

Advanced Mathematics Course Ideological and Political Integration Strategies and Practice Research

-- Taking Differential Equations Course as an Example

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Abstract: Taking the differential equations course as an example, this paper discusses the integration strategies and practice of ideological and political education in advanced mathematics courses, and analyzes the logicity of the knowledge system of the differential equations course, the advantages of cultivating students' mathematical thinking, and the connotation and extension of ideological and political education. It reveals the lack of ideological and political education in the teaching of the differential equations course, the insufficient exploration of ideological and political education resources, and the monotony of the ideological and political education model. In response to these problems, it proposes to strengthen the integration and innovation of the content of ideological and political education in the differential equations course, improve the ability and quality of teachers' ideological and political education in the differential equations course, and build a diversified ideological and political education model in the differential equations course. Summarizes the importance, optimization direction and strategy of ideological and political education in advanced mathematics courses, and the enlightenment to my country's ideological and political education in advanced mathematics courses.

Keywords: Differential equations; Ideological and political education; Optimization countermeasures; Advanced mathematics.

1. Introduction

As an important part of higher education in my country, the implementation of ideological and political education in advanced mathematics courses is of great significance. As one of the core courses of advanced mathematics, exploring the integration strategies and practice of ideological and political education in differential equations has a profound impact on improving the quality of talent training. Taking the differential equations course as an example, this paper aims to provide references and lessons for the reform and development of ideological and political education in advanced mathematics courses in our country through the analysis of course characteristics, existing problems and optimization strategies.

2. Characteristics of the Integration Strategies and Practice of Ideological and Political Education in Advanced Mathematics Courses

2.1. The Logicity of the Knowledge System in Differential Equations Courses

As an important component of advanced mathematics, the knowledge system of the differential equations course exhibits rigor in its logical structure. From the definition and classification of differential equations to their solutions, each step is closely interconnected, forming a complete logical system. This logicity is reflected not only in the differential equations themselves but also in their connections with other branches of mathematics. For instance, differential equations are closely related to functional analysis, numerical computation, and other fields. This logical structure provides a unique advantage for the course in cultivating students' logical thinking abilities. The knowledge system of the

differential equations course contributes to the development of students' abstract thinking skills. The subject of study in differential equations is various phenomena in the real world, and abstracting these phenomena into mathematical models requires students to possess strong abstract thinking abilities[1].

Through the study of differential equations, students can gradually learn how to extract mathematical models from practical problems and then use mathematical methods to analyze and solve them. The knowledge system of the differential equations course helps to cultivate students' reasoning abilities. The process of solving differential equations often involves rigorous reasoning and demonstration. Students need to use appropriate mathematical tools to derive conclusions based on given conditions. This process serves as an excellent exercise in reasoning skills. The knowledge system of the differential equations course contributes to the cultivation of students' innovative capabilities. Throughout the development of differential equations, numerous mathematicians have proposed many new theories and methods through continuous exploration and innovation. In the process of studying differential equations, students can learn about these innovative processes and ways of thinking, thereby stimulating their own innovative potential[2].

2.2. The Advantages of Differential Equations Courses in Cultivating Students' Mathematical Thinking

The differential equations course offers significant advantages in cultivating students' mathematical thinking. The problems involved in the course often possess a certain level of complexity, requiring students to have strong abilities to analyze and solve problems. By studying differential equations, students can gradually learn how to extract

mathematical models from complex practical situations and then use mathematical methods to analyze and solve them. Throughout the learning process of the differential equations course, students need to employ a variety of mathematical tools and techniques, the learning and application of which help to cultivate students' ability to use mathematical knowledge flexibly[3].

The study of differential equations also requires students to have a certain level of patience and perseverance, as the process of solving differential equations can be quite cumbersome. By overcoming these difficulties, students' willpower and character are strengthened. The study of differential equations helps to cultivate students' mathematical intuition and aesthetic abilities. In the process of solving differential equations, students can appreciate the intrinsic beauty and harmony of mathematics, which can stimulate their interest and passion for mathematics, thereby enhancing their mathematical literacy[4].

