Exploration and Research on the Cultivation of Innovation and Entrepreneurship Ability in College Mathematics Teaching

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ABSTRACT

With the advent of the global information age and the rapid development of modern science and technology and social economy, the competition in the global higher education employment market is becoming more and more fierce. Facing the new challenges of talent training, we must firmly grasp the main line of "innovation and entrepreneurship ability training" in order to cultivate more compound excellent innovative talents for the country. Through the exploration and Research on the cultivation of college mathematics innovation and entrepreneurship ability, this paper has carried out various forms of teaching method reform, teaching mode reform and teaching content reform of college mathematics teaching innovation, continuously explored and deepened the effective breakthrough of college mathematics innovation and entrepreneurship education, in order to meet the new challenges of talent cultivation in Higher Education in China, It provides an effective new idea for innovating and reforming college mathematics education.

Keywords: *College mathematics, Innovative education, Teaching methods, Teaching mode, Ability training.*

1. INTRODUCTION

In the era of knowledge economy in the new century, how to cultivate more talents with knowledge innovation and entrepreneurial spirit has become the focus of competition all over the world. Former President Jiang Zemin once pointed out: "innovation is the soul of a nation's progress and the inexhaustible driving force for the country's prosperity. A nation without innovation ability is difficult to stand in the forest of advanced nations in the world". It also points out that "the key to innovation is talents, and the growth of talents depends on education". Therefore, China has formulated the great strategy of "rejuvenating the country through science and education". In order to achieve this goal, education should go first, and higher education is the key [1-2].

2. PAYING CLOSE ATTENTION TO THE CULTIVATION AND EDUCATION OF INNOVATION AND ENTREPRENEURSHIP ABILITY IN COLLEGE MATHEMATICS TEACHING IS AN IMPORTANT MEASURE TO DEEPLY CULTIVATE COMPOUND TALENTS

The three elements of modern science and technology research: scientific theory, scientific experiment and scientific calculation all need a solid and broad mathematical foundation and strict logical thinking. At the beginning of the 20th century, roentgen, the Nobel Prize winner and the great experimental physicist, said in response to the foundation that scientists should have: "the first is mathematics, the second is mathematics, and the third is mathematics". The mathematicization of science is an obvious trend in the development of modern science. Marx said, "only when a science successfully uses mathematics can it really reach the point of perfection." It can be seen that basic mathematics education is irreplaceable in cultivating talents' innovative ability.

College mathematics teaching is known as "hard bone" in domestic colleges and universities of science, engineering and economics. It plays a dual role in cultivating compound senior engineering and technical talents and senior economic talents. One is instrumental (Applied) and the other is quality because mathematics is the language of science, we can't talk with modern science and technology without understanding this language. Mathematics is an indispensable tool and theoretical basis for learning and studying modern science and technology and carrying out innovative work. Without quantitative analysis, it is impossible to have an in-depth understanding of objective things, and its discovery, invention and creation can not be upgraded to theory. There are great limitations in understanding, so the most perfect results can not be obtained.

On the other hand, mathematics, as a model of "rational thinking", is the highest achievement and victory of human abstract thinking and the natural carrier of thinking science. Mathematics can play a great role and have a far-reaching impact on cultivating students' strict logical thinking, strict reasoning methods and establishing the viewpoint of dialectical materialism. Only high-quality talents with good and solid mathematical foundation can occupy a place in the primary innovation work. The Department of geology of Peking University can train dozens of academicians of the Chinese Academy of Sciences, which is directly related to Mr. Li Siguang's request that students strengthen their mathematical foundation. The students of Indian Institute of technology are looted by developed countries in the world, mainly because they have strict mathematical reasoning and thinking [3-5].

In the past mathematics teaching, we pay full attention to its instrumental and basic theory teaching. In terms of knowledge and methods, the explanation is in-depth and comprehensive, while in terms of thinking methods, we often hope to exert subtle influence, so as to make mathematics class play a more full role in quality education. With the requirements of the times, we should pay attention to the cultivation of thinking methods while teaching mathematical knowledge, and raise the cultivation of innovative ability to a due height in teaching. What we are talking about here is not to turn the mathematics course into a thought method course, but to make the finishing point while imparting mathematics knowledge and cultivating ability, and consciously and clearly point out the mathematics thought method. In the teaching of college mathematics course, we should fully let students deeply understand and accept some innovative ideas and methods. Therefore, while continuously strengthening the innovative teaching of college mathematics, we also deeply adopt the following teaching methods.

