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Mathematical Contest in Modeling and Cultivation of Innovative Ability for Undergraduates

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Abstract: Cultivating innovative talents has become an important goal of running a university，The Mathematical Contest has fostered students' insight into complex things，the spirit of teamwork，the ability to solve practical problems and writing the paper writing ability and other aspects,It is an effective way to cultivate undergraduates' innovative spirit and practical ability.It is of great significance to develop mathematical modeling based on the cultivation of college students' mathematical innovation ability.

Keywords: Mathematical Contest in Modeling ,Undergraduate,Innovative ability,Cultivation

National college students mathematical modeling race since 1992 has been opened, has now become China's largest college students one of extracurricular scientific and technological activities. In the course of mathematical modeling, students should complete the model hypothesis, establish and solve according to their understanding of practical problems. Therefore, mathematical modeling has become an important way to cultivate college students' innovative ability and comprehensive quality. National college students mathematical modeling race since 1992 has been opened, has now become China's largest college students one of extracurricular scientific and technological activities. In the course of mathematical modeling, students should complete the model hypothesis, establish and solve according to their understanding of practical problems. Therefore, mathematical modeling has become an important way to cultivate college students' innovative ability and comprehensive quality. In recent years, on the mathematical modeling of college students innovation and comprehensive quality of training, many domestic colleges and universities educators have been analyzed and discussed. Local colleges and universities as the most important talent training places, college students' innovation ability and overall quality is particularly important.

Mathematical modeling activities can improve the overall quality of college students, is to cultivate the application, compound and innovative talents of the important initiatives, colleges and universities for mathematics teaching reform, construction style of study, students interest in learning, improve college students innovative thinking, unity and cooperation and hard work ahead The spirit of the effective way.

The mathematical modeling contest is characterized by the fact that the problem is simplified by the practical problems in engineering technology management science, and there is generally no standard answer given in advance, leaving sufficient room for the contestants to play their ingenuity and creativity. The development of activities is conducive to the students' knowledge, ability and quality of the overall training for outstanding students come to the fore. Mathematical modeling and its activities have broken the original mathematics curriculum self-contained, self-enclosed situation, for the connection between mathematics and the outside world in the teaching process to open a channel, provides an effective way. For math students, the number of models to promote their mathematical cooperation with engineering and economic issues, urging them to improve the programming ability to stimulate their use of mathematical knowledge to solve practical problems of enthusiasm; for science and engineering students, The number of competition will enable them to learn more in mathematics, mathematics and their own science and engineering background linked to further

improve their scientific research capabilities. Mathematical modeling competitions have played a positive role in stimulating students' interest in learning, enhancing their learning initiative, cultivating their innovative spirit and team spirit, and have greatly promoted the improvement of the quality of personnel training. Mathematical modeling education and mathematical modeling contest is the largest and most successful mathematics teaching reform practice in these years, and it is an important contribution to quality education. In this paper, we give the main steps of mathematical modeling, and analyze the logical thinking method of training in mathematical modeling and the role of cultivating students 'comprehensive ability. Finally, we put forward the mathematical modeling contest to improve the students' comprehensive quality The move.

There are two ways to establish a mathematical model: a method of theoretical analysis, that is, according to the nature of objective things, analysis of causality, with appropriate assumptions to describe the number of mathematical tools with the characteristics of the other; Experimental method, that is, according to the test or calculation data, according to a certain mathematical method, summed up the system of mathematical models. The former is called the mechanism analysis method, the latter is called the test analysis method. Mechanism analysis is based on the understanding of the characteristics of objective things, to find out the number of internal mechanisms to reflect the law, the establishment of mathematical models often have a clear physical or practical significance. Test analysis will study the object as a "black box" system, through the system input and output data measurement and statistical analysis, according to certain criteria to find the best model. For some practical problems need to combine the two methods, with the mechanism to establish the structure of the model, with the test to determine the model parameters.

