics and is significant to forming college students' mathematical thinking. Through the study of the course, on the one hand, students' understanding of secondary school mathematics is substantially improved and sublimated. On the other hand, it enables students to master the course's basic concepts, fundamental theories, essential operations, and methods, and learn to analyze and solve problems using algebraic and geometric methods. However, by researching the teaching status of higher algebra and analytic geometry in similar institutions of higher education, the teaching team found many shortcomings in the current teaching of this course, especially the following three more prominent aspects.

(1) Relative lack of classroom time.

The knowledge system of higher algebra and analytic geometry courses is complicated, and the content of the teaching content is large and obscure, so teachers need to be equipped with sufficient class time to ensure the effective development of teaching. However, in recent years, class hours have been seriously reduced, causing great difficulties in both teachers' teaching and students' learning. For one thing, as a specialized basic course, the course of higher algebra and analytic geometry needs to ensure that students master the knowledge used in the subsequent courses and ensure that it achieves the training objectives of cultivating students' mastery of algebraic and geometrical methods and acquiring the ability of deductive reasoning. Hence, the teachers have high requirements for the knowledge they teach and high requirements for the students. They must not omit the explanations of the theorem proofs, abstract definitions, and computational steps. However, due to the lack of sufficient class time, many teaching contents can not be taught in detail and in fine detail in class, and the teaching effect has been greatly impacted. Secondly, the teaching content system of higher algebra and analytic geometry courses is relatively independent, students do not have the foundation of prior learning, in the process of learning, they need some time to build a new learning method, but it is difficult to give students enough time to adapt to the limited class time. Thirdly, the weak knowledge base of some students restricts the pace of teaching, and the limited classroom time deprives students of the time for active thinking and independent learning. Fourth, students' individual differences make it difficult to create higher challenges for students with good levels in the limited classroom time. This requires teachers to change the current teaching mode and make full use of online teaching platforms to carry out online teaching to make up for the shortcomings of insufficient classroom time.

(2) Lack of flexibility in teaching methods.

There is no perfect teaching method in the teaching process; different teaching methods have their own trial conditions and scope. Commonly used teaching methods include lectures, classroom discussions, problem-driven teaching, inspiration, and so on. At present, the teaching methods of higher algebra and analytic geometry courses are not flexible enough, which reduces the motivation of students to learn and the effectiveness of teaching. Firstly, there is a lack of accurate analysis of the actual characteristics of the students taught, and the teaching methods cannot be selected in a targeted manner; secondly, there is a lack of in-depth thinking on the characteristics of the content of the textbook and the teaching objectives, and there is a lack of flexibility in the selection of appropriate teaching methods; thirdly, there is no change in the concept of placing the students in the classroom as the main body, and there is no innovation in the teaching methods, and there is a lack of fusion of the traditional and the modern technological means, and there is no optimization of the teaching methods.

(3) Single-mode of assessment and evaluation.

A reasonable mode of course assessment and evaluation is the orientation of teaching activities and the guarantee of students' learning motivation, as well as an effective

means to test the effectiveness of teaching and the level of teaching. The fundamental purpose of assessment and evaluation is to promote teachers' teaching and students' learning rather than simply giving scores to differentiate between students' high and low academic performance. However, from the survey results, at this stage, the focus of the assessment and evaluation of higher algebra and analytic geometry course still remains on the degree of mastery of the basic knowledge of the students; the assessment of the students' ordinary performance has a single dimension, and there is a lack of evaluation of the learning process of the students. It is necessary to reform the assessment and evaluation model to build a more comprehensive, objective, and reasonable multi-dimensional evaluation model that emphasizes students' process learning.

In summary, the reform of the higher algebra and analytic geometry courses is imperative.

