

Research on the Integration of Higher Mathematics and Values Education

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Abstract: This study elaborates on the innovative implementation process of values education in higher mathematics courses. Aiming to address the problems of insufficient integration of ideological elements, lack of student learning motivation, and deficiency in the combination of theory and practice in traditional teaching models, we have conducted in-depth explorations into ideological connotations, reconstructed the course content system, adopted diversified teaching methods, created a teaching environment that integrates values education elements, and constructed a reasonable teaching evaluation system. Based on this, a series of teaching experimental studies have been carried out. The results show that students have made significant improvements in academic performance, value orientation, and comprehensive abilities. This innovative model has certain promotion value in the values education of science and engineering courses, and provides a valuable reference for cultivating high-quality talents with both morality and ability.

Keywords: Higher Mathematics; Teaching Innovation; Ideological Connotation; Comprehensive Quality; Values Education

1. Introduction

Higher mathematics, as an indispensable basic course for science and engineering majors in universities, plays an important role in cultivating students' logical thinking, rational analysis ability, and problem-solving ability. Traditional higher mathematics teaching often focuses on the transmission of knowledge and the training of scientific skills, neglecting the values education factors contained in higher mathematics, and failing to achieve an organic combination of knowledge and value

orientation. Therefore, it is of great practical value to study innovative ways of values education in higher mathematics courses [1,2].

2. Analysis of Teaching Problems

2.1 Insufficient Exploration and Integration of Values Education Content

In the past teaching process, teachers have not fully and systematically explored the content of values education in higher mathematics. Occasionally mentioning the life stories of mathematicians, they failed to integrate values education comprehensively into the curriculum, leading to a disconnect between values education and knowledge teaching.

2.2 Single Teaching Methods and Low Student Participation

Traditional lecture methods dominate, and students are always passive learners, unable to think and explore actively, resulting in a less lively classroom atmosphere, which leads to students' lack of enthusiasm and initiative for learning and is not conducive to the effective implementation of values education [3].

2.3 Lack of Values Education Atmosphere in the Teaching Environment

The arrangement of the teaching venue and the selection of teaching resources do not incorporate values education elements, making the learning environment lack ideological appeal and unfavorable for the shaping of students' ideological concepts and values.

2.4 Imperfect Teaching Evaluation

Teaching evaluation is mainly based on examination results, focusing on the assessment of knowledge and skills, and neglecting ideological qualities, learning attitudes, and teamwork, which cannot promote the comprehensive evaluation of students' comprehensive qualities and guide

teachers to pay attention to values education [4].

3. Innovative Measures

3.1 Reconstruction of Course Content

By in-depth analysis of each chapter of higher mathematics, the essence of values education is extracted, such as the dialectical relationship between quantitative change and qualitative change revealed by the concept of limit, the dynamic perspective of instantaneous rate of change reflected in the concept of derivative, and the philosophy of accumulating small quantities to form a large quantity contained in the infinitesimal method of definite integrals. These values education elements are cleverly integrated into mathematical knowledge, and teaching cases and lecture notes with both values education characteristics and mathematical charm are carefully compiled. The course content cleverly interweaves mathematical history and mathematical culture, telling the glorious deeds of mathematicians both at home and abroad and the milestone events in the development of mathematics, aiming to inspire students' national pride and arouse their interest in scientific research. For example, introducing the brilliant achievements of ancient Chinese mathematicians in algebra, geometry, and other fields can enable students to understand China's profound mathematical culture and enhance cultural confidence [5].

3.2 Innovation in Teaching Methods

3.2.1 Application of driver-based teaching method

Closely combining real-life and professional needs, mathematical problems with ideological connotations are designed to guide students to actively explore the connection between ideological elements and the knowledge they learn. For example, when explaining important limits, by using problems of bank compound interest and loan calculation, students are guided to think about the ethics and social responsibilities that should be followed in the pursuit of economic benefits, cultivating students' economic literacy and social responsibility.

3.2.2 Carrying out group cooperative inquiry learning

The whole class is divided into groups, and

each group completes mathematics-related tasks such as mathematics competitions and mathematical modeling. Through group cooperation, students' teamwork ability and innovative thinking are cultivated, and they are guided to be persistent, courageous in exploration, and mutually supportive when facing difficulties, promoting the construction of good values.

Through online teaching platforms, teaching programs, and other means, teaching resources and teaching methods are enriched. Pushing micro-videos of values education, popular science articles on mathematics, etc., to broaden students' horizons, and at the same time using mathematical software for visual teaching to make abstract concepts concrete and improve learning effectiveness [6].

3.3 Creation of a Teaching Environment

3.3.1 Building a classroom culture with an ideological atmosphere

Post portraits of mathematicians, famous quotes, and pictures showing the close connection between mathematics and life and society in the classroom to create atmosphere of mathematical culture and ideological education, allowing students to be subtly influenced and infected.

3.3.2 Constructing an online and offline integrated platform for values education resources

Integrate high-quality values education resources for mathematics courses, such as courseware, cases, and videos, to provide teachers and students with rich materials and convenient conditions. Utilize network platforms to carry out teacher-student interactive communication and online discussions, expanding the spatial and temporal dimensions of values education [7].

3.4 Educational Assessment Innovation

The traditional single assessment system can no longer meet the needs of modern education, and it is particularly important to establish a diversified education assessment system. This system not only focuses on traditional exam scores but also emphasizes assessing students' classroom performance, completion of assignments, participation in group projects, writing of ideological essays, and other aspects, comprehensively and fairly evaluating students' learning outcomes. The evaluation

process focuses on examining students' ideological qualities, innovative abilities, and teamwork spirit in mathematics learning.

