

A Preliminary Study on the Teaching Reform of Linear Algebra for Non-Mathematical Majors

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Abstract – In the current teaching of linear algebra for non-mathematical majors, some problems exist, such as the emphasis on theoretical system over practical application, the emphasis on completing tasks over teaching effect, and the lack of vigorous reform measures. We should take the scientific development view as the guidance, take the student as the foundation, carry on the reform in the teaching goal, the teaching content, the teaching method and the teaching mode and so on many links, in order to train the multi-standard, the multi-level ADAPTS the modern society development need the innovative talented person.

Keywords – Non-mathematics Major, Linear Algebra, Teaching Reform, Students, The Innovation Ability.

Linear algebra is an important basic theoretical course required by students of science, industry, agriculture, medicine, economics and management and other disciplines. It is generated and developed in production practice, and is widely applied in engineering technology, physics, agriculture, economy and social sciences, with strong practicability^[1]. It is not only to teach students some useful computing tools and algorithms, but also to cultivate students' mathematical quality, spatial imagination ability, logical reasoning ability and numerical calculation ability. With the rapid development of computer technology and the advent of the information age, the ancient linear algebra has shown its youth, its application is more and more extensive, and its numerical calculation requirements are higher and higher, it is also more and more attention. Yanbian university is a comprehensive university with distinctive national characteristics. It is a key university in the national "project 211", a key university in western development, a key university supported by jilin province and the ministry of education. The university has 71 undergraduate majors in 10 disciplines, and 46 non-mathematical majors offer linear algebra courses. Nowadays, how to teach linear algebra well according to the characteristics and training objectives of non-mathematics students is an important subject that many mathematics educators pay attention to.

I. THE MAIN PROBLEMS IN THE TEACHING OF LINEAR ALGEBRA FOR NON-MATHEMATICAL MAJORS

A. Emphasis on Theoretical System, Light on Practical Application

The characteristics of linear algebra courses are that the concepts, theorems and formulas are highly generalized and abstract. For many years, in the course of linear algebra teaching, the emphasis on their own theoretical system, emphasizing the basic definition of linear algebra, theorems and strict proof, ignoring the cultivation of students' application consciousness and application ability, the attention to the methods and applications of linear algebra is not enough, almost no numerical calculation is involved. So that students do not see the use of learning linear algebra, do not know how to use the theoretical knowledge to solve practical problems, thus lose interest, lack of learning motivation.

B. Focus on Completing Tasks and Ignore Teaching Effects

Thirty-two credit hours of linear algebra courses, the teaching content generally includes: determinant, matrix,

linear equations and similar matrix four chapters ^[2]. Less teaching hours to complete more teaching content, the teacher's teaching mode is generally relatively simple, often use the injection teaching method, in the limited time and space busy explanation of definitions, properties, theorems and their proof and some computing problems, the whole content completely, forced to indoctrinate students. The teaching is separated from the participation of students, pays no attention to the cultivation of students' independent learning ability, and lacks humanistic care and mathematical culture education. It makes students completely passive in the whole teaching process, without time for independent thinking and space for independent learning, which is not conducive to cultivating students' innovation ability.

C. The Teaching Management is in a Rut and Lacks of Drastic Reform Measures

Due to the expansion of college enrollment, there are some differences in students' cultural basis. Yanbian university faces the whole country to recruit students, the student that admit has a batch of time to have 2 batches of student namely, still have partial pair of person and preparatory student. Adopt the same standard teaching mode, because students' cultural basis is different, often cause some students to linear algebra ideas, principles and methods are not adapted, lack of interest in learning, leading to students do not love learning, learning effect is poor. In terms of teaching management, the school lacks of drastic reform measures, and various departments cannot coordinate and link well, resulting in students' inability to choose teaching units at different levels of different schools, departments and classes according to their major needs, learning ability and career planning. It is difficult to realize the school's student-oriented mission.

II. SOME SUGGESTIONS ON THE TEACHING REFORM OF LINEAR ALGEBRA FOR NON-MATHEMATICAL MAJORS

A. Keep Pace with the Times and Determine the Correct Teaching Objectives

After entering the 21st century, China's higher education has been transformed from elite education to mass education. At the same time, the rapid development of science, technology and economy in recent years has put forward new requirements on the mathematical quality of the basic social labor force. In order to fundamentally adapt to these requirements, the teaching of linear algebra needs to carry out a new understanding and orderly reform of the teaching plan, teaching content and teaching methods in accordance with the training requirements of different talents, so as to organically combine imparting knowledge with cultivating ability ^[3]. Due to the characteristics of their major, students of non-mathematics major are no longer required to have deep mathematical theoretical knowledge and strong reasoning and proof ability, but to have the awareness and ability of applying mathematical methods and solving practical problems with the help of computer technology. According to the characteristics of non-mathematical students and the teaching goal of linear algebra should be aimed at cultivating students' ability to apply mathematics. Therefore, the teaching objective of linear algebra for non-mathematical majors is to let students understand the intuitive background of the concepts and conclusions of linear algebra and master the commonly used linear algebra methods. Basic computing ability; I have the ability to choose linear algebra method for the simple practical problems of this major. I can establish a certain mathematical model based on the practical problems and complete the solution of the established model by combining with the computer. Finally achieve the goal of improving students' independent learning ability and innovation ability.

