Research on the Improvement of Innovative Ability of College Students by Mathematical Modeling Education

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Abstract: As an important way of education, mathematical modeling has positive practical significance in cultivating students' innovative ability in Colleges and universities. In view of this, this paper first analyses the relevant theories of mathematical modeling, and the necessity of integration of mathematical modeling education and innovative ability cultivation in Colleges and universities. Then, according to the above theory, this paper puts forward the current dilemma faced by the teaching of innovative ability of mathematical modeling in Colleges and universities, and finally puts forward targeted solutions, in order to provide some reference for the cultivation of innovative ability of College students.

1. Research Background

1.1 Literature review

As an important training method, mathematical modeling plays an important guiding role in college students'education. In the current research, many scholars have carried out a detailed discussion on this. According to the existing teaching content, some scholars conducted a questionnaire survey on the students of local schools, used SPSS software to process the collected raw data, and described the specific application situation through frequency analysis method. The research shows that by strengthening the training of students'mathematical modeling competition, students' innovative ability can be effectively promoted (Tang S. Y, et al, 2018). According to the characteristics of mathematical modeling education, some scholars analyze the influence of students'innovative ability by using mathematical modeling. By analyzing the current situation and problems of engineering graduate students'learning, the author expounds the importance of integrating the idea of mathematical modeling into graduate students' training and the necessity of practical teaching experiments. It is found that the scientific research of mathematical modeling education for engineering postgraduates can effectively promote the scientific research strength of students and promote the cultivation of their innovative ability (Liu X, 2016). Some scholars point out that mathematical modeling can not only cultivate students'quality and ability, but also stimulate students' interest in learning. For example, through the teaching of mathematical modeling, colleges and universities cultivate students'application ability and practical ability through scientific research. On this basis, they can effectively carry out teaching activities, so as to enhance students' innovative ability (Qi X.G and Liu S.Y, 2009). In the current research process, some scholars have investigated and analyzed the dilemma faced by the traditional teaching mode in Chinese universities, and put forward specific guiding ideas based on the current situation of the teaching development of College Students'mathematical modeling contest. This paper points out the positive significance of the teaching reform of College Students'mathematical modeling contest by analyzing the characteristics of College Students' mathematical modeling contest. The research also points out that there are still some problems in the existing teaching of mathematical modeling in Colleges and universities, which need more people to study and discuss in detail (Kong P, et al, 2018). In addition, with the continuous development of multimedia information technology, training innovative talents has become an important goal of talent training in Colleges and universities. Among them, students, as the main source of innovative talents, play an important role in improving their innovative ability

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(Sheng H, et al, 2017). Therefore, how to cultivate the innovative ability of College students, and through which ways to improve, is the common concern of the current people. Because the teaching of mathematical modeling has been carried out in many areas, and has been well verified. Therefore, it is an important means of current teaching to study the cultivation of College Students'innovative ability from the education of mathematical teaching modeling.

1.2 Purposes of research

How to improve the innovative ability of college students through the teaching method of mathematical modeling is an important content of this study. In the existing literature, the research mainly focuses on some characteristics of mathematical modeling education, as well as some problems existing in the teaching process, which are seldom discussed in more detail. Based on this, this paper will start from the actual situation of mathematical modeling education, study the importance of current college students learning mathematical modeling thinking, and accordingly put forward specific optimization strategies, in order to provide a useful reference for teaching innovation and cultivation of students'innovative ability.

2. Overview of Related Theories

2.1 The connotation theory of mathematical modeling

Different from the interaction of traditional mathematics teaching, mathematics modeling teaching attaches great importance to the existing theories, and requires students to apply these theories to practical activities. Its goal is to cultivate students'innovative ability, so as to promote students to use mathematical knowledge to solve real life problems (Zhu D.Y, 2015). In real society, models can be seen everywhere, and its learning can not be separated from mathematical modeling. In fact, no matter what method is used to solve the dilemma, the key is to model the existing problems and solve them by computer, so as to get the optimal solution. The key of mathematical modeling is to use mathematical tools to analyze and summarize practical problems through deduction, inference and analysis. At present, students need to constantly improve the level of mathematical modeling and optimize the application ability in the process of mathematical modeling, in order to effectively establish excellent solutions. In the process of College teaching, mathematical modeling can help students solve practical problems, refine and categorize problems through Abstract.forms of expression, so as to experience the process of solving problems by using mathematics, and cultivate innovative consciousness and ability (Liu Z. Z, 2018). Therefore, the teaching of mathematical modeling is conducive to reforming the existing teaching content and improving the quality of classroom teaching.

2.2 Necessity of integration of mathematical modeling education and innovative ability training

In mathematical thinking, modeling is an Abstract.behavior used to understand things. Modeling is the key way to study the system. This is the case when we analyze the causal relationship of the system, or the relationship between them. For example, mathematical modeling, computer modeling and so on. Innovation is under the guidance of the existing thinking mode, through rational imagination, or to meet the actual needs, the existing materials will be transformed in a certain environment, so as to create new things, methods, paths and so on. Through the integration of modeling skills and innovation ability, more innovative talents can be trained. Mathematical modeling and innovation ability complement each other, and the integration of them is necessary (Wang Q and Pan J, 2017). On the one hand, mathematical modeling education can effectively cultivate students'knowledge application ability. In the process of building mathematical models, students need not only to master the basic modeling methods, but also to understand the essential problems behind the problems. Only through reasonable analysis and calculation can we find a solution to the problem. Usually, model building involves knowledge of many disciplines. Only when students master these basic knowledge, can they carry out systematic innovation. On the other

hand, mathematical modeling can cultivate students'Abstract.thinking ability, which is conducive to cultivating innovative consciousness. Compared with traditional teaching methods, there is no unified answer to mathematical modeling. For example, for the same problem, mathematical modeling can be carried out through a variety of ideas. Students can fully apply their knowledge in University and solve practical problems through appropriate imagination and Abstract.thinking ability.