Intuitive thinking is an overall observation of the problem, the rapid retrieval, communication has been stored in the brain of the relevant information, so that with the original information to establish a substantive link, so as to make a direct judgment of a way of thinking. It is in a large number of perceptual materials on the basis of the problem of a "sudden" epiphany or understanding, often at this time to create inspiration spark, and the inspiration is often accompanied by a breakthrough and innovation. It is well known that many important mathematical discoveries in the history of mathematics come from intuitive thinking, such as Cartesian coordinate system, Fermat's big theorem, Goethebach conjecture, Euler theorem, etc., should be said that they are not the product of any logical thinking, but mathematicians through Observation, comparison, comprehend, sudden inspiration found. Through the mathematical modeling teaching, so that students have unique insights and different ways of thinking, such as good at finding problems, communication between the various types of knowledge is the intrinsic link between students to cultivate the core of innovative thinking.

Because mathematical modeling is the conversion of practical problems into mathematical problems, it is very useful to cultivate our ability to cultivate our ability to cultivate students' thinking, creativity and intellectual development if we focus on the transformation of the problem in teaching. Students in-depth study of the problem will undoubtedly stimulate the initiative of learning mathematics, and can develop students creative thinking ability, develop good at finding problems, independent thinking habits.

Modeling is the construction model, but the model is not an easy task, but also need to have strong enough structural capacity, and the improvement of student structure is the basis of creative thinking and creative ability of students, creatively use the known conditions , The creative application of mathematical knowledge. As long as we in the teaching of teachers carefully observed, carefully designed, you can put some more abstract problems, through the phenomenon to remove non-essential factors, from which to construct the most basic mathematical model, the problem back to the field of known mathematical knowledge, And can cultivate students' innovative ability.

Because of the uniqueness of mathematics modeling course, it is not enough to cultivate students' innovative

ability through mathematical modeling in teaching. It is important to insist on taking students as the main body and not from students Engage in some unrealistic modeling teaching, all of our teaching activities must mobilize students 'subjective initiative, cultivate students' innovative thinking as the starting point, guide students to independent activities, consciously in the learning process to build mathematical modeling awareness, the only way In order to enable students to analyze and solve the problem of the ability to make great progress, and only then can really improve the students' ability to innovate, so that students learn useful mathematics. Through mathematical modeling to improve students' ability to innovate, not a matter of time, but a long process. In this process, you need the math teacher to pay hard work, through teaching, training, competition and other methods, all-round to enhance students' innovative ability.

Mathematical modeling is a kind of creative thinking activities, there is no unified model and a fixed method, students need to have a good abstract general ability, mathematical language translation ability, good at grasping the nature of insight, association and comprehensive analysis, Master and use the ability of contemporary scientific and technological achievements. From the perspective of logical thinking, abstract, induction, deduction, analogy, simulation and other methods are widely used in the modeling process plays an important role. Abstraction is to ignore the specificity of each specific thing, looking for things to develop changes in the common and general rules. Inductive is based on observation, experience or experiment, based on a number of known incomplete phenomena inferred is unknown phenomenon, that is, from a special, specific understanding to advance to the general understanding of a way of thinking. Deduction is a general proposition to introduce specific proposition reasoning method. The deductive method can clarify the special circumstances, reveal the nature of the implication, contribute to the scientific theory and systematization. Analogy is a comparison between two different things, to find a number of the same or similar points, speculated that in other areas may also exist the same or similar to a way of thinking. The analogy is the property of the thing that is being studied from the thing attribute that people have already mastered. The analogy of the results is speculative, not necessarily reliable, but it has the function of discovery and is an important way of creative thinking. Simulation is a way of simulating or predicting the structure and behavior of the original system by using a simplified, rapid, economical, and safe system to describe and study the changes in the way the process and process of things evolve. The effect of a system of behavior, which is an effective way to solve complex practical problems. Modeling is a creative process of thinking, not only can cultivate students 'logical thinking, but also can cultivate students' imagination and insight, training students innovative thinking, improve their scientific research ability.

