

Original Paper

Research on Teaching Reform of "Engineering Fluid Mechanics" Based on Curriculum Ideology and Politics

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Abstract

This study aims to explore the teaching reform of Engineering Fluid Mechanics based on the concept of curriculum ideology and politics, in order to meet the needs of contemporary engineering education. The section on curriculum ideology and politics and Engineering Fluid Mechanics discusses the connotation, importance, teaching challenges, and the interrelation between curriculum ideology and politics and Engineering Fluid Mechanics. The teaching reform strategies section proposes directions for reform, including restructuring course objectives, adjusting teaching materials and teaching aids, innovating teaching methods, and improving assessment methods. The case analysis and practical experience section presents a summary of specific case analyses and practical experiences to inspire other educators. Finally, the teaching effectiveness evaluation section focuses on students' learning outcomes, feedback, and teachers' teaching experiences to verify the actual effects of the teaching reform.

Keywords

Curriculum Ideology and Politics, Engineering Fluid Mechanics, Teaching Reform

1. Introduction

1.1 The Necessity and Significance of Integrating Curriculum Ideology and Politics into Engineering Fluid Mechanics Education

Engineering Fluid Mechanics, as a crucial foundational course in the field of engineering, plays a key role in cultivating the professional literacy and comprehensive abilities of engineering students. However, in the context of today's society, merely imparting technical knowledge is no longer

sufficient. The introduction of the concept of curriculum ideology and politics emphasizes that education should not only focus on subject knowledge. Therefore, integrating curriculum ideology and politics into the teaching of Engineering Fluid Mechanics has become an inevitable trend in educational reform. Against this backdrop, this study aims to explore how the concept of curriculum ideology and politics can be used to revisit and improve the teaching methods and content of Engineering Fluid Mechanics, to better meet the comprehensive development needs of engineering students and cultivate engineering professionals with innovation capabilities and social responsibility. The research will focus on how to integrate ideological and political education elements, as well as how to improve teaching strategies and assessment methods, thereby realizing the ideological and political integration of the Engineering Fluid Mechanics curriculum and contributing to the sustainable development of engineering education.

1.2 Research Purpose and Significance

The main purpose of this study is to explore how to carry out teaching reforms for "Engineering Fluid Mechanics" based on the concept of curriculum ideology and politics. By integrating the concept of curriculum ideology and politics, revisiting, and adjusting the teaching content of "Engineering Fluid Mechanics" to align more closely with socialist core values, and strengthening the social responsibility of the subject, this study aims to innovate teaching methods and integrate ideological and political education elements into the teaching process. This approach ensures that students can not only master the professional knowledge of Engineering Fluid Mechanics but can also apply correct political concepts when solving engineering problems. The significance of the research lies in providing a new perspective and approach for the reform of the Engineering Fluid Mechanics curriculum, contributing to the improvement of the quality and sustainability of engineering education. By emphasizing the importance of curriculum ideology and politics, it can better adapt to the development needs of today's society, cultivate more well-rounded and responsible engineering professionals, and contribute to the future development of engineering education.

2. Curriculum Ideology and Politics and Engineering Fluid Mechanics

2.1 The Concept and Connotation of Curriculum Ideology and Politics

Curriculum ideology and politics, an integral part of education with Chinese characteristics under socialism, aims to integrate the Party's basic line, program, and policies into the entire process of education and teaching. It seeks to cultivate students' firm belief in socialism, high political awareness, good moral quality, and a sense of social responsibility. It emphasizes the political, ideological, and value aspects of the curriculum, demanding that education and teaching contribute to the formation of correct worldviews, outlooks on life, and values in students.

2.2 The Importance of Engineering Fluid Mechanics

Engineering Fluid Mechanics is a fundamental course in the field of engineering, involving the principles and applications of fluid movement, heat transfer, and mass transfer in engineering. It not

only provides students with profound professional knowledge but also cultivates their ability to solve practical engineering problems. Engineering Fluid Mechanics has a wide range of applications in engineering practice, covering multiple fields such as water and gas supply, aerospace, energy, and environmental protection.

2.3 Teaching Challenges of Engineering Fluid Mechanics

As a complex and important subject in engineering, the teaching of Engineering Fluid Mechanics faces a series of challenges, which also provide a necessary background for the integration of curriculum ideology and politics. Firstly, the theoretical content of Engineering Fluid Mechanics is extensive, including fluid statics, fluid dynamics, heat and mass transfer, etc., requiring students to master a large amount of mathematical and physical knowledge. This makes the teaching task heavy and requires teachers to adopt effective teaching methods to help students understand and apply this knowledge. Secondly, the practical application of Engineering Fluid Mechanics is extensive, covering multiple fields such as water and gas supply, aerospace, energy, and environmental protection. Therefore, students need to have interdisciplinary abilities to apply the principles of fluid mechanics to solve different engineering problems. This requires the course not only to impart knowledge but also to cultivate students' innovative thinking and problem-solving abilities.