3. Difficulties in Teaching Innovative Ability of Mathematical Modeling in Colleges and Universities

3.1 Lack of practical mathematic modeling course cannot provide reference for training students' innovative ability

Mathematical modeling originated in the 1970s and began to develop in western universities. After decades of development, Chinese universities have offered courses related to mathematical modeling for more than 40 years. Generally speaking, the course of mathematical modeling mainly sets up the ability of higher mathematics knowledge analysis and problem solving, mainly to enhance students'learning and innovation ability. Although Chinese universities have already offered relevant courses of mathematical modeling, there are still some deficiencies in the specific application of mathematical modeling and in the cultivation of students'innovative ability. In the existing teaching system, the course of mathematical modeling in Colleges and universities mainly concentrates on the theoretical part, and seldom starts from practical problems to provide specific guidance for students. In this case, students'innovative ability cannot be effectively improved. At the same time, teachers suffer from the lack of appropriate mathematical modeling course, can only rely on their own experience to write and teach, students'innovative ability training system has not been fully developed.

3.2 The importance of mathematical modeling education is low, and the teaching environment of cultivating students'innovative ability is poor

At present, the teaching atmosphere in Colleges and universities is relatively relaxed. After entering the university, the students'learning pressure suddenly eased, and they always passed the exam as the standard. Therefore, they no longer pay attention to the study of mathematical modeling. From the point of view of teaching environment, the current teaching environment of students'mathematical modeling in Colleges and universities does not pay enough attention. In the specific teaching process, only students' academic achievements are paid attention to, but the cultivation of their innovative ability is neglected. In this case, the teaching environment of mathematical modeling can not be effectively improved. In the specific application process, it is only developed according to actual needs, and there is no systematic improvement of the teaching environment. In this state, students'interest in learning mathematical modeling is also greatly reduced, and they do not attach importance to the cultivation of their innovative consciousness and ability. Therefore, colleges and universities do not pay enough attention to the improvement of the educational environment of mathematical modeling, making the cultivation of students'innovative ability also suffered a great negative impact.

3.3 The teaching staff of mathematical modeling teaching is insufficient, and the level of students'innovative ability training is uneven

With the continuous expansion of University scale, the number of teachers is also increasing. However, there are few teaching schemes for mathematical modeling in Colleges and universities, and there are no practical teaching cases. At the same time, although colleges and universities have introduced multimedia teaching equipment, few cases of mathematical modeling and abundant internet teaching resources have been introduced. Due to the lack of sufficient teaching resources, the educational program of mathematical modeling in Colleges and universities has not been well implemented, so the students'innovative consciousness and ability have not been improved. In

addition, there is a lack of vivid cases in the education of mathematical modeling in Colleges and universities, and the idea of mathematical modeling is not fully integrated with the main knowledge of teaching, so it can not arouse students'interest in learning. As a result, students know little about the teaching methods of mathematical modeling, so it is difficult to improve their innovative ability. Finally, many colleges and universities lack a unified curriculum standard of mathematical modeling, and the number of teachers is insufficient, which leads to the ineffective development of mathematical modeling teaching activities, and also restricts the cultivation of students'innovative ability.

4. A New Way of Training Students' Innovation Ability in Mathematical Modeling Education

4.1 Integrating mathematical modeling into classroom teaching

Linear algebra, higher algebra and probability theory are the basic courses of mathematical modeling in the existing mathematics teaching courses in Colleges and universities. The purpose of offering advanced mathematics courses in Colleges and universities is to enable students to understand the basic mathematics and to have the ability to solve problems in connection with reality. Therefore, skilled application of high-number thinking in practical problems can effectively improve students'innovative ability. In other words, colleges and universities should build mathematical models to cultivate students'ability to solve practical problems. In specific teaching, teachers can extract Abstract.mathematical concepts from practical problems, guide students to open up creative thinking to solve practical problems and enhance their innovative ability.

4.2 Training students'comprehensive quality and perfecting modeling ability

In fact, the concept of mathematical model has run through students'whole academic career. Mathematical models are fully embodied in the application of test questions in primary schools, analytic geometry in secondary schools, and the idea of University limit. Therefore, when using mathematical modeling to teach, college teachers introduce mathematical knowledge in different stages, transform it into mathematical modeling ideas, and solve different problems through different ways of thinking. At the same time, teachers need to cultivate students'ability to express practical problems by Abstracting and simplifying them into mathematical language symbols, so as to increase their innovative consciousness, and introduce computer teaching programming to improve students' ability of computing model in mathematical modeling. In addition, teachers can also cultivate students'teamwork ability. After strengthening teamwork, students can continue to innovate in the learning process, so as to improve their innovation ability and solve various problems smoothly.

4.3 Deepening innovative teaching through mathematical modeling

Mathematical modeling is a process of applying the mathematical methods we have learnt to practice and solving problems. In this process, students need to have problem insight, imagination and specific application ability. In the process of solving practical problems, teachers also need to deepen innovative teaching mode and introduce relevant skills, so as to provide certain basic conditions for cultivating students'innovative ability. For example, the introduction of computer programming related software MATLAB, Mathematics and so on, in order to form mathematical modeling capabilities. In addition, teachers may expand the classroom teaching content. When explaining the “installment payment problem”, they may add some problems such as purchasing and sales to complicate it, and guide students to solve the problem by using mathematical modeling in the process of solving the problem.

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