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Original Paper

Exploration and Innovative Research on Ideological and Political Education in Architectural Mechanics Course

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Abstract

The emphasis and implementation of ideological and political education in courses lie within the courses themselves, ensuring effective education through the process of course implementation and playing a role in nurturing students. This paper explores the elements of ideological and political education in the architectural mechanics course. It provides a detailed design of ideological and political education in accordance with the course content and characteristics. Additionally, innovative designs incorporating ideological elements are introduced for parts of the course. Finally, an application exploration is conducted within the sections of the course, specifically focusing on the subtopic of "rigid frames", with the hope of providing reference value to related courses.

Keywords

Architectural Mechanics, Ideological and Political Education, Teaching Design

1. Introduction

In December 2016, General Secretary Xi Jinping emphasized at the National Conference on Ideological and Political Work in Colleges and Universities the need to adhere to moral education and the nurturing of talent as a central focus. This involves integrating ideological and political work throughout the entire educational and teaching process, achieving comprehensive and all-round student development, and striving to create new prospects for the development of higher education in China. The emphasis and implementation of ideological and political education in courses are centered around the courses themselves, ensuring effective education through the process of course implementation and playing a role in nurturing students.

Architectural mechanics is an essential foundational theoretical course that certain universities require civil engineering students to master before delving into their specialized courses. It is also crucial foundational knowledge for further academic pursuits and involves the three major mechanics areas in civil engineering: theoretical mechanics, material mechanics, and structural mechanics. This course plays an indispensable role in preparing students for their subsequent professional courses and is often involved in postgraduate entrance examinations and relevant industry qualification exams in many schools. The teaching objective of this course is for students to acquire fundamental knowledge and computational methods in mechanics, understand the interrelationship between engineering mechanics design and construction issues, and simplify engineering structures into computational models to facilitate rational analysis and problem-solving for practical engineering issues. The ideological and political education goal focuses on nurturing students' research-oriented thinking, cultivating research abilities, fostering a spirit of not giving up easily in the face of difficulties, striving for excellence, and instilling the spirit of a skilled craftsman in a great nation. It aims to cultivate students' professional spirit of daring to explore and challenge, fostering a research attitude of diligent thinking and persistence, enhancing students' professional qualities, and thereby encouraging them to aspire to become outstanding engineers. Building upon this foundation, this paper focuses on the architectural mechanics course to conduct theoretical exploration and innovative research in ideological and political education within the course context.

2. Course Ideological and Political Education Research Status

2.1 Research Trends in Course Ideological and Political Education

Yang Jie et al., conducted a study focusing on the field of course ideological and political education using the CNKI database, analyzing 1,124 literature articles from 2000 to 2021. They concluded that research outcomes surged after 2017. The institutions publishing these articles were primarily concentrated in universities located in the Beijing-Tianjin-Hebei region and the Yangtze River Delta. Authors of these articles mainly consisted of ideological and political course instructors from universities, as well as leaders and administrators from universities and education departments, with fewer contributions from non-ideological and political course subject teachers.

Li Ping et al., utilized CiteSpace visualization software to analyze 239 core journal articles related to ideological and political education in Chinese universities from 2012 to 2022. They found that the overall quantity of research literature was on the rise, core research institutions were forming, and government-led funding was prevalent. Research hotspots centered around concepts, content, values, teaching practices, resource exploration, instructional design, and curriculum integration of ideological and political education within courses. Case-based teaching, the integration of ideological and political elements into professional courses, emerged as high-frequency hotspots in recent years. The developmental trend showed a diversified characteristic.

Overall, in China, research on course ideological and political education went through an initial

budding phase before 2016, shifted into a phase of policy guidance from 2016 to 2020, and then entered a phase of diverse development after 2020. As the promotion of ideological and political education in universities continued, course ideological and political education has become a major pathway for nurturing future talents in higher education. Further advancement of the application and promotion of course ideological and political education theory in various types of courses, particularly in public foundational courses, practical courses, and professional courses, aims to cultivate well-rounded socialist builders and successors with moral, intellectual, physical, artistic, and labor competencies.

