

## Analysis on Reform Mode of three-dimensional Teaching in Higher Mathematics Curriculum and Cultivation of Students' Ability

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**Keywords:** Three-dimensional teaching; Higher mathematics; Teaching Reform; Teaching mode

**Abstract:** As one of the most important courses in engineering universities, higher mathematics is one of the basic courses and compulsory courses for students of science and technology. The abstract, theoretical and logical characteristics of higher mathematics make it difficult for teachers to teach and students difficult to learn. Mathematics homework is the extension and expansion of mathematics classroom teaching. It is an important way for teachers to check students' learning status and obtain feedback information. The three-dimensional reform of teaching means should be based on classroom teaching, supplemented by after-class reading, extended by mathematical modeling and mathematical experiment. The paper presents analysis on reform mode of three-dimensional teaching in higher mathematics curriculum and cultivation of students' ability.

### 1. Introduction

As a traditional course, the theoretical system of Advanced Mathematics is basically perfect, but it does not mean that there are no research problems. At present, the core problem of the teaching reform is to provide a set of practical teaching materials for the students after the expansion of the university enrollment. This requires that the traditional "higher Mathematics" textbooks should be properly dealt with in theory. Nature requires further discussion of some theories in order to form teaching materials reflecting the latest achievements of modern science and technology.

As one of the most important courses in engineering colleges, higher mathematics is one of the most important courses for the students of science and technology. It not only provides the necessary mathematics knowledge for the students to learn the follow-up courses, but also provides the students with the necessary mathematics knowledge [1]. Moreover, it plays a unique role in the cultivation and improvement of talent quality with its theoretical logic rigor and flexible innovation in methods. However, due to the abstract, theoretical and logical characteristics of higher mathematics, it is difficult for teachers to teach and students difficult to learn, which makes teaching difficult to achieve the expected effect.

Students think that high numbers are difficult to learn, knowledge is difficult to understand, it is important because the basic concepts are abstract and logical. For example, when we talk about the concept of limit, we can mention the dichotomy of the Zeno paradox, the tortoise theory; When the circumferential length of the circle is calculated, the circumferential length of the circle can be approximately replaced by the circumferential length of the circle with a positive  $n$ -edge line. When the number of the regular  $n$ -sided edges is more and more, the circumferential length of the regular  $n$ -sided polygon will approach the perimeter of the circle more and more.

The teaching of higher mathematics should be based on the basic requirements of teaching. The selection of curriculum contents should not only take into account the application and specialty characteristics of talent training, but also make the students have a certain degree of sustainable development [2]. Therefore, higher mathematics teaching is not only for students to learn mathematics, but also to use mathematics to solve practical problems in the future. On this basis, we will carry out the content system of higher mathematics curriculum according to the modular

teaching mode, which is divided into three modules: "basic module", "combination module with specialty" and "application improvement module".

Under the guidance of constructivism theory, considering that the teaching object is some students whose development level, understanding degree and acceptance ability have obvious individual differences, they are unique in intelligence, interest, hobby, heredity and so on. The groups they constitute are always multi-layered and multi-dimensional. Therefore, the corresponding classroom teaching should also have a "three-dimensional sense", to take into account the individual differences of students to the greatest extent, so as to teach according to their aptitude.

The course of Advanced Mathematics is the leader of the series of mathematics courses in our college. The construction of the curriculum affects the level and quality of the construction of many courses. The orientation of the course of Advanced Mathematics is as above. We should lay a solid foundation in mathematics, strive to improve the cultivation of higher mathematics, strengthen the applied teaching of mathematics, give full play to the function of quality-oriented education, and make the education of higher mathematics develop the applied type of creative consciousness in the cultivation of contemporary higher mathematics education. Compound high-level specialized technology and management personnel play the role of strengthening the solid source.

## **2. Present Situation of Teaching Reform in Advanced Mathematics**

Teaching mode is to use what training objectives and means of teaching. In particular, the training objectives determine the teaching model [3]. The goal of post training is put forward in the past few years. It is the ability of a student to take part in a job after graduation. The cultivation of post ability has been a hot issue in recent years, and it is also a very important issue in colleges and universities. For example, a combination of engineering and learning can be used as a teaching model. Namely study in the work, work in the study. The combination of work and study is a kind of educational mode which combines knowledge learning, ability training and work experience.

Teaching material is a bridge between teachers and students. When we compile the textbook of Advanced Mathematics, we follow the principle of "little but fine, broad and shallow", omitting some more tedious proof of completion and lengthy theoretical deduction, in terms of content arrangement. According to the requirements of "capacity" and "step by step asymptotic", the concept is introduced with the aim of simplicity, conciseness and nature. As far as possible, it is introduced by the situational problem around the reader.