3. WHILE CONTINUOUSLY STRENGTHENING THE INNOVATIVE TEACHING OF COLLEGE MATHEMATICS, WE SHOULD CARRY OUT IN-DEPTH RESEARCH ON VARIOUS FORMS OF TEACHING METHODS

3.1. Induction

It is an innovative process of abstracting concepts, theories and methods through the observation, analysis, induction and summary of many individual problems, phenomena and data. Gauss once said, "many of my discoveries are made by induction". In teaching, we attach great importance to the teaching of basic concepts and the explanation of the context of problems. For some important concepts, such as function, limit, derivative and integral, a large number of practical

problems must be cited before they are introduced, and finally relevant concepts can be summarized and abstracted. In this way, it is very important for students to correctly understand these basic concepts and understand their connotation and extension. If we point out this inductive thinking method in one or two sentences and look at the essence through the phenomenon, it is very beneficial to improve students' primary innovation ability. For example, before explaining the concept of derivative, we first introduce the speed problem, tangent problem, current intensity problem, etc., and then extract the practical significance of each specific problem, only from the perspective of operation, It is nothing more than the problem of finding the change rate of the function to the independent variable at a point X for a given function $y = f(x)$. When the change is uniform, the problem can be solved by the ratio of the increment of the independent variable to the increment of the function $\triangle Y / \triangle X$; When the change is non-uniform, the above formula should be taken as the limit when $\triangle x \rightarrow 0$ in order to solve the problem, which is called derivative. At this point, we would like to conclude that the thinking of seeing the essence through the phenomenon and summarizing the new concepts and methods abstractly promoted from many problems is the basis of primary innovation. We hope that students can gradually master and deeply understand this innovative thinking method while mastering relevant mathematical knowledge. Induction will often be used in solving many problems later in this course. Such as the formulas and rules for finding higher derivative; Solving partial derivative of implicit function equations; Conditional extremum problem with multiple conditions; Solving problems of high-order linear equations (Systems) with constant coefficients [6-8].

3.2. Analogy method

If the new problem studied has some similarity and comparability with another solved problem in internal structure and attributes, we guess that we can use similar methods to solve the new problem, or think that the new problem and the solved problem will have similar conclusions. This is the idea of analogy. Laplace pointed out that "in mathematics, The main tools and means of discovering truth are induction and analogy." Nobel Prize winning physicist Tang chuanxiupeng pointed out that" analogy is a form of creative thinking ", and scientists attach great importance to analogy.

In teaching, we give the auxiliary function in the proof of Lagrange's mean value theorem by analogy, also give the auxiliary function in the proof of Cauchy's mean value theorem by analogy, and further give the idea of constructing auxiliary function by analogy with related propositions of mean value theorem; The judgment method of inflection point in the extreme value problem of univariate function is given by analogy,

and the judgment method of convergence and divergence of some abnormal integrals in the judgment method of convergence and divergence of positive term series is given by analogy; When explaining the orthogonality of Fourier series and trigonometric function system, we compare it with three-dimensional vector space and basic unit vectors I, J, K, The power series expansion of the function has nothing to do with the linearity of the power function system {X "}. When talking about differential equations, it points out the comparability of circuit system and mechanical system, which will bring great economic benefits. In short, in teaching, we should pay attention to cultivating students to be good at Association, analogy and analogy, so as to improve their innovative ability.

3.3. Strict demonstration method of bold conjecture

Newton said, "without bold conjectures, great discoveries cannot be made." Young students have a passion for pursuing truth and like to guess, but they often think wrong because they don't think deeply or comprehensively about problems. At this time, we must not say that students "take it for granted" or "think nonsense", but protect the creative spirit of daring to think. In teaching, we should encourage and induce students to think more, and guide students to make reasonable assumptions by means of observation and analysis, induction, analogy and image thinking. Nobel Prize winning physicist Steven Chu said, "the important thing is to cultivate a habit of scientific intuition, look at problems in different ways and solve problems in different ways". To be able to guess boldly and reasonably is only the beginning of innovation. It also needs a rigorous scientific attitude, strict and detailed demonstration, and can become the truth after the test of practice.

In teaching, we guide students to guess the derivation method of inverse function, compound function and parametric equation from the increment ratio, and analyze the corresponding conditions; From geometric intuition to guiding students to guess the mean value theorem; From Cauchy's mean value theorem to transforming function ratio into derivative ratio, students are guided to guess lobida's law of 0 / 0 type indefinite formula; From the analysis of the structure of homogeneous linear differential equation with constant coefficients to the conjecture that it has a solution in the form of exponential function; By analyzing the structure of homogeneous Euler equation, it is conjectured that it has a solution in the form of power function, and further conjectured that the equation can be transformed into a homogeneous linear differential equation with constant coefficients through independent variable transformation x = C '. Many theorems, their conditions and conclusions can properly guide students to make reasonable conjectures, then correctly describe the theorems in strict analytical language, and then conduct strict logical demonstration.

