Research on inquiry teaching mode of higher mathematics

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Abstract: Problem inquiry, mathematical experiment, mathematical modeling and other contents are the core of inquiry teaching, which makes mathematical thoughts and methods manifest themselves in the process of solving problems. It is also the main purpose of mathematical inquiry learning.

1. Introduction

The 21st century has brought us into the era of comprehensive knowledge. Under such a background, it is the need of learning society, higher education reform and students' sustainable development to reform teaching methods and improve students' comprehensive quality. With the expansion of college enrollment in China, the individual differences of students and the basic differences of mathematics are becoming larger and larger. Therefore, the teaching of higher mathematics cannot be based on the same model and the same requirement. The quality of a teaching model needs time to verify, and also needs to take appropriate methods for analysis and evaluation. Like foreign studies, Chinese scholars believe that “problem exploration, mathematical experiments, mathematical modeling” and other contents are the core of mathematics teachers' inquiry-based teaching. The purpose of inquiry teaching is to make learners become the inquiry and researchers of mathematics, and to make mathematical thoughts and methods manifest themselves in the process of solving problems, which is also the main purpose of inquiry learning.

Since the second half of the last century, China has been vigorously advocating quality-oriented education, improving students' practical ability, and advocating the spirit of exploration. Under this background, China's basic education reform has been developing vigorously, and many teaching models combining basic education with inquiry-based teaching mode have been put forward. However, as higher education, there are relatively few studies on how to integrate inquiry teaching into undergraduate teaching, how to strengthen mathematical inquiry and practice, and how to strengthen mathematical experiment inquiry, so as to combine higher mathematics with inquiry teaching organically and form a teaching mode suiTable for the requirements of The Times and with characteristics of The Times. This article is on how to implement the inquiry teaching of higher mathematics, improve the students' practical ability, and give the appropriate evaluation and analysis of the teaching effect of the inquiry teaching mode.

2. Inquiry teaching system

Higher mathematics is an important public basic course in colleges and universities, and its teaching quality directly affects students' learning of subsequent courses. At present, students are generally not good at thinking, cannot find problems, do not have a thorough understanding of theories, and only pay attention to memorizing and applying formulas instead of flexibly applying new knowledge to solve new problems. The existence of these phenomena indicates that the original teaching mode has not fully mobilized the initiative and creative spirit of students. The key to solving the above problems is to change the lecturing style to the inquiry-based one, which is to collect, select and compile classical problems before inquiry and discussion. The method of “easy

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first, difficult later” and “hierarchical progression” is adopted. Different levels of problems are utilized to stimulate students' learning interest according to different students.

2.1 Basic idea of inquiry teaching based on problem solving

In the teaching of higher mathematics, the most basic method is to propose problems, solve problems and think rationally, that is, under the guidance of teachers, students construct knowledge based on problem solving by using the teaching and learning method of inquiry around specific problems. In order to meet the above requirements, according to the discipline characteristics of higher mathematics, we optimize the classroom teaching process, turn the traditional teaching process into a learning process centered on problem solving, based on inquiry and student-centered interactive exploration between teachers and students, and promote the full development of students' personality. Teachers are not only the guide of learning activities, but also a cooperative learner.

2.2 Basic structure of inquiry teaching based on problem solving

The specific operating procedures of inquiry teaching can be summarized as four stages: problem introduction -- problem inquiry -- problem solving -- knowledge construction.

A. Problem introduction stage. Starting from students' cognitive basis and life experience, teachers design questions according to the teaching content, create situations, and put forward questions, so that students can be clear about the objectives of inquiry, and stimulate students' enthusiasm and initiative in inquiry learning at the same time.

B. Question exploration stage. Based on the original knowledge and experience, students put forward some preliminary ideas with their own way of thinking, learn and solve problems independently, discover and recreate freely and openly. The purpose of problem inquiry is not only to acquire mathematical knowledge, but also to enable students to fully display their thinking process and methods in exploration, analysis and discussion, reveal knowledge rules and methods and approaches to solve problems, help each other, learn from each other, enhance the sense of cooperation, and improve communication skills. In this stage, teachers act as the guide and organizer of students' learning.

C. Problem solving stage. By asking and answering questions and check, the teacher timely grasp the learning situation of students, and then in view of the difficult point content and common problems, teachers are offered to explain, as much as possible to trigger students' deep thinking and discussion, guide them to summarize the conclusion they have explored, so as to consolidate and internalize new knowledge.

D. The stage of knowledge construction. The teacher makes some key comments appropriately, guides the student to consciously reflect on the problem solving process, and helps the student to evaluate himself or others. At this stage, teachers check the learning effect by asking students to discuss and solve other related problems and finish some corresponding homework. So that every student can be flexible use of knowledge, broaden the train of thought, explore innovation, so as to refine and sublimate thinking, the construction of their own knowledge system.

