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Innovative Teaching Model Exploration of Combining Ideological and Political Education in Mathematical Physics Equations Course

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Abstract: This study seeks to ascertain effective strategies for incorporating ideological and political elements into the instruction of mathematical physics equations. The objective is to address the contemporary need for multifaceted talent development, thereby enhancing both teaching quality and students' overall competencies. Upon examining the prevailing teaching paradigms, we advocate for a hybrid approach that merges online and offline modalities. This method leverages information technology platforms to augment teaching resources and seamlessly integrates ideological and political dimensions into the curriculum. It also delves into narratives of scientific luminaries, fortifying students' pride and fostering innovative thinking. Furthermore, we advocate for the establishment of evaluation frameworks and practice arenas to kindle students' passion for scientific inquiry. Empirical evidence suggests that our reforms have markedly elevated student engagement and research capabilities, bolstered their problem-solving skills, and invigorated creativity. A comprehensive course evaluation has been instituted, leading to notable improvements in teaching efficacy. In conclusion, this model offers a robust foundation for the refinement of mathematical physics course instruction, paves the way for advanced graduate training, and serves as a benchmark for future curriculum transformations.

1. Introduction

Against this backdrop, this paper explores how to integrate the "Classics + Ideological and Political Education" teaching model by incorporating classic works and professional courses to deepen the knowledge system[1]. It guides students towards autonomous learning, finds a way to combine practical cases and problem-solving, applies mathematical modeling, places students at the center, constructs a comprehensive evaluation system, strengthens process-oriented evaluation, and enhances student value guidance. Through curriculum reform, the aim is to naturally incorporate

ideological and political elements into the course[2], improve teaching effectiveness, stimulate student interest, cultivate innovative thinking and research capabilities, enhance overall quality, provide new ideas for the reform of "Mathematical Physics Equations" teaching for engineering postgraduates, and help cultivate talents needed by the times.

2. Current Status and Issues in the Teaching of Mathematical Physics Equations

"Mathematical Physics Equations" is a fundamental mathematics course that engineering students need to take. The quality of the course plays a crucial role in cultivating high-quality applied and research-oriented innovative talents[3][4]. This course bridges the gap between mathematics, natural sciences, and engineering technology. For students majoring in Marine Information Engineering, Marine Technology, and Marine Measurement and Control at Qilu University of Technology's Ocean College, it serves as the cornerstone for subsequent professional studies and is also the starting point for stimulating innovative thinking. The purpose of the course is to gradually enhance students' abstract thinking, logical reasoning, mathematical modeling, and problem-solving abilities, especially their application skills for practical problems and difficult issues in their respective fields. As a theoretical course, most domestic universities still adopt the traditional "spoon-feeding" teaching method, which mainly involves teacher lectures supplemented by student homework, with learning outcomes assessed solely through final exams.

This approach neglects interactive discussion and exploration and can no longer meet the new demands of societal development. In light of the trend in undergraduate education reform, the goal of the course is to apply knowledge to practice, but the existing teaching methods for "Mathematical Physics Equations" have not been able to achieve this. In terms of depth of learning, the content of the "Mathematical Physics Equations" course is complex, its theories profound, and its derivations tedious, which can easily lead to student resistance and affect their enthusiasm for learning. Therefore, introducing elements such as scientific stories and interesting research anecdotes into the classroom appropriately provides new ideas for curriculum reform.

To address the teaching challenges faced by the course of mathematical physics, we strive to go beyond the conventional teaching framework and adopt an innovative teaching concept that takes students as the center and teachers as the guides. This new concept focuses on cultivating students' mathematical physics thinking, helping them build a knowledge framework, and enabling them to use knowledge independently and explore. The course objectives are to activate students' intrinsic motivation, ignite their learning enthusiasm, encourage independent learning, and enhance their courage to explore the unknown. In practice, a series of teaching innovation strategies are implemented in class to enhance teaching effectiveness[5][6].

2.1. Introduction of Online and Offline Blended Learning Strategies

Implementing "online and offline blended learning" aims to utilize information technology platforms to enrich teaching resources, strengthen the construction of online resources, and produce and upload teaching videos. High-quality teaching videos are recorded after class to explain the key points and difficulties of the course, and uploaded to online learning platforms such as the school's LMS (Learning Management System), MOOCs (Massive Open Online Courses) platform, etc., for students to watch and learn independently. Diverse learning materials are provided, in addition to videos, regular PPTs, documents, online case studies, exercise sets, online encyclopedia links and other multimedia resources are uploaded to meet the needs of students with different learning styles, increasing the interactivity and interest of learning.

Utilizing online practice platforms, for courses with strong experimental or practical components, tools such as virtual laboratories and online programming environments are employed to allow

students to complete practical operations without being constrained by time and space. The optimization of offline classroom activities is enhanced, including interactive discussions and problem-solving. Classroom time is primarily used for in-depth discussions, problem-solving, and team collaboration. Teachers provide targeted explanations based on the key difficulties and challenges highlighted in students' online learning feedback, reinforcing the value of face-to-face communication.

Strengthen collaborative learning and project work among students, organize group discussions, case analyses, project reports, etc., to promote the internalization and application of knowledge. Practical exercises and experiments are arranged for hands-on operations that require physical equipment or specific environments, ensuring students gain real operational experience by scheduling offline lab time. Management and support of the teaching process involve flexibly adjusting the teaching progress, making timely adjustments to offline teaching plans based on online learning data analysis, ensuring that the teaching content matches the students' learning progress. Personalized learning paths encourage students to formulate personalized learning plans according to their own situations, using adaptive learning resources and tests provided by information technology platforms for self-assessment and progress adjustment. During actual teaching processes, ensure seamless integration between different platforms and tools, such as the integration of learning management systems with video platforms, homework submission systems, etc., to provide students with a smooth learning experience.