The reform of teaching ideas of college mathematics teaching team is embodied in the continuous exploration of the new teaching mode under the new situation, and the classified teaching is put forward and implemented in the course of Advanced Mathematics. This teaching mode not only pays attention to the teaching of basic knowledge, but also emphasizes the enlightenment of scientific spirit and scientific thought, trains the students' purport for learning, and pays attention to the guidance of research methods and scientific spirit in teaching [4]. The theoretical basis of hierarchical teaching is the theory and strategy of differential teaching, which's thought, originates from the idea of "teaching students according to their aptitude", put forward by Confucius and Mencius, that is to say, under the same teaching objective, the students of different levels are taught separately. Finally, the same teaching requirements are achieved.

After entering colleges and universities, many college students still use the habitual thinking of examination-oriented education in primary and secondary schools to look at the study of advanced mathematics, pay attention to the problem-solving skills, skill training and question-type teaching, and think that "mathematics is problem-solving." Learning mathematics is to find a result by solving the problem, but not to regard learning higher mathematics as a process, an activity; As a solution to a problem, to gain an experience. Under the influence of the traditional examination-oriented education for many years, many students have become accustomed to the traditional "known-to-prove" or mechanical formulation.

Higher mathematics is a compulsory course of basic theory for the majors of science and technology and economic management in various colleges and universities. It lays the necessary basic theory knowledge for the study of each major and improves the students' mathematical

thinking. The cultivation of students' mathematical accomplishment plays an important role, so teachers can not give a simple definition in the course of class, and then do strict logic proofs, which will make the students feel that mathematics is useless and lack of practicality. Can not enhance students' interest in learning, can not enhance students' initiative in learning.

Although in terms of organizational form, hierarchical teaching is only a change in teaching organization and management, turning the natural class into a teaching class, it is not a teaching idea, let alone a teaching method [5]. But it directly affects the change of teaching thought and teaching method. Students divided into different levels of teaching classes, to our teaching management and administration has brought many new problems.

The basic module is the basic knowledge part. It is a basic course which must be offered by the whole school for the first half of the first semester of the freshmen in our school. Its foundation is to satisfy the basic requirements of mathematics, which is the most basic content in higher mathematics. At present, this part of the curriculum has been basically completed, the overall situation is good.

According to C.R.Rogers, founder of humanistic psychology, "the purpose of education is to foster personality development." Education should be student-centered. Cultivate creative, constructive, selective behavior and personality development. " The purpose of higher mathematics learning is to apply, and the process of application is the process of creation. During a return visit to graduates, the author finds that many students who have come to society realize that the bottleneck that affects and restricts their ability to exert maximum ability is not the problem of mathematics theory, but the problems of mathematics application that they encounter in their work.

### **3. Suggestions and Measures for Improving the Teaching of Higher Mathematics**

Higher mathematics course is an important foundation and tool course for all majors in colleges and universities. It not only provides essential mathematical basic knowledge and mathematical methods for students to learn the follow-up courses and solve practical problems, but also provides the basic knowledge and method of mathematics for students to learn the follow-up courses and solve practical problems [6]. It also provides valuable materials for cultivating students' thinking ability, analyzing problem solving ability and self-study ability, and making students form good learning methods. Therefore, the quality of higher mathematics teaching directly affects the teaching quality of follow-up courses, and trains high-quality talents.

In order to avoid this situation, the multi-project teaching model can be adopted in practical teaching, and the advanced mathematics can be divided into two items: the basic project and the professional practice project. The setting of teaching content of basic project is based on the requirement of mathematics for every major, and the most basic content is taught. Professional practice items should be determined by teachers engaged in higher mathematics teaching, and different items should be set up according to different specialties according to the opinions of professional teachers of other departments. For example, the major of civil and industrial construction needs to set up more mathematical knowledge related to drawing and drawing, and the major of engineering cost focuses on the mathematics knowledge of calculation.

In mathematics teaching, reverse thinking training is one of the most direct and effective methods to cultivate students' ability of thinking and changing thinking, and it has a direct influence on students' ability to analyze problems. Therefore, in higher vocational mathematics teaching, it is very important to strengthen the cultivation of reverse thinking ability. Through reverse thinking, students can promote students to change positions to reflect and improve their reverse thinking ability.

However, the function of "thinking ability" and "mathematical culture", which contains the function of "thinking ability" and "mathematical culture", is also a very important content for modern people. However, all students should be trained in the same ability according to different professional requirements rather than uniform requirements. For example, the students of science and engineering should focus on the ability of thinking and the education of mathematics culture, while the students of liberal arts should take the ability of thinking and culture education as the main line, and emphasize the instrumentality of higher mathematics appropriately.