2.3. The Connotation and Extension of Ideological and Political Education in Differential Equations Courses

The connotation of ideological and political education in the differential equations course is mainly manifested in its aim to cultivate students' scientific spirit and national sentiment. Through the study of differential equations, students can learn about China's magnificent achievements in the field of differential equations, which can stir their national pride and patriotic sentiment. In the research process of differential equations, students can experience scientists' rigorous academic attitude and pursuit of truth, thereby cultivating their own scientific spirit. The ideological and political education in the differential equations course aims to cultivate students' teamwork and communication abilities. Research in differential equations often requires collaboration, and students can understand the importance of teamwork through the study of the course. The learning of differential equations also necessitates mutual discussion and exchange among students, which helps to cultivate their communication skills[5].

The ideological and political education in the differential equations course aims to cultivate students' innovative consciousness and practical abilities. In the research process of differential equations, students can learn about mathematicians' continuous exploration and innovation, which have led to the proposal of many new theories and methods. This can help stimulate students' innovative potential. The learning of differential equations also requires students to apply theoretical knowledge to practical problems, which helps to cultivate their practical abilities. The extension of ideological and political education in the differential equations course is mainly manifested in its potential to combine with other disciplines, forming an interdisciplinary educational model. For example, integrating differential equations with physics, biology, and other fields allows students to experience the practical value of differential equations in real-world problems. Ideological and political education in the differential equations course can be combined with students' daily lives and social practice, allowing students to apply their knowledge of differential equations to practical problems through participation in social practice activities, thereby enhancing their practical abilities. Ideological and political education in the differential equations course can also be integrated with information

technology, utilizing modern information technology such as computer-aided instruction and online teaching platforms, which can provide students with more abundant and convenient learning resources, improving their learning outcomes[6].

3. Issues in the Integration Strategies and Practice of Ideological and Political Education in Advanced Mathematics Courses

3.1. The Lack of Ideological and Political Education in the Teaching of Differential Equations Courses

Despite the significant advantages of the differential equations course in cultivating students' mathematical thinking, the lack of ideological and political education in actual teaching remains an undeniable problem. Some teachers focus too much on the transmission of knowledge and the training of problem-solving skills during the teaching process, neglecting the integration of ideological and political education. This approach leads to difficulties for students in forming correct values and a scientific spirit during the learning process. While pursuing knowledge, students also need to cultivate critical thinking, innovative consciousness, and moral values, all of which are important components of ideological and political education.

The content of the differential equations course is often abstract and complex, making it easy for students to feel frustrated and overwhelmed during the learning process. Teachers fail to pay timely attention to students' mental health and emotional needs, resulting in the lack of ideological and political education. When facing challenges, students need encouragement and support from teachers to help them build confidence and cultivate problem-solving abilities. The teaching evaluation system of the differential equations course is too monolithic, often focusing only on students' test scores and neglecting the cultivation of students' overall quality and innovative capabilities. This evaluation system leads students to overly pursue grades during the learning process, disregarding their comprehensive development.

3.2. Insufficient Exploration of Ideological and Political Education Resources in Differential Equations Courses

The differential equations course is rich in ideological and political education resources, but in actual teaching, the exploration and utilization of these resources appear to be insufficient. The ideological and political elements in the differential equations course have not been fully exploited. For example, the history of the development of differential equations contains rich ideological and political education resources, but teachers often focus only on the transmission of knowledge during the teaching process, neglecting the exploration and utilization of these resources.

The close connection between the differential equations course and practical problems provides a rich source of cases and practical opportunities for ideological and political education. In actual teaching, teachers often focus only on the explanation of theoretical knowledge, neglecting the use of these cases and practical opportunities. The interdisciplinary integration of the differential equations course also offers a broad space for ideological and political education. In actual

teaching, teachers often focus only on the knowledge system of differential equations itself, neglecting the interdisciplinary integration.

3.3. The Monotony of the Ideological and Political Education Model in Differential Equations Courses

The monotony of the ideological and political education model in the differential equations course is also an important issue currently present. Teachers often adopt a "lecture-only" teaching model during the teaching process, failing to fully embody the students' principal role. This teaching model leads to a lack of initiative and enthusiasm among students during the learning process, significantly reducing the effectiveness of ideological and political education. The teaching methods of the differential equations course are too monolithic, often focusing solely on classroom lectures and neglecting the use of other teaching methods. For example, group discussions, case analyses, and experimental practices are all teaching methods that can effectively promote the implementation of ideological and political education, but they are seldom used in actual teaching.

