



Research on Online Teaching Mode of Linear Algebra Course

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Abstract. According to the characteristics of linear algebra course, this paper analyzes its online teaching, and puts forward improvement measures based on the relationship between four elements of online teaching. Through the integration of problem-oriented teaching mode and traditional teaching mode, the purpose of enhancing interaction and improving online teaching quality is achieved.

Keywords: Linear algebra · Teaching mode · Online teaching · Teaching reflection

1 Introduction

Linear Algebra is one of the public courses for science and engineering majors in higher education institutions. It is a basic discipline for learning follow-up professional knowledge, and also a necessary part for the entrance examination for master's degree candidates. It is characterized by logicity and abstractness. Through the study of this course, students can understand the basic concepts of linear algebra, master the necessary operational skills, and cultivate and improve their abstract thinking and logical reasoning.

Affected by the COVID-19 and the popularity of network technology, the original offline teaching mode has been changed to online teaching. Online teaching refers to a teaching organization mode in which teachers use various means such as network organization and students use the network to receive information at terminals, which is different from traditional classroom teaching methods [1]. Teachers can achieve “online” teaching by pushing teaching resources and organizing exchanges and discussions. Students can participate in “online” learning.

To realize online teaching, it is necessary to deal with several aspects: first, teaching design, second, selection of online teaching platforms, third, teaching reflection based on feedback from students' learning activities, and fourth, diversified assessment.

2 Online Instructional Design

To make a good teaching design, it is not only necessary for teachers to consult materials, not only limited to textbooks, but also to connect the unknown with the known well. It is also necessary for teachers to understand the psychological characteristics of college

students, guide them from multiple perspectives, so that students spontaneously love linear algebra courses. For example, the transformation leads to the definition of matrix and matrix multiplication, see Fig. 1. Starting from the perspective of transformation, it is convenient for students to connect with the known and explore the unknown, which is more consistent with students' psychological characteristics.

The organizational ability of teachers includes the ability to interact with students. Teachers must have the basic ability to effectively use information technology, reasonably use various teaching media, and achieve intuitive, resource, and interactive teaching effects.

The author believes that based on different training plans, there should be different teaching methods. In the calculation of the upper triangular determinant [4], interesting determinants can be used to help students learn and use knowledge points flexibly, as shown in the following figures (Fig. 2 and Fig. 3). Through the following formula, we can also introduce ideological and political elements into teaching design.

In teaching design, in terms of teaching modes, there are three common teaching modes: 1. The traditional lecturing teaching mode. 2. A problem oriented teaching mode. 3. Team teaching method. The author believes that the online teaching of linear algebra can adopt a problem-oriented teaching model and a combination of traditional lecturing

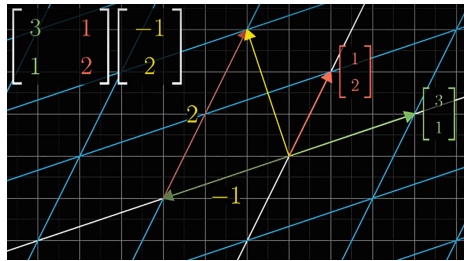


Fig. 1 Matrix multiplication

$$D_1 = \begin{vmatrix} H & 2 & 3 & 4 \\ 0 & E & 5 & 6 \\ 0 & 0 & R & 7 \\ 0 & 0 & 0 & O \end{vmatrix} = ?$$

Fig. 2 Upper triangular determinant

$$D_2 = \begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 1 & 4 & 9 & 16 \\ 1 & 8 & 27 & 64 \end{vmatrix} = ?$$

Fig. 3. Vandermonde determinant

teaching models. The main basis for which teaching mode to adopt is the characteristics of the chapter content and the psychological characteristics of students. Teachers need to carefully grasp and reasonably design it to promote students' learning.

