A preliminary Study on the Construction and Teaching Practice of Higher Mathematics Courses under the Construction of High-Quality Colleges and Universities

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Abstract: In today's society where high-tech and computer technology are rapidly changing and popular, the development of high-tech cannot be separated from the support of mathematics. Without good mathematical literacy, it is impossible to achieve innovation and breakthrough in engineering technology. Therefore, how to cultivate people's mathematical literacy in the process of mathematics education and let people learn to use mathematics knowledge and methods to deal with practical problems is worth thinking about by mathematics educators. The purpose of college students' participation in various mathematical practice activities has gradually developed. The purpose is to stimulate students' enthusiasm for learning mathematics, improve students' comprehensive ability to establish mathematical thinking and use computer technology to solve practical problems, broaden students' knowledge, and cultivate creative spirit and cooperative awareness. To promote the reform of university mathematics teaching system, teaching content and teaching methods, under the construction of high-quality colleges and universities, teaching practice and curriculum construction are inseparable.

Keywords: Advanced mathematics; Curriculum construction; Teaching practice

1. The historical development of advanced mathematics

Among the three major branches of mathematics, geometry, algebra and analysis established before the 19th century, the first two were originally the branches of elementary mathematics, and later developed the part belonging to advanced mathematics, and only analysis belonged to advanced mathematics from the beginning. The basis of analysis - calculus is considered to be the beginning of "the mathematics of variables", therefore, the study of variables is one of the characteristics of advanced mathematics. The original concept of variable is the direct abstraction of the changing quantities of the material world, and the concept of variable in modern mathematics includes a higher level of abstraction. The concept of describing the dependencies between variables is developed from functions to functionals, transformations and even functors. Like elementary mathematics, advanced mathematics also studies spatial forms, but it has a higher level of abstraction and reflects the characteristics of change, or studies it in change. For example, the concepts of curves and surfaces have been developed into general manifolds. According to Erlangen's program, geometry is a theory about the invariant properties of figures under a certain transformation group, that is to say, geometry is to study various spatial forms under transformation. It is undeniable that mathematics is a vast subject and no one can fully grasp it. Humans gradually established the concept of natural numbers from counting, gradually mastered simple calculation methods, and gradually understood the most basic and simple geometric shapes. At first, arithmetic and geometry were not separated. From the 5th century BC to the 17th century, in about two thousand years, human beings gradually formed the main branches of elementary mathematics (constant mathematics): arithmetic, geometry, algebra. The mathematics of variables came into being in the 17th century, and generally experienced two decisive major steps: the first step was the emergence of analytic geometry; the second step was the emergence of calculus. From the first half of the 19th century, the development of mathematics entered a modern stage, characterized by profound changes in algebra, geometry, and analysis [1].

Infinity enters mathematics, which is another characteristic of higher mathematics. All kinds of things in the real world appear in finite forms, and infinity is a generalization of their common essence. Therefore, the infinite entry into mathematics is a reflection of the highly theoretical and abstract mathematics. Infinity in mathematics comes in two forms: potential infinity and real infinity. In the limit process, the changes of variables are endless and belong to the form of potential infinite. And the existence of limit value reflects the real infinite process. The most basic limit processes are the limits of sequences and functions. Mathematical analysis is based on it, establishes various concepts and related theories that describe the local and overall characteristics of functions, and initially successfully describes the non-uniform changes and motions in the real world. Other limit processes, which are more abstract in form, also play a fundamental role in other mathematical disciplines. There are also many disciplines whose research objects are infinite individuals, that is, infinite sets, such as groups, rings, fields, and various abstract spaces. This is the real infinity in mathematics. Being able to deal with such infinite sets is a manifestation of improved mathematical level and ability. To deal with such infinite sets, various structures such as algebraic structures, ordered structures, and topological structures have been introduced into mathematics. In addition, there is a metric structure, such as norm, distance and measure in abstract space, which quantifies and digitizes the relationship between individuals and becomes a bridge between qualitative description and quantitative calculation of mathematics. The above structure makes these infinite sets have rich connotations and can be distinguished from each other, and thus form a large number of mathematical disciplines. For example, complex function, analytic function is the main object of complex function research. In mathematics, it focuses on the introduction of complex numbers, complex functions, derivatives of complex functions, analytic functions, integrals of complex functions, complex series, residues and other basic knowledge.

In terms of the computational nature of mathematics, advanced mathematics even occupies a dominant position in elementary mathematics, and its position in advanced mathematics is also obvious. In addition to many highly theoretical subjects, advanced mathematics also has a large number of computational Strong subjects such as differential equations, computational mathematics, statistics, etc. Under the highly abstract theoretical equipment, these disciplines can deal with the complex computing problems in modern science and technology.

2. The meaning and content characteristics of advanced mathematics

It contains two meanings: on the one hand, when you are faced with a problem to be solved, you can actively try to find a problem-solving strategy with mathematical standpoints, viewpoints and methods; on the other hand, when you accept a new mathematical theory (May learn more branches of mathematics), can actively explore the ins and outs and practical value of this new knowledge, and the mathematical thinking throughout this will play a direct or subtle role. This requires students to work hard to establish mathematical concepts and improve their understanding of mathematics.The so-called awareness of building a mathematical model means that when we encounter a practical problem, we use the knowledge we have learned to establish the mathematical problem (mathematical model) corresponding to the problem, and solve the original practical problem while solving the mathematical problem. We will encounter many such application examples in the process of learning. Please summarize these examples carefully and promote them to general methods. When studying other courses, you will deliberately consider whether these methods can be used to deal with the problems of this discipline.