The teaching tools of the differential equations course are also too monolithic, often focusing only on traditional blackboard teaching and neglecting the use of modern information technology. With the development of information technology, online teaching, multimedia teaching, and other methods have provided new avenues and platforms for ideological and political education. However, the use of these methods in actual teaching appears to be insufficient. The issues of the lack of ideological and political education in the teaching of the differential equations course, the insufficient exploration of ideological and political education resources, and the monotony of the ideological and political education model all urgently need to be addressed. Only through reform and innovation can we better achieve an organic combination of the differential equations course and ideological and political education, cultivating outstanding talents with comprehensive quality and innovative capabilities.

4. Optimization Strategies for the Integration of Ideological and Political Education in Advanced Mathematics Courses

4.1. Strengthening the Integration and Innovation of the Content of Ideological and Political Education in the Differential Equations Course

To address the lack of ideological and political education content in the teaching of the differential equations course, it is necessary to strengthen the integration and innovation of the content of ideological and political education. Teachers should delve into the ideological and political elements within the differential equations course and organically combine them with mathematical knowledge. For instance, when explaining the analytical methods of solving differential equations, it is possible to introduce the scientific spirit and innovative consciousness displayed by scientists in the process, thereby stimulating students' interest in learning and their potential for research. By discussing how scientists overcome difficulties and continuously explore new theories

and methods, students can learn the spirit of perseverance and courage in exploration, which is significant for cultivating their interest in research and their innovative capabilities.

Attention should be given to the connection between the differential equations course and practical problems, bringing real-world issues into the classroom. This allows students to experience the application value of differential equations in the process of solving these problems. For example, when discussing the application of differential equations in economics, real issues such as market equilibrium and economic growth can be introduced, enabling students to analyze economic phenomena by establishing mathematical models and solving differential equations, thereby enhancing their ability to apply mathematical knowledge.

Using real-world problems to guide students to focus on social issues and cultivate a sense of social responsibility and mission is also important. For instance, when discussing the application of differential equations in environmental science, real issues such as climate change and pollution control can be introduced, allowing students to study solutions to environmental problems through solving differential equations, thereby fostering a sense of social responsibility and mission in students. Emphasis should be placed on the interdisciplinary integration of the differential equations course, breaking down barriers between disciplines, and broadening students' academic horizons. For example, when explaining the application of differential equations in biology, experts in the field of biology can be invited to give lectures or organize interdisciplinary research projects, enabling students to improve their overall quality through interdisciplinary research processes.

By collaborating with experts in biology, physics, engineering, and other fields, students can understand the application of differential equations in various disciplines, thereby cultivating interdisciplinary thinking abilities and innovative consciousness. Strengthening the integration and innovation of the content of ideological and political education in the differential equations course is the key to solving the problem of the lack of ideological and political education content. By delving into the ideological and political elements within the course, focusing on the connection between differential equations and practical problems, and emphasizing the interdisciplinary integration of differential equations, it is possible to integrate ideological and political education into the teaching process of the differential equations course. This will cultivate students' scientific spirit, sense of social responsibility, and innovative capabilities, which will contribute to the cultivation of outstanding talents with comprehensive quality and innovative abilities, and ultimately benefit society's development.

4.2. Enhancing Teachers' Ideological and Political Education Competence and Accomplishment in the Differential Equations Course

Teachers are the key factor in ideological and political education, and it is crucial to enhance their competence and accomplishment in this area within the differential equations course. Teachers should establish correct educational concepts and integrate ideological and political education into the teaching process of the course. They need to clarify the objectives of ideological and political education in the differential equations course and use these as a guide for their

teaching activities. This means that teachers should not only impart mathematical knowledge but also pay attention to the ideological growth of students, guiding them to form correct values and a scientific attitude.