For Yanbian University students in the school, the mathematical modeling contest is indeed a mathematical, physical and computer science and other related disciplines to solve practical problems of the test and training. In recent years, Yanbian University team to participate in mathematical modeling competitions have achieved good results, see Table 1, mathematical modeling competition can not only enhance the analysis of college students and problem-solving ability, cultivate students of mathematical innovation and mathematics Innovative thinking, but also for outstanding students come to the forefront of creating favorable conditions. The author notes that students who have achieved excellent results in the math modeling competition have significantly improved their learning ability, mathematical innovation ability and scientific research ability. In the course of mathematics and elective courses, college graduates' graduation design and graduate entrance examination Showing a strong advantage, after graduation can get the general welcome and recognition of the employer.

Table 1 Yanbian University in recent years to participate in the national college students mathematical modeling contest results analysis

(Table A, B, C, D, E said: A for the national first prize, B for the national second prize, C for the Jilin Division (provincial) first prize, D Jilin area (provincial) Second prize, E for the Jilin Division (provincial) third prize)

Actively participating in the Mathematical Modeling Contest not only improves the ability of college students to acquire basic knowledge of mathematics and the ability to use mathematical knowledge to analyze and solve practical problems, but also cultivates students' ability of mathematical innovation, unity and cooperation ability and scientific research ability. In my opinion, the mathematical modeling competition provides a combination of theoretical learning and practice of innovative talent training model vision and philosophy, highlighting the focus on the basis and practice, cultivate innovative educational characteristics. At the same time, it has provided some ideas for the deepening reform of higher education and the improvement of teaching quality in colleges and universities.

年份	*A*	*B*	*C*	*D*	*E*
2011	1	0	2	6	14
2012	0	0	3	7	13
2013	0	1	3	8	15
2014	0	1	4	8	3
2015	1	0	5	8	2
2016	0	1	8	18	16

Mathematical modeling exercises the ability of students to discover problems, analyze problems and solve problems, is a more comprehensive scientific research practice and training activities.

(1) exercise students to access and use a variety of literature, including the ability to check the information on the Internet. This ability is necessary to do research projects.

(2) to develop students' ability to comprehensively apply mathematical knowledge and to analyze the ability to solve problems. Mathematical modeling requires students to establish a mathematical model on the basis of rational simplification of the problem, and to cultivate students' ability to use mathematical knowledge comprehensively and analyze the ability to solve the problem.

(3) to cultivate students' ability to write research papers. Participants write a paper that includes abstracts, questions, model assumptions, problem analysis, model assumptions, model building, model solving, result analysis, model evaluation and extension, references, appendices and so on. Students in the writing of papers to clearly express their own modeling ideas and analysis of the problem, and clearly express the conclusions, but also to try to focus on the clear, clear logic, structured. In the process of writing, the writing ability of students' research papers has been cultivated and improved.

(4) to cultivate students' imagination and innovative spirit. Mathematical modeling training to explore the main discussion, requiring students to explore their own new knowledge, pay attention to independent research, asking them to give full play to their imagination, good association.

(5) to develop students' observation and insight. Facing the intricate practical problems, students are required to quickly seize the main contradictions, to sort out the problems and difficulties and solutions.

(6) to develop students' ability to use computer software and programming. The solution and verification of the model can be realized by programming, requiring students to be familiar with at least one programming language, such as Matlab, Mathemat-ica, Lingo, etc., the data preprocessing students need to use Word, Excel and other software.

(7) to cultivate students' team spirit. Team spirit is the key factor in whether the mathematical modeling can achieve good results, each team of three individuals to support each other, encourage each other, give full play to each person's expertise, such as computing, analysis, programming, writing, etc., help students develop Work

with others good habits, training team spirit. In addition, in the process of digital competition and training, students will find their own deficiencies, such as the lack of profound knowledge of mathematics, programming ability, but the paper writing thinking chaos, which prompted them to study hard, take the initiative with the teachers and students More exchanges, and constantly improve their ability.

The purpose of the mathematical modeling competition is to improve the students 'ability. The process of competition training is more important than the results of the competition. It is mainly through the training of mathematical modeling to improve students' ability to analyze and solve problems, but also to promote teachers to improve their teaching and scientific research. In the process of organizing the competition, as far as possible the purpose of the competition --- innovation, team spirit, focus on participation, fair competition to implement.

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