2.4 The Interrelation between Curriculum Ideology and Politics and Engineering Fluid Mechanics

Despite the challenges faced in the teaching of Engineering Fluid Mechanics, the integration with the concept of curriculum ideology and politics can bring multiple benefits. Firstly, curriculum ideology and politics demand that education and teaching contribute to the formation of correct worldviews, outlooks on life, and values in students. As an important subject in engineering, the principles and applications of Engineering Fluid Mechanics are directly related to the health, safety, and sustainable development of human society. Through the guidance of curriculum ideology and politics, students are more likely to understand the significance of fluid mechanics in society and develop a sense of social responsibility and ethical awareness.

Secondly, the integration of curriculum ideology and politics can promote innovative teaching in Engineering Fluid Mechanics. Students should not only be recipients of knowledge but also solvers of problems and participants in society. By guiding students to think about how the knowledge of Engineering Fluid Mechanics can be applied to solve real-world problems, teachers can cultivate students' innovative abilities and critical thinking, equipping them with higher practical skills.

Lastly, the integration of curriculum ideology and politics can also enhance the quality of experimental teaching in Engineering Fluid Mechanics. Education and teaching should emphasize the importance of practical education, and fluid mechanics experiments are an important means to cultivate students' practical operation skills and hands-on abilities. By focusing on the objectives of curriculum ideology and politics, experimental teaching can be better organized, guiding students to consider issues such as social responsibility during the experiments.

3. Teaching Reform Strategies

3.1 Course Objective Reconstruction

In integrating the concept of curriculum ideology and politics into the teaching of "Engineering Fluid Mechanics," the primary task is to revisit and reconstruct the educational objectives of the course. Traditionally, the teaching of Engineering Fluid Mechanics has focused primarily on students' mastery of fluid mechanics theories and applications, emphasizing the cultivation of technical skills. However, through the lens of curriculum ideology and politics, we can extend the course objectives to broader fields. Firstly, we can set objectives that include cultivating students' awareness of significant social issues such as water resources, environmental protection, and energy efficiency. This involves guiding them to think about how to apply the knowledge learned to solve these issues, thereby fostering a positive sense of social responsibility. Secondly, the course objectives can emphasize the cultivation of students' innovative abilities and interdisciplinary skills. Engineering Fluid Mechanics is closely related to other engineering disciplines, and the course can encourage students to think about how to integrate fluid mechanics principles with knowledge from other disciplines to solve complex interdisciplinary problems and promote innovative development. Lastly, the course objectives can emphasize the cultivation of students' critical thinking and decision-making abilities. Engineers need to make decisions in their actual work, considering society, the environment, and human well-being. By guiding students to analyze social issues, the course can cultivate their thinking and decision-making abilities.

3.2 Adjustment of Teaching Materials and Aids

The choice of teaching materials and aids is crucial for teaching reform. To integrate the concept of curriculum ideology and politics, the following strategies can be adopted: Firstly, select appropriate teaching materials. The teaching materials should include case studies and examples related to social and political education so that students can understand the application of Engineering Fluid Mechanics and its social responsibility from actual cases. At the same time, the materials should also include relevant theoretical content and ideological and political education content to guide students in decision-making and value-oriented thinking.

Secondly, employ a variety of teaching methods. Traditional classroom teaching can be combined with case analysis, group discussions, experiments, and project research among other teaching methods, to promote students' ideological and political education. Through hands-on operations and interactions, students can more easily understand and apply concepts of social responsibility.

Lastly, make full use of modern technology and online resources. Online learning platforms, simulation software, and virtual experiments can provide a wealth of educational resources, helping students to deeply understand the principles of Engineering Fluid Mechanics and its social applications.

3.3 Innovation in Teaching Methods

Innovating teaching methods is a key aspect of integrating the concept of curriculum ideology and politics into the teaching of "Engineering Fluid Mechanics". Below, we explore how the goals of curriculum ideology and politics can be achieved through innovative teaching methods.

Firstly, incorporate case-based teaching. Case-based teaching is an effective method that connects abstract fluid mechanics theories with real engineering problems. Teachers can select engineering fluid mechanics cases involving social responsibility and political factors for students to analyze and discuss. This helps students understand how engineering decisions are influenced by social and political factors, prompting them to think critically.

Secondly, adopt group discussions and interactive teaching. Organizing group discussions and class interactions gives students the opportunity to share their perspectives and thoughts, thereby promoting the exchange of ideas and ideological and political education. Teachers can pose questions with a background of social responsibility to guide students in discussions and debates. This interactive teaching style can stimulate students' thoughts, cultivating their critical thinking and political awareness.

Engineering Fluid Mechanics often needs to be integrated with other engineering disciplines (such as environmental engineering, energy engineering, etc.) to solve complex practical problems. The course can introduce interdisciplinary projects, allowing students to collaborate in solving actual engineering problems while considering factors of social responsibility.

3.4 Improvement of Assessment Methods

Improving assessment methods is a crucial part of ensuring the effective implementation of curriculum ideology and politics. Traditional exams and homework assessments mainly focus on the mastery of subject knowledge, but curriculum ideology and politics emphasize the goals of ideological and political education. Therefore, assessment methods need to more comprehensively examine students' overall literacy and the effectiveness of ideological and political education. One possible improvement is the introduction of case analysis assignments. Students can analyze problems related to Engineering Fluid Mechanics, propose solutions, and discuss the reasoning behind their solutions. This type of assignment can assess students' understanding and ability to apply principles.

