Analysis on the Teaching Reform of Linear Algebra in Applied Universities

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Abstract. Based on the requirements of application-oriented talent training and the characteristics of linear algebra, this paper analyzes the current situation of linear algebra teaching, and puts forward that the teaching of linear algebra should emphasize the application, pay attention to the application of knowledge, and drive the teaching of linear algebra with practical problems. Pay attention to the new technology means, using the network teaching to improve the teaching effect; Combined with the study of the professional, increase the application of case teaching, not only to improve the teaching effect of linear algebra, but also conducive to the cultivation of students' ability.

Introduction

Linear algebra course in colleges and universities is a very important basic course of science, engineering, agriculture, medicine, economic management and other subjects. It plays a vital role in strengthening students' logical thinking and creative thinking and cultivating students' innovative ability. The quality of teaching directly affects the cultivation of students' innovative thinking and ability \cite{1}. However, due to various reasons, the teaching effect of this course is always unsatisfactory, which is mainly manifested in the fact that only theoretical knowledge can be taught, but theory cannot be put into practice. The teaching process emphasizes the systemic of knowledge and the integrity of theory. Teaching mode is mostly adopted in teaching. This teaching mode is a one-way communication between teachers and students, rather than a two-way communication with students as the main body and teachers as the leading role. It is easy for students to lose interest in learning, become lazy in thinking and lack initiative and creativity in learning. This is contradictory to the goal of cultivating application-oriented and innovation-oriented talents proposed in the transformation and development of newly-built application-oriented undergraduate colleges. Therefore, the reform of linear algebra teaching for application-oriented talents is imperative.

Teaching Status of Linear Algebra

The course of linear algebra is characterized by many concepts, symbols, theorems, complex operations, and strong abstractness and logic. On the one hand, in the teaching process of linear algebra, many teachers still use the traditional blackboard teaching, the whole teaching class seems very boring, cannot form a good learning atmosphere. On the other hand, in the case of fewer class hours, teachers are eager to teach the progress but ignore the practical application background of the theorem, and seldom use modern teaching equipment to assist classroom teaching. Teachers often explain the large amount of calculation and more complex knowledge, will appear the phenomenon of "filling the room." This kind of teaching cannot attract students to actively participate in the teaching, and cannot guarantee the normal teaching effect in the classroom. Moreover, it is possible to make a mistake in calculation, resulting in a wrong final result, which will hurt students' confidence in learning this course. In this case, students can master some basic theories and concepts and can calculate some simple questions, but it is difficult to cultivate students' mathematical thinking and mathematical ability through the study of this course. Due to the lack of class hours, the teaching content is rarely combined with the major students learn, which leads to the fact that the teacher fails
to explain the teaching content according to the characteristics of the major students learn, and fails to serve the major and improve students' ability to solve practical problems. In the process of learning, students will not understand the use of linear algebra knowledge for learning specialized courses. Once involving practical problems, they will be at a loss, unable to link textbook knowledge with practical problems, and fall into the situation of "learning not to use," thus losing their interest in this course.

In linear algebra teaching, many teachers are used to by way of explanation for the students, a professor at the linear algebra knowledge, but in the teaching process, do not take the guide students to learn knowledge of linear algebra for application. In the teaching, teachers for students application situation is less, so that students only know some theory knowledge, don't know to want to how to realize the practical application of linear algebra, in time to solve the problem of professional courses, students are hard to relate linear algebra and professional issues [2].

The Teaching Reform of Linear Algebra

To Pay Attention to the Application of Knowledge and Drive the Teaching of Linear Algebra with Practical Problems

To drive linear algebra teaching with practical problems, is in the classroom to guide students to analyze the teaching cases, and then practical problems into math problems, and to establish a reasonable mathematical model, finally calculated the solution of the mathematical model. In the whole process of solving practical problems, according to the need of solving practical problems, introducing the basic concepts of linear algebra teaching contents, basic operation knowledge, etc. [3]. By reference to these common teaching cases, can help students understand the abstract concepts in linear algebra and the application background, thus the abstract linear algebra theory and practical problems, to teach students to learn how to apply linear algebra mathematics knowledge to solve practical problems, at the same time let students experience and understand the origin and development of linear algebra course knowledge, finally understand what they have learned linear algebra course content comes from the real problem and in turn learning linear algebra course is in order to solve practical problems. For example, the concept of matrix and matrix operation are introduced by considering the calculation problem of sports record and prize money. Matrix multiplication is introduced through the transformation of graphics in computer graphics. The problem of solving linear equations is introduced through the calculation of planetary orbit and the balance of chemical equations. The concept of inverse matrix and the method of matrix inversion are introduced through information encoding and decoding. The linear relation of vectors is discussed through geometric vector relation and chemical component structure. The concept of eigenvalue and eigenvector is introduced through infectious diseases and the development trend of biological population. The concepts of similarity matrix and matrix diagonalization are introduced through the semi-axis calculation of planetary elliptic orbit and the temperature distribution in the process of chemical mechanical cooling.