According to the new syllabus, according to different levels, make a new teaching plan, adjust the teaching content appropriately [7]. For the students of the comprehensive improvement class and the fast class, the teaching content is deepened and broadened properly, the teaching progress is properly quickened, so as to ensure the students have a solid mathematical foundation, a wide range of knowledge and a stronger mathematical ability; Especially for the improvement class, the teaching contents about mathematical modeling and mathematical experiment are mainly added.

At present, the teaching content system of higher mathematics in engineering still follows the "five-block" model in the past that is, monadic calculus, multivariate calculus, series, differential equation, analytic geometry. Because of the same teaching objectives, uniform teaching materials, uniform teaching requirements and consistent teaching processes, higher mathematics has become the most suitable curriculum for the implementation of unified examinations in a wide range of areas. Not to mention advanced mathematics is also a compulsory course for graduate students in engineering.

#### **4. Reform Mode of Three-Dimensional Teaching in Higher Mathematics Curriculum and Cultivation of Students' Ability**

In the process of teaching, teachers should strengthen the combination of higher mathematics knowledge and professional knowledge. In this way, higher mathematics teachers are required, not only to be familiar with mathematics knowledge, but also to use a certain amount of time and experience to learn other professional knowledge [8]. In the process of classroom teaching, some exercises related to the specialty are explained. For example, when it comes to the concept of derivative, for physics students, the concept of derivative can be explained with the example of instantaneous velocity of an object at a certain time.

Completing homework is an important way for students to learn high numbers well, but through correcting homework and talking with students, it is found that some students can't finish homework on time, some students have serious plagiarism phenomenon, which makes homework flow into surface form. Some students think that mechanical repetitive exercises are easy to get tired of learning. In the long run, homework has become a burden for students, a boring and had to engage in activities, greatly depressing students' curiosity, intellectual desire and creativity.

The main feature of "combining with major module" is to embody the specialty, so that the teaching content is closely connected with the content of each major. All content should reflect "necessary, enough", let the student feel "mathematics is beside me". The teaching goal of this module is how to better meet the requirements of the talents training objectives of each major and meet the needs of the professional development under the premise that the students have mastered the basic contents of mathematics [9]. Truly apply the mathematics content to the study and practice of specialized courses. The content of this module is also the core of the curriculum reform of Advanced Mathematics.

The teaching package is designed for the higher mathematics curriculum, which includes the traditional paper teaching resources, such as the teaching materials for different levels and specialties, the teachers' reference books with the teaching materials, the guidance books for students' study, and so on. At the same time, it should also include PowerPoint electronic teaching plans for teachers' teaching and students' review, CAI courseware for solving key and difficult problems, and providing self-taught self-test network courses for students.

It is necessary to develop computer aided instruction design, mathematical model teaching, mathematics competition, increase students' interest, and improve students' ability to think independently [10]. The use of computer software and multimedia projection equipment can make mathematics more vivid and lively, overcome the dull shortcomings, and deepen the students' ability to understand mathematics. In particular, the mathematical modeling contest is pointed out here. Its creation provides a forward direction for the national college students to study advanced mathematics. The aim of National Mathematical Modeling Competition is: creative consciousness, team spirit, participation and fair competition.

For the students in the ordinary class, the basic concepts, the explanation of the basic methods and the training of the basic calculation ability are strengthened in order to ensure that the students can meet the basic requirements of the course teaching and lay a good mathematical foundation for the students to study the following specialized courses. In order to improve the class and some students with good foundation, the following elite training plan was formulated and implemented. From the fourth semester, additional mathematics training courses were opened for four consecutive semesters, and the students' mathematical quality was specially trained uninterruptedly.

In the current competitive society, the following changes must be achieved in teaching objectives: emphasis on knowledge transfer to emphasis on ability training, re-examination results into re-examination process, combining heavy skills training with thinking training, So that the teaching of higher mathematics really plays a supporting role in learning other courses and serves for the improvement of students' quality and ability.

## 5. Summary

In higher mathematics teaching, teachers should not only pay attention to students' understanding of classroom teaching content, but also realize the importance of effective homework design for students to learn high numbers well, improve teaching quality and realize the goal of talent training. We should make efforts to do a good job in the teaching process of homework design, so that students' homework can be self-selected, experience and apply, explore and innovate primarily, give full play to homework in the cultivation of students' interest in high numbers, and the development of thinking mode. The improvement of mathematical quality and other aspects of the role of promotion.

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