Additionally, assessments can take the form of oral presentations and debates. Students can choose a topic related to social responsibility in Engineering Fluid Mechanics and engage in oral presentations or debates. This helps improve students' expressive abilities and the practical effectiveness of ideological and political education.

Finally, introduce peer assessment and mutual evaluation mechanisms. Students can evaluate each other's case analyses, oral presentations, or team projects. This method helps cultivate students' self-evaluation and mutual learning abilities, and can also alleviate the assessment burden on teachers.

4. Case Analysis and Practical Experience

4.1 Specific Case Analysis

Water Resource Management: In the course on Hydraulic Machinery and Fluid Mechanics, we introduced a case study that prompted students to consider issues surrounding water resource management. Students were required to research the water supply problems of a region, including the

distribution, conservation, and environmental protection of water resources. Through classroom discussions and group research, students not only learned the principles of fluid mechanics but also delved deeply into how to balance different interests, ensure the fair distribution of water resources, and the importance of protecting the environment. This case helped students combine course content with social responsibility, enhancing the effectiveness of their ideological and political education.

Sustainable Energy Project: In the course, we organized a practical sustainable energy project, requiring students to collaborate and design a renewable energy solution based on the principles of fluid mechanics. This project tested students' understanding and application ability of fluid mechanics and also prompted them to think about issues related to sustainable development and environmental protection. Students had to consider aspects of the project such as its social impact, environmental sustainability, and resource utilization efficiency. Through this case, students organically integrated Engineering Fluid Mechanics with the concept of sustainable development, enhancing their experience in ideological and political education.

4.2 Summary of Practical Experience

During the implementation of the curriculum ideology and politics in the teaching reform of "Engineering Fluid Mechanics," we have accumulated some practical experience. Case-based teaching is an effective method; by introducing cases related to society and politics, students can better understand the social applications and issues of Engineering Fluid Mechanics. Case-based teaching can stimulate students' interest and prompt them to think deeply.

Engineering Fluid Mechanics often requires collaboration with other engineering disciplines to solve complex problems. Interdisciplinary projects can cultivate students' teamwork and interdisciplinary thinking, better preparing them to meet the challenges of social responsibility.

In addition to traditional exams and homework, a variety of assessment methods such as oral presentations, case analyses, and project evaluations can more comprehensively examine students' overall literacy and the effectiveness of ideological and political education. These methods encourage a more holistic approach to learning and assessment, ensuring that students not only master the technical aspects of the course but also develop a strong sense of social responsibility and critical thinking skills.

5. Teaching Effectiveness Assessment

5.1 Assessment of Students' Learning Outcomes

Assessing students' learning outcomes is an essential part of curriculum ideology and politics, aimed at verifying the effectiveness of teaching reforms and whether students have achieved the expected educational objectives. We evaluated students' academic performance, including traditional academic assessments such as final exams, assignments, and lab reports, to test whether students have mastered the theoretical knowledge and application skills of fluid mechanics.

We paid close attention to students' participation and feedback. Students' active engagement and feedback are crucial for assessing teaching effectiveness. We encouraged students to provide

suggestions for improvement and conducted regular surveys to understand their views and feelings about the ideological and political education of the course.

5.2 Student Feedback and Engagement

In terms of student feedback, we regularly organized course satisfaction surveys and discussion groups to understand students' opinions about course content and teaching methods. Through these feedback sessions, we gained valuable insights that helped us adjust and improve the course design. The feedback from students generally indicated that the integration of curriculum ideology and politics increased the practicality and appeal of the course, helping them better understand the social impact of Engineering Fluid Mechanics.

Student engagement is one of the key manifestations of curriculum ideology and politics education. By introducing interactive teaching methods such as case analysis, group discussions, and presentations, we encouraged students to actively participate in classroom activities and share their views and thoughts. Students' engagement gradually increased, and they expressed their opinions more confidently.

5.3 Teachers' Teaching Experience

The teaching experience of instructors is also a part of assessing the effectiveness of teaching. In the teaching reforms under curriculum ideology and politics, teachers play a crucial role in guiding and motivating students. Feedback from teachers indicates that integrating elements of curriculum ideology and politics has made teaching more challenging and innovative. This approach has ignited teachers' passion and motivated them to continually improve the quality of education.

6. Conclusion

In summary, the research on teaching reform of "Engineering Fluid Mechanics" based on curriculum ideology and politics has achieved positive results. By rethinking course objectives, innovating teaching methods, assessing students' outcomes from multiple dimensions, and introducing interdisciplinary thinking, we have successfully integrated social responsibility and political concepts into the education of Engineering Fluid Mechanics. The active participation and feedback from students, as well as the continuous growth of teachers, reflect the effectiveness of curriculum ideology and politics education. The experience gained from this research not only helps improve the quality of the Engineering Fluid Mechanics course but also provides valuable insights for curriculum ideology and politics education in other engineering fields.

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