Also, look for cases that are as relevant to the student's life as possible to introduce the concept of linear algebra. For example, the analytic hierarchy process in mathematical modeling and the concept and calculation of matrix eigenvalues can be introduced through such examples: a senior student is selecting suitable jobs from several recruitment units. The main factors he considers are development prospects, economic income, unit reputation, geographical location and so on. Try to build a model to advise him on his decision. Through such instances, the student's understanding is that linear algebra is closely related to his own life, and a solution to these problems in life is to mathematical modeling: the real-life problems into math problems first, then mathematical problems to able to apply their own mathematical knowledge to solve mathematical problems, aiming at the problem solving, then mathematical feedback the solution to practical problems. The presentation of these practical problems aroused the students' keen interest, and enabled them to see how the practical problems were connected with mathematical concepts and theories, and to see the conciseness of the
mathematical expressions of the practical problems, so as to have a certain understanding of the formation and application of the basic concepts of mathematics, and to cultivate students' awareness of innovation.

To Attach Importance to New Technical Means and Improve the Teaching Effect through Online Teaching

There are many concepts, abstractions and formulas in linear algebra. Many students feel that knowledge points are easy to forget. Therefore, in order to ensure the learning effect, students should always insist on reading and practicing so as to ensure that these trivial knowledge points are not easy to forget. Video can be effectively combined with this characteristic of linear algebra. Using the online platform, students can relearn difficult concepts and obscure theorem proof, so as to further understand and absorb.

In the network can provide students with linear algebra and effective communication to explore environment. Students have the problem, the teacher can also through the platform for the first time to guide the students to make the students to solve problems in learning success. The teacher can also through the interactive platform, to collect the student in learning linear algebra in some of the common problems, targeted in class, increase of linear algebra teaching. Use of online teaching, students can choose learning content according to their own needs, can you don't understand the knowledge of effective exploratory discussion with teachers and classmates, by this means, Students can complete the knowledge construction effectively, and their knowledge reserve of linear algebra will be more abundant [4].

Path through the network learning knowledge of linear algebra, if students study direction of the target is not clear, in the face of a vast amount of learning resources, the student was confused about what to do. In this case, the teacher must guide students can according to their own situation to do a good job of learning planning and design of linear algebra, and be able to provide students with the necessary direction to choose advice. Teachers should guide students how to quickly and efficiently from the Internet for linear algebra learning resources, you need to lead good learning psychology and learning attitude, to guide students to actively on the network platform to display their own problems, For discussion, when students encounter difficult problems in learning, teachers should be able to guide students to find the right way of thinking, etc. In the network environment, teachers need to guide students' exploratory learning activities, so as to ensure the high quality and efficiency of students' linear algebra learning.

To combine it with Learning Majors to Increase the Teaching of Applied Cases

In linear algebra teaching, if the teaching content is not closely related to or even out of line with the students' professional background, it will be difficult for students to apply what they have learned in class to solve their professional problems, thus causing the students' learning objectives to be unclear and learning motivation to be insufficient. Therefore, it is necessary for different majors, design different teaching cases, in order to solve the problem of corresponding professional demand as the guide to introduce concepts, the theorem is derived, and the key problems such as the core of each class and clues, guide students in the process of exploration of professional solutions to problems gradually construct linear algebra knowledge system, deepen the students understanding the nature of the course material, cultivate their consciousness of problems between the osmosis, engaged in scientific research work of basic training. For example, for students majoring in economics and management, the concept of linear equations is introduced from the "input-output model" in economics. Facing the students majoring in electronics, Kirchhoff's law in circuit is introduced into the case. For biochemistry, the balance of the chemical equation can be introduced. It helps students feel that linear algebra is relevant to their major. Secondly, the process of establishing equations can cultivate students' mathematical modeling ability.

Background to understand the practical application of linear algebra, stimulate students' learning enthusiasm and realize the transmission to the society has the actual application ability and innovation ability of talent that goal, can apply the Matlab software as auxiliary teaching tools into the classroom, using Matlab to solve linear algebra problem, and to penetrate the Matlab to the
chapters of linear algebra [5]. Realization of simple calculation and simulation by Matlab, the real combination of theory and practice not only improves students' practical ability, inspire the students' interest in learning, more can improve the students' ability of mathematical problem solving, but also make the students to the basic concepts, basic theory, basic methods have more in-depth understanding [5].

Through combined with professional, can make students fully aware, linear algebra in follow-up professional courses learning does have many important applications, thereby stimulating study interest, to overcome the fear, to a certain extent, guide students to active in learning specialized courses in the future application of learned knowledge of linear algebra theory to solve the problem.

Summary

Facing the era of popular education, cultivating talents according to different levels and improving the quality of talents is an important trend of the current highly educational reform. In order to cultivate high-quality application-oriented undergraduate talents, application-oriented universities must reform the teaching methods of "linear algebra" course. In linear pay attention to the reform of teaching methods in the teaching process, and consciously cultivate the students' application consciousness, ability, pay attention to the problem of background knowledge, using new technology, the algebraic theory with practical problems and computer and other organic combination, can we truly reflect imparting knowledge, cultivating ability and improving the teaching efficiency of the organic unity.

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References


