Transactions on Comparative Education (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/trance.2024.060113
ISSN 2523-5818 Vol. 6 Num. 1

Construction of Moral Education in "Principles of Steel Structure Design" Based on the Concept of Certification

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Keywords: Concept of certification, moral education, educational objectives, assessment methods

Abstract: To cultivate outstanding steel structure professionals with both excellent professional competence and moral character, this paper aims to emphasize the importance of moral education in the current context, and introduces the concept and significance of moral education. By analyzing the relationship between curriculum teaching and moral education objectives, the paper clarifies the teaching goals and moral education objectives of the curriculum, and also defines the excavation and assessment of moral elements. Through the exploration of moral education resources, the paper organically integrates moral elements into the curriculum, aiming to cultivate students' comprehensive qualities. Additionally, the paper proposes suggestions for teachers to enhance their awareness of moral education, to dig out the moral elements embedded in the curriculum knowledge, and to establish appropriate assessment methods and standards.

1. Construction Background and Significance

The concept of "certification-based education" is a student-centered, outcome-oriented educational model that emphasizes both the process and results of education. It sets the learning outcomes achieved by students as the goal for instructional design and implementation. This concept addresses issues such as educational quality, student development, and educational reform. Outcome-Based Education (OBE) has become the mainstream concept of educational reform [1].

In the teaching of steel structure courses, embedding the concepts and elements of moral education aims to enhance students' comprehensive literacy and sense of social responsibility, adapting to the current societal changes. By continually optimizing the curriculum and teaching theory, steel structure students are encouraged to become well-rounded individuals in terms of moral character, intellectual abilities, physical skills, and aesthetic appreciation. Implementing moral education not only improves the teaching quality of the curriculum but also facilitates holistic student development. The implementation of moral education breaks down the barriers between professional teaching and talent cultivation, integrating the two and improving teaching quality. It fosters students' enthusiasm for learning and cultivates their comprehensive qualities [2-4]. Therefore, in the context of the current era, it is crucial and urgent to explore how to effectively promote moral

education.

"Principles of Steel Structure Design" is a core course in civil engineering. Its aim is to enable students to systematically learn the basic theories of steel structure, including the characteristics of steel structures, the basic properties of steel materials, connection and construction measures of components, and the strength, stiffness, and stability of beam-column components. It also intends to equip students with the ability to select steel materials rationally, design basic components and their connections, analyze and calculate effectively, and solve initial complex engineering problems. Moreover, students are expected to incorporate considerations of green, economic, safety, and environmental factors into their comprehensive steel structure design abilities, laying the foundation for their future engagement with complex steel structure engineering projects that meet societal needs. The distinguishing feature of this course lies in its integration of theory and practice, as it involves the resolution of various practical engineering issues. This feature provides valuable opportunities for the implementation of moral education. Through the study and discussion of real engineering cases, students can develop a profound understanding of societal responsibilities, environmental protection, sustainable development, and ethical standards [5-6], and integrate these concepts into their professional learning and future careers.

In the construction of the moral education system for this course, in order to effectively achieve the teaching objectives and cultivate students in accordance with these objectives, and to ensure that the curriculum instruction fully supports the realization of talent development goals, a relatively complete system of moral education has been established through years of learning, research, reform, and construction efforts. This system, guided by the OBE concept in engineering education accreditation, encompasses the teaching and moral education objectives of the curriculum, the excavation of moral education elements, and the main assessment methods, effectively promoting the cultivation of moral literacy within this course.

2. Educational and Moral Education Objectives

The goal of a course is to identify the extent of students' gains in knowledge, abilities, and quality after their course studies. Under the accreditation philosophy, the setting of course objectives should provide clear support for the professional graduation requirements, which is also key to course construction. To this end, based on an in-depth study of the accreditation philosophy and in conjunction with the training goals and graduation requirements of the civil engineering program, the educational and moral education objectives of this course were determined through surveys and research. The educational objectives are as follows:

(1) Knowledge objectives: Students are expected to master the main performance characteristics of steel materials, understand the force-bearing characteristics of steel members, and grasp the requirements for connection structures; they should also comprehend the basic theories that guide the selection of steel materials, member connections, and stability; moreover, students should be capable of comprehensively using their knowledge of strength, rigidity, and stability to inspect and verify the connections and components within steel structures.

(2) Ability objectives: Students should develop the ability to identify critical issues related to steel structures, analyze the influencing factors of various structural solutions by synthesizing information from relevant literature, and they are expected to solve complex problems in steel structures through optimization techniques; furthermore, they ought to design rational forms of steel structure connections and load-bearing members based on their findings from surveys and analysis.

(3) Quality objectives: Students must aspire to observe professional standards and uphold engineering ethics in their practice; they should act responsibly, contribute to national development, and serve society at large; and they must be trained to take into account the interrelationships

between green, economic, safety, and environmental factors when designing steel structures, thereby establishing a solid foundation for managing complex steel structure projects that adequately address societal needs in the future.

