Research on the Mathematics Teaching Reform and the Cultivation of Students’ Innovation Ability in Colleges and Universities

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Abstract

With the renewal of educational concepts and the development of science and technology, the traditional mathematics teaching mode has been difficult to meet the demand of modern society for innovative talents. Therefore, this study aims to explore how to effectively improve students’ innovation ability through mathematics teaching reform. First, we analyze the current situation of mathematics teaching in colleges and universities and identify the main problems that restrict the development of students' innovation ability. Subsequently, based on innovative educational theories, a series of teaching reform strategies are proposed. These include the implementation of project-based learning, enhancing the integration of mathematics with other disciplines, and utilizing diverse teaching methods and evaluation systems. The experimental results show that the mathematics teaching after the implementation of the reform not only improves the students’ mathematical literacy but also significantly enhances the students’ innovative consciousness and practical ability. This study not only provides theoretical basis and practical guidance for the reform of mathematics teaching in universities, but also provides new ideas and methods for cultivating innovative talents.

Keywords

College mathematics teaching, teaching reform, innovation ability

Introduction

With the rapid development of society and the progress of science and technology, mathematics teaching in colleges and universities is facing unprecedented challenges and opportunities. The traditional mathematics teaching mode can no longer meet the requirements of modern society for the innovation ability of talents, so the reform of mathematics teaching in colleges and universities is imperative. This paper aims to explore the relationship between the reform of college mathematics teaching and the cultivation of students' innovation ability, analyze the current situation and problems of mathematics teaching in colleges and universities, and put forward the corresponding reform strategies and suggestions.

1. The present situation and problems of college mathematics teaching

1.1 Teaching content is single, lack of innovation

At present, the current situation of mathematics teaching in colleges and universities is worrying. Many teaching contents
still adhere to the traditional mode of knowledge transmission, lack of enough innovation and practicality. In this mode, students often become passive recipients of knowledge, and their learning process is limited to the level of remembering and understanding knowledge, with little opportunity for in-depth thinking and exploration. This passive learning method greatly limits the cultivation of students' innovation ability and practical ability. In order to adapt to the requirements of talents in the new era, mathematics teaching in colleges and universities is in urgent need of reform, introducing more innovative and practical teaching contents and methods, to stimulate students' interest in learning, cultivate their active thinking and exploration ability, and then improve their innovation ability and practical ability.

1.2 Old teaching methods and lack of interaction

The traditional teaching method of mathematics in colleges and universities is indeed limited to some extent, which mainly depends on the mode of teachers ‘teaching and students' listening to the lecture. This one-way knowledge transmission mode often ignores the interaction and communication in teaching. Under this teaching method, students often only passively accept the knowledge, but lack of in-depth thinking and independent exploration, which makes their learning process become mechanical and boring.

The lack of interaction and communication of teaching methods not only makes students feel the lack of interest in learning, but also limits their initiative and sense of participation. Students are unable to express their views and questions in time and lack the opportunity to discuss problems with teachers and classmates. Such an environment is not conducive to the cultivation of students’ innovative thinking, because they lack a platform to collide ideas and inspire inspiration in communication and discussion.

At the same time, this teaching method also hinders the cultivation of students' practical abilities. Mathematics is a subject that needs continuous practice and application. It is difficult to master and apply it only by relying on listening to lectures (Gao, X., 2023). Students who lack practical opportunities are often unable to transform the knowledge they have learned into problem-solving ability, or to test and improve their mathematical knowledge in practical application.

Therefore, in order to stimulate students' interest and enthusiasm in learning, and cultivate students' innovative ability and practical abilities, it is urgent to introduce more interactive and communication teaching methods in college mathematics teaching. Through the introduction of group discussion, case analysis, experimental operation, and other teaching methods, students can more actively participate in the learning, and the mystery of teachers and students to explore mathematics and improve the learning effect and comprehensive ability.

1.3 The evaluation system is single and lacks diversity

In the teaching of colleges and universities, the evaluation system plays a vital role, which is not only related to students' academic performance but also affects students' learning motivation and development direction. However, the current evaluation system of mathematics teaching in colleges and universities is often too single, too dependent on the traditional examination form, and only through the written test results to evaluate the students' mathematical ability. This practice obviously has many disadvantages.

First of all, a single evaluation system cannot fully reflect the students' comprehensive quality and ability level. Mathematics is not only a subject requiring memory and understanding ability, but also a subject requiring innovative thinking and practical ability. However, the current evaluation system often only focuses on students' memory and understanding ability, ignoring students' innovative thinking and practical ability. This leads students may study just to cope with exams and lack the motivation to think and explore deeply.

Secondly, a single evaluation system is not conducive to promoting the overall development of students. Under the educational concept of all-round development, students need to cultivate their own innovative thinking, practical ability, teamwork ability, and other abilities while learning mathematics. However, due to the single nature of the evaluation system, students often only pay attention to the test scores and ignore the cultivation of other abilities. As a result, students often lack the ability and methods to solve problems when facing practical problems.