2.2 Current State of Research on Ideological and Political Education in Architectural Mechanics Course

Yan Xiaohuan et al., grounded their research in the architectural mechanics course to conduct in-depth practical studies on course ideological and political education. They carried out exploratory research into the integration of ideological and political education within the architectural mechanics curriculum. The following conclusions were drawn: (1) Establishment of diversified ideological and political education. (2) Innovation of teaching methods. (3) Construction of an open teaching system. (4) Creative presentation of ideological and political elements through well-designed teaching processes.

Li Weina et al. elucidated a plan for integrating ideological and political education into the architectural mechanics curriculum through case studies. They utilized steps such as enabling, empowering, enhancing, integrating, releasing, and strengthening to ensure continuous integration of ideological and political education throughout the entire classroom process. This approach elevated the knowledge-based and humanistic aspects of professional teaching, achieving an organic integration of classroom education, knowledge impartation, skill training, and value cultivation.

Yin Xiangbao et al., using the example of mechanics courses in teacher-training institutions, expounded on the current development status of mechanics courses. They analyzed the hybrid teaching model and the essence of ideological and political education within courses. Through specific case studies, they explored ways to introduce ideological and political education into the curriculum. Based on applied cases and effects of the hybrid teaching model, they highlighted its superiority.

Based on the literature survey, it is apparent that while there is substantial research on integrating ideological and political education into traditional mechanics courses such as physics mechanics, theoretical mechanics, material mechanics, and structural mechanics, there is relatively less exploration in the realm of architectural mechanics. This is partly due to the broad and diverse content covered by architectural mechanics, as well as the differing target audiences for the course, mainly catering to vocational students in civil engineering colleges and some upgrading students in higher education institutions. Overall, research outcomes concerning ideological and political education in the architectural mechanics course are currently relatively scarce.

3. Significance of the Research

Among the more than three thousand universities nationwide, specialized courses and instructors make up a significant portion, with students primarily engaged in studying these specialized subjects. Reliance solely on traditional ideological and political courses for university political education is fundamentally insufficient. Therefore, various specialized courses constitute the main battleground for ideological and political education. Specialized course instructors are crucial practitioners and influencers in the realm of course ideological and political education. Exploring how to fully harness the ideological and political education function of diverse specialized courses requires continuous practice and exploration by a wide array of specialized course teachers.

The subject of architectural mechanics is characterized by an abundance of knowledge points, strong theoretical foundations, abstract conceptual content, and high continuity between different topics. Relative to other courses, this subject is particularly challenging due to its high difficulty level. Students generally find it demanding, leading to higher failure rates in various universities. Through meticulous instructional design, instructors can adeptly integrate ideological and political elements into their teaching. This not only enlivens the classroom atmosphere but also ignites students' interest and enjoyment in learning, enabling them to easily grasp the knowledge while achieving the goal of ideological and political education.

4. Main Research Contents

This course is characterized by high theoretical content and serves as a fundamental subject for many majors. Consequently, its teaching content is more abstract compared to other basic subjects, encompassing various methods and experiments. As a result, students may find the classroom environment somewhat monotonous, leading to reduced classroom enthusiasm. Therefore, teachers should scientifically structure the course content, utilize practical examples to stimulate critical thinking, optimize teaching to ignite students' learning enthusiasm, cultivate their interests and self-confidence, thereby enhancing classroom effectiveness and elevating teaching standards.

Given the strong theoretical nature of this course and its close connection to practical engineering, integrating real-world engineering projects into teaching and unearthing ideological and political elements within the curriculum can effectively connect architectural mechanics knowledge with practical applications. This approach facilitates the seamless integration of ideological and political education, achieving a subtle and unobtrusive effect. The use of images, information, videos, and other means constructs a database of ideological and political cultural case materials for the curriculum. Furthermore, by extracting ideological and political elements from this case database, a disciplinary ideological and political cultural system framework is established.