3.4. Main contradiction law

When dealing with complex problems, we should be good at grasping the main contradictions and temporarily ignoring the secondary factors, so as to simplify the problems. But it can't be done once and for all. Problems must be tracked at all times.

When dealing with problems in this course, one of the most important ideas is local linearization. As the linear principal part of function increment - differential, it ignores the higher-order infinitesimal part. However, with it, the derivative of function, definite integral and some differential equations will be solved easily, and the main contradiction should be paid attention to in the establishment of differential equations.

In the teaching of this course, there are many important ways of thinking, such as the concept of movement, the idea of transformation, looking at the change trend, the idea of pinch, etc. In the proof of theory, many ways of thinking, such as forward thinking, reverse thinking and divergent thinking, are necessary to cultivate high-quality talents with innovative ability and entrepreneurial spirit.

4. REFORM MEASURES ON TEACHING MODE, CONTENT, SYSTEM AND TEACHING METHODS OF COLLEGE MATHEMATICS

Two teaching modes: one is to cultivate elite talents, have deep mathematical skills, and strengthen the teaching of theoretical basis on the basis of the original teaching; The other is to train advanced applied engineering and technical talents and advanced applied economic management talents. We should flexibly use mathematics and strengthen comprehensive and practical application on the basis of the original teaching. Finally, two systems are formed for hierarchical teaching. About 1 / 4 of the students in the school choose the first and 3 / 4 of the students choose the second.

Engineering technology majors adopt the teaching method of combining advanced mathematics with analytical geometry, and economic management majors adopt the teaching method of combining calculus with economic mathematics. Although the teaching contents and class hours of the two models are different, after years of teaching practice, higher mathematics and analytical geometry have been integrated to realize the combination of shape and number. The teaching effect is good, and the teaching method of combining calculus with economic mathematics has also produced good results.

The "mathematics experiment" course has been opened in the whole school, with 18 classes and more than 600 students.

In order to broaden students' knowledge and cultivate compound talents, the basic knowledge of complex variable function and integral transformation is added to the mathematics textbooks of Engineering Universities for selection by different majors; In order to further study mathematics knowledge in the future, some new knowledge docking has been done through the appendix or the chapter marked with *; In order to improve students' self-study ability, a comprehensive and practical example is specially written for students after each chapter for self-study; We have constantly collected and compiled some new exercises, especially those reflecting the characteristics of the times, for students to study in depth and solve practical problems. Such as: Chernobyl nuclear power plant, Irkutsk submarine, Shenzhou spacecraft soft landing, National Grand Theater, population, pollution control, etc; Make full use of the knowledge of linear algebra in multivariate functional differential and differential equations to make the problem more concise; In order to deeply explore the connotative development road of the cultivation of compound high-quality talents, we unify the double integral, triple integral, first line and area integral under Riemann integral, which is conducive to improving students' abstract thinking ability on the one hand and strengthening the discussion on the application of integral on the other hand; Combining the second type curve integral, surface integral and field theory makes their physical background clearer and more conducive to their further application in the future; Combining the application of differential and integral of univariate function is convenient to further discuss more comprehensive problems and further improve students' ability to analyze and solve problems [9-10].

Strengthen multimedia teaching and constantly summarize regularly, make full use of the advantages of network teaching, and further improve the teaching quality.

Implement the separation of teaching and examination, and evaluate students' academic performance, which is composed of attendance performance, usual performance and final examination performance, so as to not only urge students to study at ordinary times, but also make the performance evaluation more reasonable and objective.

5. CONCLUSIONS

With the advent of the global information age and the rapid development of modern science and technology and social economy, the competition in the global higher education employment market will be more and more fierce. Facing the new challenges of talent training and the increasing requirements of employers, we must firmly grasp the theme of "cultivation of innovation and entrepreneurship ability", always based on the forefront of teaching reform and scientific research of college mathematics teaching, carry out various forms of teaching reform and teaching research of college mathematics teaching innovation, further emancipate the mind and change educational ideas, Break through the traditional teaching mode, constantly explore and deepen the effective breakthrough of college mathematics innovation and entrepreneurship education, and cultivate more compound excellent innovative talents for China's higher education.

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