Therefore, the evaluation system of college mathematics teaching needs to be reformed urgently. We need to build a more diversified and comprehensive evaluation system, including students' innovative thinking, practical ability, teamwork ability, and other abilities into the evaluation scope. Through diversified evaluation methods, such as project practice, mathematical modeling competition, teamwork project, etc., students' mathematical ability and comprehensive quality are comprehensively evaluated, stimulate students' learning motivation and creativity, and promote their all-round development.
2. The relationship between college mathematics teaching reform and students' innovation ability cultivation

2.1 Teaching reform is the premise of innovation ability cultivation

The reform of college mathematics teaching is indeed the premise and foundation of improving students' innovation ability. In today's rapidly changing era of science and technology, the traditional mathematics teaching mode has made it difficult to meet the social demand for innovative talents. Therefore, it is particularly important to carry out a comprehensive and in-depth reform of mathematics teaching content, teaching method and evaluation system.

First of all, reforming the teaching content is the key to improve the students' innovation ability. By introducing cutting-edge mathematical theories, methods, and application cases, students can broaden their knowledge horizons and stimulate their interest in learning. At the same time, pay attention to cultivating students' mathematical thinking and problem-solving ability, so that they can use mathematical knowledge to solve practical problems, so as to enhance their innovation ability.

Secondly, reforming the teaching method is an effective way to improve the students' innovation ability (Liu, C., 2022). Various teaching methods such as heuristic, inquiry, and discussion, can stimulate students' interest and enthusiasm in learning, and cultivate their active thinking and exploration ability. By guiding students to participate in classroom discussion, group cooperation, project practice, and other activities, we can let them learn and grow in practice, so as to improve their innovation ability.

Finally, the reform of the evaluation system is an important guarantee to improve the students' innovation ability. The establishment of a diversified and comprehensive evaluation system, paying attention to students' knowledge mastery, learning ability, innovative spirit and comprehensive quality, and other aspects, can comprehensively evaluate students' performance and development potential. Promote their overall development by encouraging students to achieve more achievements in learning and innovation.

2.2 Cultivating innovation ability is the goal of teaching reform

The core goal of mathematics teaching reform in colleges and universities is undoubtedly to cultivate high-quality talents with innovative abilities. In the current rapidly changing social background, the realization of this goal is of great significance to the individual's career development and the scientific and technological progress of the country.

In order to achieve this goal, special attention should be paid to cultivating students' innovative thinking in the process of college mathematics teaching. Innovative thinking is the core of innovative ability. It encourages students to jump out of the traditional thinking mode and dare to put forward new ideas and new ideas. In mathematics teaching, teachers can stimulate students' innovative thinking by designing challenging problems and introducing interdisciplinary knowledge and thinking methods.

In addition, the cultivation of innovative practice ability is also an important direction of teaching reform. Innovative practice ability refers to the ability to apply innovative thinking and innovative methods to practical problems. In mathematics teaching, teachers can design practical teaching projects, let students participate in the real problem-solving process, and exercise their innovative practical ability through practice.

In the teaching process, teachers should pay attention to cultivating students' innovative thinking, innovative methods, and innovative practical ability, so that students can carry out innovative research and practice in the field of mathematics or other fields, to make contributions to the country's scientific and technological progress and social development.

3. Strategy and suggestions for college mathematics teaching reform

3.1 Update the teaching content and pay attention to the innovative practice

Mathematics teaching in colleges and universities should indeed keep pace with The Times, constantly update the teaching content, and introduce the cutting-edge mathematical ideas and methods, so as to better cultivate the students' innovative and practical ability (Li, Y., 2022). This reform direction is not only in line with the current social demand for innovative talents but also an important way to promote the development of mathematics itself.

To achieve this goal, colleges and universities can actively offer mathematics experiment courses. Such courses not only provide a practical application platform for theoretical knowledge, but also allow students to experience the charm of mathematics in practical operation. Through mathematical experiments, students can understand mathematical principles more intuitively, master mathematical methods, and improve their mathematical literacy. At the same time, the
mathematics experiment course can also cultivate students' practical ability and problem-solving abilities, laying a solid foundation for their future innovative practice.

In addition, the mathematical modeling course is also an important way to cultivate students' innovative and practical abilities. Mathematical modeling is the process of applying mathematical theory to practical problem solving, which requires students to have a solid mathematical foundation, good logical thinking ability and innovative and practical ability. Through the mathematical modeling course, students can learn how to transform practical problems into mathematical problems and use mathematical methods. This process can not only exercise students' mathematical ability, but also cultivate their innovative thinking and practical ability, making them more competitive in their future work and research.