4.1

The overall instructional design for this course adheres to three main objectives: character formation, knowledge dissemination, and skill development. Based on the "Chaoxing Learning Platform," a

blended online and offline teaching mode is implemented. It centers around the concept of "student-centeredness," thoroughly integrating educational and ideological and political elements into key and challenging course content, naturally permeating throughout various sections. This is achieved by deriving from the development history of civil engineering, China's civil engineering progress and national conditions, understanding students' characteristics and ongoing developmental needs, leveraging disciplinary advantages, implementing the fundamental mission of moral character education, promoting concurrent development of course learning and ideological and political education, generating a synergistic effect. Partial design features are as follows:

4.1.1

Building upon the "Chaoxing Learning Platform," pre-lesson video study is coupled with typical case interaction during class, interim video viewing to inspire students, and post-lesson assignments including online political learning tasks. This approach consistently maintains ideological and political education goals, continually nurturing students with a spirit of excellence, encouraging them to become exemplary craftsmen who strive for perfection, and igniting a sense of national pride and mission in contributing to science and technology while never forgetting classroom-based character education.

4.1.2

Blending theoretical knowledge with practical applications, foundational knowledge is learned through classic engineering case studies. Students analyze specific mechanics problems from a practical perspective, engaging their theoretical knowledge actively. This guides them to independently apply their theoretical knowledge to solve problems, while fostering a rigorous and meticulous professional consciousness.

4.1.3

Incorporating current events, students are exposed to industrial trends and frontier issues, enabling them to grasp fundamental knowledge and specific abilities promptly. This aids in the development of a sense of ownership, as well as the awareness of their inadequacies and direction for improvement, ultimately boosting their self-directed learning motivation.

4.1.4

Introducing real-life stories, impactful figures are introduced to the classroom. Through accounts of accomplished mechanics experts in our country, students are inspired by the spirit of delving deep into research, confronting challenges, consistent and rigorous scientific attitudes, instilling an innovation-driven mindset. This cultivates students' professional ethics, subsequently inspiring them to aspire to become exceptional engineers, thereby achieving the teaching objectives of "course ideological and political education."

4.2

The course team has implemented several reform innovations aligned with course ideological and political education objectives, emphasizing a student-centered teaching philosophy. Some of these innovative designs are as follows:

4.2.1

Precise surveys. Firstly, after each new lesson on the Chaoxing Learning Platform, instructors distribute relevant questionnaires in the form of surveys to gather feedback on the challenging knowledge points encountered in the lesson. The rationale is that students retain a profound impression of the areas where they did not comprehend the content immediately after attending the class. This cultivates the habit of identifying problems and summarizing solutions. Subsequently, instructors analyze the survey results and compile relevant materials to address these points more comprehensibly through engineering examples, fostering the integration of theory and practice. In the pre-lesson introduction phase, students are intrigued through the integration of real-world examples in a fun way, dissecting the relevant key points from the previous lesson. This stimulates students' interest in learning and cultivates exploratory and innovative attitudes, deepening their understanding and absorption of knowledge points and dismantling the barriers posed by complex mechanics concepts.

4.2.2

Tailoring teaching to individual capabilities. For students exhibiting exceptional calculation and analytical abilities, challenging optional tasks are assigned both online and offline through the Chaoxing Learning Platform. This taps into students' curiosity, allowing them to engage in self-exploration, cultivating mechanics thinking, and nurturing a spirit of continuous improvement. Conversely, for students with weaker foundational skills, instructors simplify intricate mechanics formulas and difficult examples, presenting them in the form of tables or mnemonics. For instance, following a chapter on tension and compression, students are tasked with identifying real-life examples of tension and compression elements, capturing images or recording videos. In the next lesson, these results are thoroughly discussed. This approach sources from real-life scenarios, fostering observation skills, problem-solving abilities, practical application skills, and innovative thinking. Through the fusion of theory and practice, students better grasp theoretical knowledge, encouraging reflection, forming correct values and professional ethics, ultimately establishing a bottom line for professional ethics.