4   Construction of Online-Offline Blended Teaching Model Based on Super Star Learning Channel

Relying on the first-class undergraduate offline course construction project of Guangdong Ocean University, 34 class hours in the course of higher algebra and analytic geometry adopt the blended teaching mode of students' online independent learning and offline flipped classroom. To change the mode of passive acceptance of learning by students, it is necessary to organically combine offline traditional teaching means and online modern teaching means and give full play to their respective advantages. Finally, forming a teaching mode combining targeted teaching methods and flipped classrooms, taking online courses as the teaching platform. The design of the blended online and offline teaching process for the higher algebra and analytic geometry course is divided into the following phases.

(1) Pre-course online instruction.

Using the Superstar learning link platform, we upload the pre-recorded teaching videos or web-based video learning resources, the question library, and the courseware made by myself to provide resource support for developing higher algebra and analytic geometry hybrid teaching activities. The task list is released to students through the superstar learning link and QQ group to watch videos, courseware, and other learning resources in advance. In the material setting, teachers make adequate preparations, mark each class's knowledge points and critical points, attract students through interesting form design, and set preview questions and thinking to guide students to think and solve. Students who do not understand the questions can communicate with teachers through QQ or Superstar learning link in time. Teachers will summarize the questions and then answer them for students to improve students interest in learning. Teachers can ask students to respond to preview tasks to ensure each student sees the notice and is ready for class. To do these well, we can solve the problems mentioned above, such as fewer teaching hours and differences in students' basic and learning abilities, to a certain extent.

(2) Participatory teaching in the classroom.

Since the teacher has assigned the next stage of education tasks in the pre-class stage, appropriate adjustments should be made in offline classroom teaching. Teachers can no longer focus on the derivation of calculation formulas and the proof of theorems but pay attention to strengthening basic knowledge and the practical application and practice of knowledge points and organizing students to discuss in groups in class. Students have generally mastered the essential knowledge content of the next lesson through online previews before class, so teachers should pay attention to the interaction and communication with students in class. Teachers can set up thematic classroom discussion activities based on students' online knowledge learning. The content discussed in class can deepen and extend online preview content. With the help of complete discussion in offline classes, students' interest in knowledge learning is stimulated, and their excellent habits of deep thinking are cultivated.

(3) Teaching sublimation after the lesson.

After each class, the teacher will publish homework in The Superstar learning link. After students submit assignments regularly, the teacher will correct them, and the scores will be directly counted in the Super Star learning channel. Teachers also need to answer questions online in the QQ group and Superstar learning link to get students' learning feedback in time. It will help students consolidate what they have learned and enable teachers to reflect on teaching according to students' feedback to improve teaching methods and effects. In addition, the teacher should summarize the mistakes that easily occur in the teaching process and post them to the QQ group so that students can think, consolidate, improve, and encourage students to share their learning experiences. It helps teachers to grasp the learning situation of the whole class, and then teachers can guide and supervise students in a targeted way.

(4) Appraisal and Evaluation System.

The higher algebra and analytic geometry course forms the learning process result of the comprehensive learning situation of each link. The grade ratio is as follows: the ordinary performance score is 40%, and the final exam is 60%. Ordinary scores include watching videos and course materials, which accounted for 10%; Homework, 10%; literature search, classroom discussion, and after-class communication, which accounted for 10%; and experimental results, which accounted for 10%. This assessment method can effectively solve the problem that the abovementioned assessment method is unreasonable.

5   Conclusions

The formation of online and offline blended teaching mode is not achieved overnight, and it needs to be improved continuously by combining theory and practice. It should strengthen the construction of teaching staff, deepen the reform of teaching content,

teaching methods, and teaching means, continue to improve the construction of teaching materials, attach importance to theoretical teaching. The online and offline teaching mode of higher algebra and analytic geometry course should be improved mainly from the following aspects: Firstly, we need to establish a reasonable knowledge structure and attach importance to all aspects of course teaching. Secondly, we set up and perfected the higher algebra and analytic geometry test question bank and practice question bank. Thirdly, we must prepare practical application cases related to higher algebra and analytic geometry for classroom discussion. Fourthly, use network resources and environment fully, constantly improve and update curriculum resources, and create a diversified teaching environment. The above improvements will enhance the teaching quality of the online and offline blended teaching modes.

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