Teachers should continuously improve their own ideological and political education abilities, which include a deep understanding of the content of ideological and political education in the differential equations course, proficiency in teaching methods, and a thorough understanding of students. Teachers can enhance their ideological and political education abilities by participating in training, reading relevant books, and exchanging ideas with peers. For example, teachers can take courses in educational psychology and principles of education to improve their understanding of educational subjects and processes. They should also pay attention to the latest trends in the education field, learn new teaching concepts and methods, and better adapt to the needs of students.

Teachers should focus on the innovation of teaching methods, using a variety of teaching tools to stimulate students' interest and participation. For instance, they can use case teaching, flipped classrooms, and group cooperative learning methods to enhance students' abilities to analyze and solve problems while addressing real-world issues. Teachers can also utilize modern information technology, such as online courses and virtual laboratories, to provide students with more abundant and convenient learning resources.

Teachers should pay attention to students' mental health and emotional needs, offering personalized care and support. They need to be aware of the problems and confusion students may encounter during the learning process and provide timely guidance and assistance. For example, teachers can have regular one-on-one conversations with students to understand their learning progress and psychological state, offering personalized coaching and advice. Teachers should also pay attention to students' mental health, providing emotional support to help students develop a healthy psychological quality. For instance, they can organize lectures on mental health and team-building activities to help students establish positive interpersonal relationships and improve their psychological resilience.

Enhancing teachers' ideological and political education competence and accomplishment in the differential equations course is key to ensuring the effective implementation of ideological and political education. Teachers should establish correct educational concepts, continuously improve their ideological and political education abilities, and pay attention to students' mental health and emotional needs, providing personalized care and support. Through these measures, it is possible to cultivate outstanding talents with comprehensive quality and innovative abilities, contributing to the development of society.

4.3. Establishing a Diverse Model of Ideological and Political Education in the Differential Equations Course

To address the issue of a monolithic ideological and political education model in the differential equations course, it is necessary to establish a diverse model of education that emphasizes the principal role of students, using heuristic and discussion-based teaching methods to stimulate students' initiative and enthusiasm. For instance, when explaining methods for solving differential equations, teachers can have students discuss different problem-solving approaches in

groups, fostering their teamwork abilities and innovative consciousness. Group collaboration not only allows students to learn various problem-solving techniques but also teaches them how to communicate and cooperate with others, which is crucial for developing their social skills.

Full use should be made of modern information technology, such as online teaching and multimedia teaching, to provide new avenues and platforms for ideological and political education. For example, teachers can use online teaching platforms to distribute preview materials and homework, guiding students to engage in independent learning and deep thinking. Teachers can also utilize multimedia tools, such as videos and animations, to visualize abstract mathematical concepts, helping students to better understand and master the knowledge. Additionally, teachers can interact with students through online platforms, answering questions and providing personalized guidance and support.

Emphasis should be placed on practical teaching, combining theoretical knowledge with practical applications. For instance, when discussing the application of differential equations in physics, teachers can organize students to conduct experiments, allowing them to experience the practical value of differential equations in real-world situations. Through practical activities, students can not only deepen their understanding of differential equations but also enhance their ability to solve real-world problems. Teachers can also guide students to participate in scientific research projects or internships, enabling them to apply what they have learned in real-world settings, improving their professional and comprehensive abilities.

Measures such as strengthening the integration and innovation of the content of ideological and political education in the differential equations course, enhancing teachers' ideological and political education competence and accomplishment, and establishing a diverse model of ideological and political education in the course will help to address current issues in the teaching of the differential equations course and cultivate outstanding talents with comprehensive quality and innovative abilities. Through a diverse model of ideological and political education, students' interest in learning and potential for research can be stimulated, cultivating their teamwork abilities, innovative consciousness, and practical skills, contributing to the development of society.

5. Summary

This paper discusses the ideological and political education in the differential equations course, revealing the existing problems in current teaching and proposing corresponding optimization strategies. The importance of ideological and political education in advanced mathematics courses is self-evident, and the clarity of the optimization direction and strategies is of great significance for improving the quality of talent training. This research provides some insights for the reform and development of ideological and political education in advanced mathematics courses in our country. It is worth noting that the implementation of course ideological and political education is a long and complex process that requires the joint efforts of teachers, students, and educational administrators, as well as continuous exploration and practice to achieve better results.

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