In summary, blended learning, combining online and offline methods, provides high-quality learning resources and opportunities for independent study online, while focusing on deepening understanding, practical operations, and teacher-student interaction offline. The combination of the two aims to comprehensively enhance teaching effectiveness and learning experience.

2.2. Integrating Ideological and Political Education into the Curriculum

During the implementation of regular courses, integrating the "Mathematical Physics Equations" course into ideological and political education is a deepening and expansion of the mission to educate through teaching.

In actual teaching, relevant philosophical thoughts and socialist core values can be interspersed to guide students to think about the philosophical principles and scientific spirit behind mathematical physics equations. For example, by discussing the methodology of science, the attitude of seeking truth from facts, and the courage to explore truth, students can help establish a correct worldview and values. Mining scientists' stories: In conjunction with the teaching content of "Mathematical Physics Equations", tell stories related to scientists such as Einstein and Schrödinger, introduce their life experiences, scientific contributions, and spiritual qualities displayed when facing difficulties. These stories not only stimulate students' interest in learning but also convey the spirit of perseverance and innovation. Strengthening national confidence and innovative thinking: Emphasize the contributions of Chinese scientists in the field of mathematical physics, such as Hua Luogeng and Qian Xuesen, as well as China's achievements in scientific and technological development. Through these contents, enhance students' national confidence and pride, while encouraging students to carry forward the spirit of innovation and bravely explore the unknown.

Through ideological and political education in the curriculum, students' national consciousness can be truly strengthened. At the level of cultivating students' awareness, through the integration of ideological and political education in the curriculum, education is not only about imparting knowledge but also about cultivating values. Helping students establish correct worldviews, outlooks on life, and values is the fundamental task of higher education. It can stimulate learning motivation. The stories of scientists and their scientific exploration spirit can greatly stimulate

students' enthusiasm for learning, making them more engaged and proactive when studying "Mathematical Physics Equations." It can cultivate innovative talents. By emphasizing innovative thinking and national confidence, it encourages students to dare to challenge and innovate in their studies and research, cultivating high-quality talents with innovative capabilities and international perspectives for society.

Preliminary time evidence suggests that integrating ideological and political education, stories of scientists, and the cultivation of national confidence and innovative thinking into the teaching of "Mathematical Physics Equations" can not only enhance students' academic level but also comprehensively improve their overall quality. This is of significant importance for cultivating high-quality talents who can meet the needs of social development. Not only does it strengthen students' national confidence, but it also promotes cultural heritage, enabling students to better understand and learn about the stories of Chinese scientists. This aids in the inheritance and promotion of China's excellent cultural traditions, enhancing students' identification with and sense of belonging to Chinese culture.

2.3. Constructing an Evaluation System, and Stimulating Scientific Research Interest

Constructing an evaluation system and practical platform for the course of mathematical physics equations is a systematic project, which requires comprehensive consideration of teaching objectives, learning processes, practical applications, and the cultivation of innovative abilities.

Firstly, it is necessary to construct an evaluation system, that is, diversified evaluation, combining various evaluation methods such as regular grades, final exams, project assignments, classroom participation, group discussions, etc., to comprehensively examine students' knowledge mastery, problem-solving, teamwork, and innovative thinking abilities. Increase process-oriented evaluation, pay attention to the learning process, record students' learning trajectories through online learning platforms, including watching teaching videos, completing online exercises, participating in discussion activities, etc., provide timely feedback, and encourage continuous progress. Assessment and evaluation are completed through practical assignments such as experimental reports, case analyses, simulations, etc., to evaluate students' actual operation capabilities and the application of theoretical knowledge. Within the knowledge framework, encourage students to reflect on themselves, write learning logs, and conduct peer evaluations in group projects at the same time, promoting mutual learning and self-improvement.

Through the implementation of the above strategies, not only can the teaching quality of mathematical physics equations courses be improved, but also students' practical operation abilities can be effectively enhanced, their scientific research interests can be stimulated, and a solid foundation for future scientific research and technological development can be laid.

3. Teaching practice and effect

Based on the above teaching theories, the author implemented a method of integrating ideological and political education into the course of Mathematical Physics Equations in Marine Technology and Marine Information Engineering. After two semesters of course implementation and feedback observation, students not only have a significant improvement in their overall understanding of the course framework and mastery of various knowledge points, but also have a certain understanding of the bridging role of the course between mathematics and physics. Practice has shown that even in terms of test scores, the average score has increased by 15% compared to before, the excellent rate has increased by 30%, and the failure rate has decreased by less than 5%. In addition, in terms of learning interest and course difficulty, more than 90% of students are very interested in the course. This indicates that this teaching method can effectively enhance students'

mastery of course knowledge, broaden and reconstruct their own knowledge system, and improve their interest in learning and the ability to flexibly apply knowledge.

4. Conclusions

This paper primarily explores how to effectively integrate elements of ideological and political education into the teaching of mathematical physics equations, in order to meet the demands of the new era for the cultivation of compound talents, while also enhancing the quality of teaching and students' comprehensive abilities. In summary, by reforming the teaching model and combining mathematics with politics, a bridge between theory and practice has been established, stimulating student interest, enhancing innovative thinking, and broadening knowledge. At the same time, the course combines scientific research practice and innovative teaching models, laying the foundation for the cultivation of compound talents. Future teaching reforms will need to continue exploring and constantly optimizing to adapt to new requirements.

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