The moral education objectives of the course are as follows:

(1) The course aims to cultivate students' values of patriotism, dedication to work, honesty, and friendliness through the study of major engineering case studies such as "construction demons" and the "height and speed of China," adopting a people-oriented approach and prioritizing moral education to shape them into useful individuals.

(2) The curriculum is designed to develop students' commitment to professional ethics and to instill a quality-first craftsmanship spirit, meticulous professional attitude, and a truth-seeking, practical, innovative professional spirit by analyzing professional standards alongside major steel structure engineering accidents.

(3) The teaching strategy intends to stimulate students' motivation for proactive learning through the exploration of the design and application of steel structures in areas like emergency protection, consequently enhancing their professional confidence and fostering their awareness and ability for lifelong learning.

3. Moral Education Element Exploration

In the process of moral education, the design of the moral education elements is the foundation for successful implementation of moral cultivation in the curriculum. Specifically, in carrying out course moral education construction and practice, the following four aspects should be explored:

(1) Social Responsibility and Mission: The course seeks to guide students to develop a sense of social responsibility alongside their absorption of professional knowledge by incorporating practical cases that present achievements of science and technology. For instance, by examining the application of steel structure technology in civil engineering, such as the "China Sky Eye", high-speed rail construction, road and bridge design, and high-rise residential buildings, students can gain a deeper appreciation of the great accomplishments in the field of steel structures. Also, by applying what they have learned to their own passion for their profession and future career planning, they are encouraged to cultivate confidence and pride, as well as to recognize their responsibility and mission to society.

(2) Professional Ethics: During the process of moral education teaching, it's crucial to emphasize the guidance and education on professional integrity and ethical standards, such as the scientific rigor of technological development, the paramount importance of engineering quality and life safety, etc. Through combining with typical engineering accident cases as cautionary teaching materials, students can understand their responsibilities and obligations in social development while learning their profession.

(3) Holistic Education: The curriculum continuously emphasizes team spirit and collectivism. It inspires students to understand the profound impact of technological development on social progress and encourages active learning of new knowledge, theories, and methods to comprehensively enhance their own qualities.

(4) Practical and Innovative Abilities: Guided by the spirit of craftsmanship, the curriculum emphasizes the core importance of product quality, advocates the spirit of striving for excellence, innovation, and superior customer service. Students are taught to cultivate rigorous work habits, understand the lifelong responsibility system for engineering projects, and appreciate the importance of engineering safety.

4. Assessment and Evaluation Construction

To effectively evaluate the moral education effects of the course, it is necessary to assess and evaluate moral teaching, which is also an important means to further promote the improvement of moral education through evaluation. Unlike professional courses that can be simply measured by quantitative indicators for direct feedback, moral education is a process that deeply guides individual thought and requires a longer time span to fully manifest. Therefore, it is particularly important to reflect on and explore its effects.

In the construction of this moral education teaching assessment system, by incorporating student feedback in the teaching assessment, it is possible to evaluate whether teachers integrate moral education into their courses, with a focus on the following key points:

(1) Whether the goals of moral education are correct, appropriate, and clearly specific: The goal setting of moral education carries the expectation of educating students. Only when the goals are clearly defined and aligned with students' actual needs can students be guided to form a positive and motivated learning attitude.

(2) Whether the exploration of moral elements is sufficiently in place: During the teaching process, it is essential to fully explore and utilize the moral education resources inherent in professional courses, focusing not only on guiding the improvement of professional skills but also on stimulating thought and refining moral character.

(3) Whether "moral education" and "professional education" are organically integrated: Moral education should not be an extra task added to the professional course but should be intrinsically integrated with professional knowledge teaching, complementing and enhancing each other.

(4) Whether the content of moral education is timely: Moral education should focus on current affairs and advocate timeliness by using the latest social cases to help students understand and accept correct social values.

(5) Whether moral education includes criticism and resistance to incorrect views and tendencies: Moral education should also help students establish correct ideological concepts and be able to identify and oppose various incorrect ideologies and views.

5. Conclusion

This paper, based on accreditation philosophy, has explored the construction of moral education in the "Principles of Steel Structure Design" course and has achieved the following main conclusions:

(1) By setting goals for moral education, the course's teaching objectives and moral education objectives are clarified, and designs for the extraction of moral education elements and main assessment methods are provided, along with the central role of teachers in the teaching of moral education.

(2) By tapping into moral education resources, moral elements are organically integrated into course teaching. This guides students to establish correct ideological concepts and professional ethics, while cultivating a spirit of craftsmanship and innovation capability.

(3) Key elements of assessment and evaluation for moral education cultivation are proposed, including the establishment of moral education objectives, extraction of elements, integration with the profession, timeliness, and criticism of improper views.

Acknowledgements

The study was supported by 2020 Teaching Research Project of University of Jinan (JZ2010), 2021 Shandong Province Professional Degree Graduate Case Repository Construction Project

(SDYAL21119). Any opinions and conclusions expressed in this paper are those of the writers.

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