B. Optimize the Integration of Teaching Content and Select the Best Teaching Materials Suitable for Teaching Objectives

It is an important guarantee for the teaching reform to choose the excellent textbooks which are closer to the teaching objectives. In order to do some reform practice from the teaching content, teaching methods and teaching means, it is necessary to have corresponding reform teaching materials. In the selection or compilation of teaching materials, we should highlight the characteristics of non-mathematics majors, boldly reorganize the teaching content, pay attention to the connection between theory and practice, pay attention to the practical application, content concise, simple. Pay attention to the origin and background of concepts, properties, theorems and theoretical methods, and make some deletions to those contents requiring more or more difficult knowledge without affecting the integrity and applicability of the discipline system. Carefully designed examples, layered writing exercises, so that students at different levels to get enough training. Mathematical modeling and mathematical experiments are introduced so that students can use modern ideas and methods to think and solve corresponding problems.

C. Using Flexible Teaching Methods to Improve the Teaching Effect of Linear Algebra Courses

Overcome the injection method of teaching, teaching should take students as the center, put the knowledge into the teaching process of problem solving explore process, consciously will be certain to reveal the concept, to prove the laws of the problem to be solved, in pairs problems in the design of the learning process of students find and solve the activities of the process, students participate in the process of problem solving, detour through experience exploring process, fork in the road, and correct process, attended by the illumination of innovative thinking method, experience the fun of learning knowledge, cultivating the ability of autonomous learning and innovation capacity^[4].

In the classroom, students should deliberately leave enough space for thinking, so that students have the potential for continuous development. In the students to establish a learning collaboration group, teachers can facilitate students to study the chapter and some thinking problems, assigned to students, let students solve or by the collaborative group to jointly study and solve, finally according to the students or the collaborative group to answer the question, to give students a certain peacetime results. Through such independent learning, the collision and exchange of different viewpoints cultivated students' dialectical thinking and divergent thinking, and the establishment of learning cooperation group cultivated students' cooperative spirit. It also makes up for the shortage of teaching hours.

In addition, teachers should pay attention to every student in the teaching process, amiable, amiable, rigorous scholarship to give full play to the important role of emotional factors in the teaching process, improve students' learning efficiency. Pay attention to the cultivation of students' mathematical cultural quality, so that students form logical thinking habits, develop a serious and rigorous learning attitude.

D. Permeate the thought and Method of Mathematical Modeling, Enhance the Consciousness of Application

Mathematical modeling is the analysis of practical problems, the establishment of a mathematical model, the solution of the model and for the treatment of practical problems. It is an effective method to train students to analyze problems and solve practical problems by comprehensive application of mathematical knowledge. In view

of the highly abstract characteristics of linear algebra courses, the application background or examples of important concepts and results should be introduced, so that students can fully pay attention to the background and process of the generation of these concepts, so as to cultivate students' habit of thinking with mathematical knowledge in the face of practical problems [5]. In the course of teaching, students can be trained in mathematical modeling by selecting some examples related to real life or related to their major. In the teaching process of linear algebra through the idea of mathematical modeling, is to teach students a good thinking method, it builds a bridge for students from mathematical knowledge to practical problems, so that students can flexibly construct a reasonable mathematical model based on practical problems, handy to solve problems. The introduction of this kind of thought has cultivated students' ability of observation, reading, analysis, discussion, judgment and reasoning. Has cultivated the student solves the practical problem with the help of the computer the beginning ability; Has cultivated the student's innovation ability. And can make the student receives the imperceptible scientific research method education, causes the student to develop the good design question, the analysis question and the solution question custom.

E. Teach According to One's Aptitude, Teach at Different Levels

According to the concept of modern education, students should be taught according to their aptitude, respect their individuality, give play to their strengths, and cultivate innovative talents who can adapt to the development of modern society in a multi-standard and multi-level way. This request in the process of teaching reform, not only to the teaching contents, methods and assessment methods to do the necessary reforms, but also the whole teaching mode thoroughly change one size fits all, overcome the disadvantages of traditional teaching, according to professional needs, students' learning ability and acceptance, adopt hierarchical teaching, according to their aptitude, meet the needs of different levels students' development, promote the rapid growth of the outstanding talent. School teaching, educational administration departments and the student management department should be harmonious and unified, strengthen cooperation, not afraid of difficulties, all take the student as this, break the traditional school, department, class as the traditional model of teaching unit, for the non linear algebra course for students majoring in mathematics teaching of drastic reforms, adopt hierarchical teaching.

III. CONCLUSION

The teaching reform of linear algebra courses for non-mathematics majors should be based on the characteristics of non-mathematics majors, take students as the basis, teach them in accordance with their aptitude, respect their individuality, and aim at cultivating innovative talents who can adapt to the development of modern society with multiple specifications and levels. Teaching reform is a complicated systematic engineering. It is necessary to clarify the problems existing in the current teaching process and carry out reform in teaching objectives, teaching contents, teaching methods and teaching modes. The relevant departments of the school should coordinate and cooperate with each other, make bold attempts, take the scientific development view as the guidance, and launch the reform measures with great strength.

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