3. Practice of inquiry teaching mode

3.1 Reasonable design

Teaching students in accordance with their aptitude is a principle that must be followed in education. Any teaching that deviates from students' foundation and ability to accept will be a failure. Teachers must understand the basis of students, master the syllabus, familiar with the teaching materials, so as to grasp the teaching center, highlight the key points, and through the design of a reasonable teaching gradient, scattered difficulties, design a reasonable topic of inquiry, so that students interaction with the teacher, and thus achieve teaching resonance under the guidance of the teacher.

3.2 Elaborate and practice more

Practice is an important way to learn and consolidate knowledge. At present, students have limited spare time. The time cannot be guaranteed, if they put all the exercises after class. In addition, for students with poor foundation, if there is no sufficient classroom training, it is difficult to finish the homework independently, and they will choose to give up or plagiarize. Therefore, it is necessary to elaborate the content and spare more time to do in-class exercises, which is not only conducive to students' timely digestion of the teaching content, but also beneficial for teachers to know about students' knowledge at any time, so that teachers can adjust their teaching ideas in time, find out the gradient of teaching, make sure that teaching and learning are not disjointed, and ensure the quality of teaching.

3.3 Focus on the physical background and geometric significance

Almost every higher mathematics knowledge has its physical background and geometric significance. If students know the physical background of each knowledge point, they can know the background of the knowledge, which will deepen their memory and understanding of the knowledge. While geometric meaning can enhance the intuition, which is conducive to improving students' ability to analyze and solve problems. Therefore, strengthen the connection between knowledge and physical background and geometric meaning in teaching, which is convenient for students to accept and understand the teaching content and improve their mathematical quality.

3.4 Strengthen experimental teaching

Focusing on the training of engineering application-oriented talents, the proof of mathematical theory can be weakened appropriately, and the goal is to master the thought method, but the operational ability should be strengthened. Through mathematical experiments, students can fully experience the prominent symbolic operation function, powerful drawing function, precise numerical calculation function and simple command operation function of Mathematica software, which is essentially a mathematical technology. For engineering students, the most important thing is to learn how to apply mathematical principles and methods to solve practical problems. Therefore, teachers should combine theoretical teaching with experimental teaching organically. In experimental teaching, we should not only teach basic experimental commands, but more importantly, select some experiments that are beneficial to students' understanding of calculus theory and concepts, so that students can practice with their hands. We should combine theoretical teaching with experimental teaching, so that students can experiment with questions, and experimental teaching can truly become a supplement and extension of theoretical teaching.

4. Conclusion

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There is sufficient theoretical basis for carrying out inquiry teaching in higher mathematics teaching reform. The practice of basic education reform provides us with corresponding theoretical basis for carrying out inquiry teaching in higher mathematics. On this basis, as long as we continue to pursue and improve the corresponding theory, then change the traditional teaching model and establish a new teaching model, the inquiry teaching reform of higher mathematics will make greater progress, which plays an important practical significance and practical value in promoting the teaching reform of other colleges and universities.

Compared with the traditional teaching method, which focuses on the process of teachers' teaching and students' learning, while the Inquiry-based teaching is more helpful to students' deep understanding of concepts and theories, It is also helpful for students to study and explore the open questions boldly, and to apply this spirit to their future work practice.

It has become the common understanding of many educational counterparts to introduce the idea of inquiry teaching in higher mathematics, and to make higher mathematics teaching meet the requirements of times development and lifelong learning. “Inquiry-based” learning promotes the

development and improvement of students' mathematical intelligence and mathematical literacy. At the same time, we also see that for students at different levels and different levels, this effect is different. We know that students at the undergraduate level prefer this inquiry teaching mode based on problem solving, and they believe that this teaching mode has greatly improved their learning ability, while the student of specialized subject level, still agree with traditional teaching mode quite. Therefore, that kind of regardless of the student's actual level and the study level, blindly pursues “the Inquiry teaching” , the practice following the fashion often to be just the opposite to what one wishes, therefore we must proceed according to the student's actual ability.

4.2 Expectation

Reviewing the history of education and teaching reform, it is not difficult to find that any kind of education reform will be highly concerned by the public or students. The research direction of this topic is being carried out by many colleagues at home and abroad. With the rapid development of computers, the evaluation of teaching reform will become more and more important, and the evaluation methods and means will be more abundant.For example, some scholars use multivariate statistical analysis, meta analysis, FUZZY analysis and so on. Many results have been achieved in the evaluation of teaching or education.

From the simple results of this topic, to strengthen students' practical application ability, as a basic subject of mathematical science, is of great significance in the future teaching. Through practice and statistical analysis in the future, we will also apply this model to the teaching of other courses of related majors, and explore some problems related , adopt the method of relevant analysis, try new ideas, and strive for more and better results.

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