

A New Exploration of Network Teaching Mode for Linear Algebra

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ABSTRACT. *Linear algebra is a basic course for science and engineering students in most universities, which has strong logical thinking. How to combine the network teaching mode of linear algebra with the traditional teaching mode is an important link in the new exploration of linear algebra teaching in our university. In this paper, we mainly discussed how to explore and analyze the advantages and disadvantages of network teaching mode and provide methods and Suggestions for the reform and practice of network teaching mode.*

KEYWORDS: *Linear algebra, Network teaching, Analysis of teaching*

1. Introduction

Linear algebra is a very useful course in universities and colleges, and it is also a compulsory subject for the postgraduate entrance examination of science and engineering majors. The purpose of studying this course is to enable students to master the preliminary knowledge of algebra and mathematical logic thinking, and to cultivate the ability of abstract thinking and logical reasoning of college students. Based on the importance of linear algebra courses, Wu Guoli [1] and Zhang Yanyan [2] explored the new teaching mode of linear algebra courses. How to reform the traditional linear algebra course teaching mode and explore the new network teaching mode is the core of research. In order to make the network teaching model better adapt to teaching and better integrate with the traditional teaching model, it is necessary to find some new teaching methods to make the classroom teaching effect more efficient, which is a very meaningful teaching reform.

2. The Formation of a New Teaching Model of Linear Algebra

During the stage of COVID-19 pandemic this year, universities across the country stopped offline teaching, and online teaching became popular for a time.

There are various online teaching courses. Because the student foundation and learning requirements of various universities are not unified, we should know how to explore a new teaching method. Fan Yingmei [3] proposed that the first problem we must solve is dealing with the problem of students and ensuring the teaching progress and teaching effect. Li Xinghua[4] and Zhang Hui[5] proposed the use of network information technology combined with diversified teaching modes should find the convenience of online teaching and demonstrate the efficiency of offline teaching. It is also the core of our exploration of new the teaching model in linear algebra courses. Based on the current situation, we build SPOC linear algebra courses in our school by using online teaching as an aid, take online teaching as a supplement and enhancement of offline teaching mode. Moreover, we also give full play to the respective advantages of online teaching and offline teaching, rely on the MOOC platform of Chinese universities, select national quality course teaching resources, and adopt online teaching a new type of online and offline hybrid teaching mode to build SPOC.

The new hybrid teaching mode of linear algebra includes offline classroom teaching and online course teaching. Traditional offline teaching is mostly based on teachers by means of guidance and teaching. But the course speed is fast and the learning time is short. Therefore, it is difficult for students to digest all the content they have learned in the classroom. There are many concepts and theorems in linear algebra courses, most of which are very abstract and logical. In the actual teaching process, most students often feel that the nature of concepts and theorems is difficult to understand. They can be understood in class, but it is difficult to do the questions after class. Besides, it is difficult to grasp the important content of the course. Using the online course teaching of the Chinese University's MOOC platform as a teaching aid, it is convenient for students to watch and review after class. Besides, it deepens students' understanding of linear algebra and improves students' self-learning and learning interest. This teaching mode enriches teachers' teaching methods and adds vitality to students' learning. Especially in the current epidemic stage, students cannot take large-scale centralized classes for a long time. Relying on online teaching not only ensures the safety of teachers and students, but also ensures the normal teaching progress. The new hybrid teaching mode with offline stimulates students' enthusiasm for learning and improves teachers' teaching effect.

3. Implementation of New Linear Algebra Teaching Mode

3.1 Learning Method of Linear Algebra Course

The new online and offline hybrid teaching mode of linear algebra courses is divided into three parts: online Chinese university MOOC platform national quality course learning and discussion, offline teaching interaction, homework and assessment. Teacher releases the learning tasks of each class before online teaching course. Students can complete the learning of the video content according to the assigned preparatory tasks. Each student can arrange video learning according to their own learning characteristics and acceptance level. If students are not familiar

with the content or feel it is difficult to master, they can view repeatedly. Besides, it adopts online questions and discussions. In offline teaching, the teacher will answer the questions raised by the students in the online video learning. They will sort out the important and difficult points of linear algebra, explain the important exercises and examples and also emphasize the precautions in the next course in the offline course.

3.2 Linear Algebra Course Schedule

The linear algebra course has 35 hours in total, 5 hours per week, and the learning content is Chapters 1-3. It will combine online with offline teaching mode. It is planned to arrange 14 hours online, 21 hours offline and 2 hours a week online courses. Students are arranged to carry out independent learning according to the teaching tasks assigned in the classroom. Students are required to preview and do the exercises, completing learning tasks such as exercises and tests on SPOC. In the offline three-hour course per week, teachers carry out offline teaching activities, explain the important and difficult points in linear algebra courses, organize student discussions, and use Mu Classroom to effectively organize flipped classroom teaching. For each online course, Mu Class will also generate corresponding learning records and data, which can be used as an important reference for classroom activity. The specific class schedule is as follows:

Table 1 Course schedule

35 Hours	Online(14 hours)	Offline(21 hours)
Teacher	The class schedule is normal. Teacher is not available in the classroom during online time, but learning tasks must be assigned. Do a good job in statistics of various data of online courses.	Go to the classroom according to the timetable, mainly to explain the key points, organize discussions, answer questions, and urge students to do exercises. Use Moocs to effectively organize various tasks in the flipped classroom.
Student	Self-study in online class time and other spare time, complete unit test and other learning tasks on SPOC.	Attend the activities like interacting with teachers Do homework Attend in the final test offline.

4. Evaluation Method of Linear Algebra Course

Under the new hybrid teaching mode of linear algebra courses, the course assessment is divided into two parts: online and offline. The online assessment is divided into three parts: online video learning, course discussion activity, and online course testing. Video learning accounts for 10 %, online discussion accounted for

10%, online course test accounted for 30%; offline assessment is divided into three parts: classroom sign-in, classroom performance, and final exam, of which classroom sign-in accounted for 5%, classroom performance accounted for 5%, and final exam accounted for 40%.

5. The Innovation and Characteristics of the New Linear Algebra Teaching Model

The new online and offline hybrid teaching mode of linear algebra courses is a trend in teaching in the future. We must change our learning concepts and habits. We must change from listening to teachers in the classroom to doing preview by online courses in advance. We should come to the classroom to learn with questions. This is a process of mutual stimulation, improvement and deepening between teachers and students. This new teaching model requires students to plan their own learning progress, improve their ability to learn independently, and improve their ability to solve problems and communicate. Use the resources of network teaching to improve students' learning efficiency and mathematics literacy. Students can understand and master linear algebra knowledge easily. This mode stimulates students' interest in learning, and guides students to learn independently, which reflects the novelty of the new hybrid teaching model of linear algebra courses. It has increased students' interest in linear algebra courses, and also prompted teachers to explore and research new teaching models, which play a very important role in improving the teaching quality and teaching reform of linear algebra courses.

6. Conclusion

Combining online teaching with traditional offline teaching can give full play to the convenience of online teaching and the advantages of offline teaching. The new teaching model of linear algebra courses using the Internet as a communication medium truly achieves the organic combination and complementary advantages of online teaching and offline teaching. Therefore, the linear algebra courses are of great significance for improving the teaching quality of linear algebra courses and promoting teaching reform. It provides theoretical and practical references for the diversified linear algebra course teaching methods, and also provides a powerful new platform for training for college students in the new era.

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