In China, students of various majors in science and engineering (except mathematics, which majors in mathematics analysis) have difficult mathematics, and their textbooks are often called "advanced mathematics"; Textbooks are often called "calculus". Different majors in science and engineering and different majors in literature and history have different degrees of depth. It is advanced mathematics that studies variables, but higher mathematics does not only study variables. As for the courses accompanying "advanced mathematics", there are usually: linear algebra (mathematics majors study advanced algebra), probability theory and mathematical statistics (some mathematics majors are taught separately).

Elementary mathematics studies constants and uniform variables, while advanced mathematics studies non-uniform variables [2]. Advanced mathematics (it is the general name of several courses) is an important basic subject in science and engineering colleges, and it is also a compulsory mathematics course for non-mathematics majors in science and engineering, as well as a compulsory course for some other majors.

3. Basic situation of teaching and curriculum implementation

In recent years, the College of Engineering has offered the course "Advanced Mathematics". The assessment method is a combination of 40% of the usual grades and performance and 60% of the final exam grade. According to the needs of the major and the actual situation, in teaching, first of all, ask yourself to pay attention to clarifying the practical significance of each mathematical concept and application; pay attention to the cultivation of students' basic computing ability, problem analysis ability, and problem

solving ability; pay attention to the integration of theory with practice, for the professional Students learn professional knowledge that lays the foundation for sound mathematical and logical thinking.

The teaching contents include functions, limits and continuity, derivatives and differentials, integration, etc. . According to the actual requirements of teaching and the limitation of class hours, some of the contents are slightly omitted or explained in the explanation. According to the requirements of the training objectives of various majors of the college, reasonably arrange the teaching content, reasonably select the theoretical system to appropriately reduce the theoretical difficulty of the course content, and deal with some parts of the traditional course content on the premise of ensuring the scientific nature of the course content. In the selection of classroom exercises, we adopt the principle of less and more precise, try to avoid the problem of off-topic problems, so that most students can draw inferences from one case to another. In the application of teaching ideas and methods, in view of the teaching practice that there are many abstract contents in the course and the students have a poor knowledge base in this area, before teaching abstract concepts, try to introduce their application background or simple examples, or make comparisons. The foreshadowing work of sufficient words or signs inspires students to sublimate their thinking from concrete to abstract, and helps them understand the teaching content. On the other hand, let the rigorous and realistic work style give some positive effects to students, and require students to review exercises after class, and upload their assignments to Xuetong, so that teachers can timely grasp the students' mastery of knowledge. In the last stage of the semester, in order to better review and consolidate the students, mock test questions are given before the test, highlight the key knowledge test sites, and encourage students to actively review and prepare for the test according to the test sites, so as to dispel the haze of students with learning difficulties. Re-examine the mock exam questions that have been explained, and patiently guide the low-scoring students individually, cultivating excellence and making up for the poor, so as to learn mathematics.

In the evaluation and assessment of the semester, great emphasis is placed on the process and formative assessment.

4. Problems, Improvements and Measures in Teaching Practice

As an important part of the national education system, mathematics education shoulders important responsibilities such as cultivating diverse talents, rejuvenating the country through science and education, and promoting employment and entrepreneurship. However, the mathematics classrooms of most vocational colleges are faced with many problems: students' poor mathematical foundation, low learning enthusiasm, teachers' teaching level is generally high but students' learning effect is not good, etc. It is not difficult to find that the reform of engineering mathematics is urgent.

There are many researches on mathematics teaching reform at home and abroad, mainly focusing on teaching mode, teaching method, teaching evaluation and teaching material innovation.

Several improvements in teaching work in the future. First of all, as a teacher, I must constantly improve my own quality, pay attention to the mathematics humanities education in higher mathematics education ideologically, and not only complete the teaching of this course but also cultivate good people. Secondly, strengthening teaching management is the key to learning advanced mathematics well. In addition to strict requirements in teaching, careful preparation of lessons, lectures, and careful correction of homework, it is strictly required that students' attendance from attendance to homework completion should be included in their usual grades as required. The homework should be reviewed in a timely manner, and the reason for the error should be pointed out face to face for the poor homework. At the same time, let students strengthen their self-learning ability, learn more and practice more under the guidance of teachers. Apply what they have learned, students have mastered the knowledge points, why they will not be able to encounter slightly changed questions, the reason is that they have not comprehended the ideas and methods behind the knowledge points. Therefore, it is necessary to put more effort into the design of practice questions, design them ingeniously, echo the front and back, and leave room for ideas in the exercises, so that students can repeatedly experience in the variant exercises to achieve the understanding of mathematical ideas. Improve students' confidence in learning mathematics.

The reform of engineering mathematics education and teaching aims to provide new ideas for the teaching reform of mathematics courses for the majority of college teachers, and to promote the all-round development of college students. The curriculum design of engineering mathematics courses can be reversely designed, so that students can not only acquire the necessary mathematical knowledge for related follow-up courses and other professional courses, but also master basic mathematical thinking methods and necessary application skills, so that students can learn to use mathematics. The way of thinking solves practical problems encountered in life, study and work, and further strengthens the understanding and interest in mathematics, so that students have the spirit of teamwork, seek truth from facts, dare to innovate and forge ahead in learning and life. It can further enhance students' sense of learning, improve students' subjective initiative in learning, and help teachers to design effective teaching activities.

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