3.2 Reform the teaching methods and enhance the interactivity

The voice of mathematics teaching reform in colleges and universities is growing increasingly, among which the reform of teaching method is particularly critical. In order to cultivate students' innovative ability and practical spirit, we must abandon the traditional "cramming" teaching and turn to the teaching mode that pays more attention to the interaction between teachers and students and students' participation.

First, the problem-oriented teaching method is a worthwhile attempt to promote. In this method, teachers are no longer simple knowledge impartors but guide students to think and explore actively and lead them. By asking challenging and inspiring questions, teachers can stimulate students' thirst for knowledge and exploration, prompting them to take the initiative to seek answers and form their own understanding and insights. This teaching method can not only cultivate students' innovative thinking but also improve their problem-solving ability.

Secondly, the inquiry-based teaching method is also an important direction of the mathematics teaching reform in colleges and universities. The inquiry teaching method encourages students to discover the internal laws and connections of mathematical knowledge through independent exploration and cooperative learning. Teachers can design a series of mathematical inquiry activities so that students can experience the fun and value of mathematics in practice, so as to cultivate their innovative practice ability. At the same time, the inquiry teaching method can also promote the development of students' teamwork and communication skills, laying a solid foundation for their future career development.

In addition, the application of modern information technology means also provides a strong support for the mathematics teaching reform in colleges and universities. Multimedia, networks, and other modern technical means can make mathematics teaching more vivid, image, improve students' interest and enthusiasm in learning. Teachers can enrich teaching means and teaching resources and improve teaching effects by making exquisite courseware and using online teaching resources. At the same time, modern information technology can also provide students with more convenient learning channels and communication platforms to promote their communication and cooperation.

College mathematics teaching should reform the traditional teaching methods and enhance the interaction between teachers and students and student participation. By adopting problem-oriented teaching methods, inquiry-oriented teaching methods, and other new teaching methods, and making full use of modern information technology, students' interest and enthusiasm in learning can be stimulated, and their innovative ability and practical spirit can be cultivated.

3.3 Improve the evaluation system and pay attention to multiple evaluation

In the process of constantly improving mathematics teaching in colleges and universities, the reform of the evaluation system is particularly important. The traditional evaluation system often relies too much on the single test results, ignoring the evaluation of the students' innovation ability and practical ability, which obviously cannot fully reflect the students' comprehensive quality. Therefore, constructing a new system focusing on multiple evaluations has become an urgent demand for the current reform of university mathematics teaching.

In order to evaluate students' innovation ability, universities can organize mathematical competitions, mathematical modeling competitions, and other activities. These activities can not only provide a platform for students to show their abilities but also stimulate their enthusiasm for innovation. In the competition, students need to use the mathematical knowledge they have learned and combine with practical problems for innovation and exploration. This process itself is a kind of exercise and improvement of students' innovation ability. At the same time, the result of the competition can also be used as an important basis for teachers to evaluate students' innovative abilities.

The evaluation of practical ability is equally important. Colleges and universities can carry out mathematical experiments, mathematical projects and other activities, so that students can apply their mathematical knowledge to practical problems, so as to cultivate their practical ability. In these activities, students need to be hands-on, a process that allows students to have a deeper understanding of mathematical knowledge and improve their practical ability. Teachers can also
evaluate students' practical ability by observing their performance in the activities.

In addition, teamwork ability is also an important indicator to evaluate students' comprehensive quality. Colleges and universities can cultivate students' teamwork ability by organizing activities such as math group study and math team projects. In these activities, students need to work with others and complete tasks together, a process that allows students to better understand the importance of teamwork and improve their teamwork skills.

College mathematics teaching should improve the evaluation system and pay attention to multiple evaluations. By constructing an evaluation system including multiple dimensions, and carrying out mathematical competition, mathematical modeling competition, and other activities, students' comprehensive quality can be comprehensively evaluated, and their enthusiasm for innovation and practical ability can be stimulated.

3.4 Strengthen the construction of teachers and improve the quality of teachers

The reform of mathematics teaching in colleges and universities needs to strengthen the construction of teachers and improve their quality. Teachers should have innovative consciousness and innovative ability, and can guide students to carry out innovative research and practice. At the same time, teachers should have rich teaching experience and teaching methods, and be able to flexibly use various teaching means and teaching resources to improve the teaching effect.

4. Conclusion

The reform of college mathematics teaching is inseparable from the cultivation of students' innovation ability. By reforming the teaching content, teaching methods, and evaluation system, students' learning interests and enthusiasm can be stimulated, and students' innovative abilities and practical abilities can be cultivated. At the same time, strengthening the construction of teaching staff is also an important guarantee to improving the teaching level and cultivating innovative talents. Therefore, colleges and universities should actively promote the reform of mathematics teaching and make contributions to the cultivation of high-quality talents with innovative abilities.

References