4.2.3

Exemplifying through practical cases. Departing from traditional problem assignments, which can often be monotonous, students are encouraged to observe mechanics phenomena in their daily lives. The completion of assignments shifts from traditional forms to images or videos. For instance, after a section on tension and compression, students are tasked with finding and documenting examples of tension and compression elements in their surroundings, sharing the results in the next class. This approach bridges the gap between theory and reality, facilitating a deeper understanding of theoretical knowledge through practical experience. Additionally, students presenting to the class, also known as a flipped classroom model, develops their communication and analytical skills.

5. Application Case Study and Exploration - Taking Frame Structures as an Example

Before the classroom teaching, instructors use the “Learning Platform” to assign self-study tasks and upload micro-lessons about frame structures, along with related teaching materials to stimulate students’ interest in learning. For instance, segments from documentaries such as “Mega Engineering” are included. Students watch these segments, engage with the online resources provided through self-study tasks, and answer corresponding questions, such as “Discuss a mega engineering project you are familiar with and the spirit of craftsmanship.” This cultivates students’ habits of independent learning and fosters their ability to think critically.

The course introduction involves heuristic and inquiry-based questions (e.g., “Do you have any understanding of frame structures?” “Have you encountered frame structures in your daily life?”) to introduce the theme of the lesson and spark students’ interest. Students continue to study with curiosity and interest.

Instructors explain course materials using demonstrations, starting with practical examples from daily life, such as bridges, streetlights, and drying racks. These examples introduce frame structures and their characteristic behaviors. The basic types of frame structures are introduced, fostering the ability to connect theory with practice. Real-life examples are brought into the classroom to enhance students’ interest and engagement. The instructor showcases a BIM model of the building where students are studying, demonstrating that the entire building is composed of frame structures. Through the BIM model, students immerse themselves in professional learning, constructing mechanical models in groups, thoroughly analyzing the load characteristics of frame structures, achieving a synergy between learning and application, and reinforcing teamwork.

Next, through solving example problems, the process of determining support reactions in frame structures is explained in detail. This is followed by the determination of internal forces within frame structures, combined with an explanation of how to draw internal force diagrams. By explaining the process of determining support reactions and internal forces, students’ logical thinking is exercised. The life story of the renowned Chinese mechanics scholar, Mr. Qian Weichang, is shared. This fosters discussion and sharing of work experiences, enabling students to appreciate the spirit of in-depth research, the courage to face challenges, and a persevering scientific attitude. This cultivates an active and diligent work ethic among students. Finally, a survey is conducted on the Learning Platform before the end of class to identify knowledge gaps among students. Subsequently, tasks are assigned for students to find real-life examples of frame structures, to be presented by groups in the next class.

6. Application Effects

The application effects of ideological and political construction in this course are as follows:

6.1

The number of students taught by the course team accounts for a significant proportion of the major. According to questionnaire survey reports organized by the school, overall teaching satisfaction is high,

with high evaluations of the course's importance and satisfaction. Feedback from student evaluations, supervisory evaluations, and peer evaluations is also positive.

6.2

Through innovative teaching methods such as precise surveys, reverse examples, real-life feedback, and the incorporation of "new engineering" elements like BIM, students' interest is increased, and their enthusiasm for learning is ignited. By combining major engineering project cases, stories of significant figures, and tailored teaching approaches, students experience the spirit of daring exploration, courage in facing challenges, persistent scientific attitudes, and diligent reflection. This cultivates their professional qualities, motivating them to aspire to become outstanding engineers and thus achieving the educational objectives of "course ideological and political education."

7. Conclusion

Effective course ideological and political teaching not only enhances students' mastery of knowledge but also teaches them how to become better individuals and deal with various situations. When designing instructional plans, teachers should dig deeper into the ideological and political elements of the course content and integrate political education content into the process of delivering professional knowledge. This maximizes the role of moral character education in classroom teaching. In the future, the course teaching team will further develop and enhance an online resource database, enriching it with classic case materials, micro-lessons, literature, question banks, and supplementary reading materials. This approach will broaden students' horizons, provide relevant materials and topics, and solidify their knowledge. Through continuous exploration and innovation, the architectural mechanics course will be developed into a high-quality "online and offline + course ideological and political education" course.

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