3 Selection of Online Teaching Platform

There are more than 3000 ordinary colleges and universities across the country, and different disciplines and majors have multiple requirements. Network stability is the primary condition for ensuring that such a large group of teachers and students can learn online at the same time. According to the survey data, the functions and features that teachers most want the platform to have in order are: smoothly conversations between teachers and students, the platform is not congested, it can record classroom discussions and questions, it can sign in for statistics, and it supports screen sharing functions; The functions and features that students most want in order are: playback after class, non-congestion on the platform, convenient homework submission, simple installation and operation, and sign-in statistics [2]. Currently, the functions of most commonly used teaching platforms in universities need to be improved. The Rain Classroom platform possess Mu Ke resources, and the system can also import the list of students in the teaching class, making it easy for teachers to view students' learning conditions and other functions. Therefore, it is also a teaching platform used by many college teachers when using hybrid teaching in conjunction with live streaming. In addition, business online conference platforms such as Tencent Conference and Nailing are also an option for most college teachers.

The selection of online platforms for linear algebra courses needs to be based on the areas where teachers and students are located, combined with the Training program of the school, and the needs of teachers and students for courses.

4 Teaching Reflection Based on Feedback from Students' Learning Activities

Due to the disruption caused by the epidemic, some students may experience psychological problems such as anxiety, confusion, and lack of confidence in online teaching, making them more likely to fall into a state of learned helplessness. Teachers need to properly guide them, find the correct attribution, and guide students to build a healthy psychology. The teacher guides students to develop appropriate learning plans without being overly ambitious, learn to decompose goals, and establish good methods suitable for their own learning of linear algebra.

From the perspective of effective learning, moderate stress is an important cornerstone for students to maintain vitality. The area where a person has the fastest growth and progress is at the edge of their ability comfort zone. Areas that are too difficult or too comfortable can easily make us stop moving forward [5].

Since students have different knowledge bases, different levels of learning focus, and levels of understanding of knowledge are different. Teachers need to make teaching reflections and adjust the teaching design for the next section based on students' absorption.

5 Diversified Assessment of Online Teaching

Online teaching is different from traditional teaching, so traditional teaching assessment methods are no longer applicable. The goal of teaching is to promote students' learning, improve their knowledge and ability, and improve their logical thinking level. The assessment method should be formulated to achieve teaching objectives. Comprehensive assessment of students' learning through multiple methods such as attendance, online homework, group discussion and learning reports, and online testing. It avoids the possibility of winning or losing an exam and gives students more ways to complete their studies.

6 Conclusion

In the future, the development of online teaching will pay more attention to personalized learning for learners and personalized teaching for teachers, and use new technologies to build an immersive, interactive, and experiential learning environment.

The online teaching of linear algebra can combine a problem-oriented teaching model with traditional teaching methods, and diversify the assessment methods to better carry out the online teaching.

Online teaching still has some drawbacks, such as difficulty in classroom supervision and network congestion. However, online teaching still has its advantages, promoting the improvement of teachers' information based teaching ability and the updating of teaching concepts, as well as promoting the improvement of college students' autonomous learning ability. Online teaching requires more requirements and challenges for teachers, requiring more guidance and control from teachers, fully mobilizing the enthusiasm and initiative of students, and making online teaching of linear algebra colorful.

References

1. Dawei Chen, Persistence and Change in Online Teaching [J]. *Education and Teaching Research*, 2020(4):67-77.
2. Yi Liu, Zhang Huirong Investigation and Research on Online Teaching in Colleges and Universities [J]. *Research on Higher Education in Chongqing*, 2020, 8(5): 66-78.
3. Shudi Wang. Practical exploration of quality assurance issues in online undergraduate teaching [J] *Modern commercial industry*,2022(8):175-177.
4. Department of Mathematics, Tongji University. *Linear Algebra* [M]. Higher Education Press.2016.
5. Zhou Ling. *Cognitive Drive* [M]. People's Post and Telecommunications Press.2021.
6. Lingling Wei. Application of project-driven teaching model on software functional testing. *Proceedings of 2011 International Conference on Advanced Materials and Information Technology*. 2011.

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