Combining formative and summative assessments, the students' learning progress is tracked and evaluated regularly, providing timely feedback on students' learning status and problems, and guiding students to continuously improve and enhance. At the same time, it advocates for self-assessment and peer assessment among students to improve their self-reflection and evaluation abilities, and promote autonomous learning and growth [8].

4. Teaching Experiment Research

4.1 Data Collection

4.1.1 Academic performance

Through regular unit tests and final exams, the mathematics scores of both groups of students were collected and compared to analyze the differences in their level of knowledge mastery.

4.1.2 Ideological quality

Using methods such as questionnaires, classroom observation, and student interviews, the level of students' understanding, comprehension, and acceptance of ideological elements, as well as the growth of ideological quality during the learning process, were grasped.

4.1.3 Comprehensive ability

Through the evaluation of team project results, student self-evaluation, and peer evaluation, the performance of students in terms of teamwork, innovative thinking, and problem-solving abilities was examined.

4.2 Data Analysis

Using statistical methods to analyze the collected data, the results showed that the average scores of the experimental group students in terms of test scores, ideological quality, and comprehensive ability were significantly higher than those of the other group. In the team project evaluation, all indicators exceeded those of the control group. Through classroom observation and student interviews, it was learned that students in the experimental group showed stronger learning initiative and participation in the classroom, could actively think about and discuss the connection between mathematical problems

and ideological elements, and were more perseverant and had a stronger team spirit when facing difficulties [9].

5. Teaching Effectiveness

5.1 Significant Improvement in Students' Academic Performance

Through innovative teaching methods and the reconstruction of course content, students' understanding and mastery of higher mathematics knowledge have become deeper and more solid, and their academic performance has improved significantly. The results of the final exam show that both the excellent rate and the pass rate have increased significantly compared with the past. When facing complex mathematical problems, students have demonstrated stronger analytical and application abilities.

5.2 Effective Improvement of Ideological Quality

In the process of learning higher mathematics, students have deeply understood the ideological connotations behind mathematical knowledge, such as dialectical thinking, exploratory spirit, and patriotism. According to a questionnaire survey of 53 universities nationwide, 65% of students agreed with the educational purpose of values education courses, and were able to consciously apply ideological concepts to their daily lives and studies, establishing a correct worldview, outlook on life, and value orientation.

5.3 Comprehensive Abilities Have Been Fully Developed

Group cooperation and project research activities have improved students' teamwork, communication skills, and innovative thinking. Students have performed excellently in mathematical modeling competitions, extracurricular academic research, and other activities, winning many honors and awards, demonstrating strong comprehensive qualities and practical abilities.

6. Promotion Value

6.1 Providing a Reference for Values Education in Engineering Courses

This innovative practice has explored a new and practical teaching model for values

education in higher mathematics courses, which has reference and learning significance for other engineering courses to carry out values education. By deeply exploring the values education elements in mathematical knowledge and innovating teaching methods and evaluation systems in combination with the characteristics of the course, it is possible to organically integrate knowledge transmission and value guidance, and improve the overall quality and effectiveness of values education teaching in engineering courses.

6.2 Promoting the Innovation of Educational and Teaching Concepts

This innovative model emphasizes student-centeredness and focuses on cultivating students' comprehensive qualities and innovative thinking, which promotes the updating and transformation of higher education teaching concepts. This educational concept emphasizes the coordinated development of knowledge, ability, and quality, cultivates high-quality innovative talents for the development of the new era society, and can to a certain extent promote the teaching reform of the entire higher education field ^[10].

6.3 Promoting the Shaping of a Whole-staff Education Pattern in Colleges and Universities

Through the exploration and implementation of values education in "Higher Mathematics", we have not only improved students' mathematical literacy but also cultivated students' ideological and moral cultivation and sense of social responsibility. For example, guiding students to correctly understand this discipline, viewing mathematics as an art and a tool, rather than simply a pile of formulas and symbols. At the same time, through specific case analysis and exercises, cultivating students' application ability and innovative spirit, as well as teamwork ability and social responsibility. Our practice can not only set an example for values education in other courses in universities but also promote the enthusiasm and initiative of all teachers, forming a good pattern of whole-staff education, all-process education, and all-round education, and promoting the deepening of values education work in universities.

In the future teaching of higher mathematics, we will continue to promote curriculum reform,

reconstruct teaching content and methods, update the teaching evaluation system, fully implement the relevant educational spirit, implement the spirit of relevant conferences of Chinese universities, adhere to the correct direction of education, and practice the fundamental mission of cultivating morality and people. We will adhere to the overall principles of value guidance, skill achievement, and knowledge transmission, exert the educational effectiveness of various courses, and mobilize all staff to carry out educational work at all stages and in all aspects, cultivating builders and inheritors with both morality and talent and comprehensive growth. We will strengthen the construction of teachers' moral character, guide teachers to actively integrate values education into various course teaching; strengthen ideological and theoretical education and value guidance, give full play to the educational role of relevant disciplines, fully tap and utilize the values education resources contained in various disciplines, and build a group of general education courses and professional courses full of values education elements and functions. At the same time, we also hope that this innovative report can provide some useful ideas and references for teachers in colleges and universities to build values education in courses, and jointly promote the high-quality development of higher education.

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