



Research on the Cultivation of Craftsman Spirit and Professional Ethics in Civil Engineering Structure Testing Teaching

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How to cite this paper: Ying Xu. (2025). Research on the Cultivation of Craftsman Spirit and Professional Ethics in Civil Engineering Structure Testing Teaching. *The Educational Review, USA, 9(9), 769-773*. DOI: 10.26855/er.2025.09.002

Received: July 30, 2025

Accepted: August 29, 2025

Published: September 28, 2025

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Abstract

This research explores the integration of craftsmanship spirit and professional ethics into the teaching of civil engineering structure inspection, aiming to establish a comprehensive, practice-oriented teaching system. By designing multi-dimensional course modules, incorporating real-world case studies, and implementing immersive on-site training, students are guided to develop a strong sense of responsibility, rigorous quality awareness, and adherence to ethical standards. Mentorship programs and reflective learning further reinforce these values, enabling students to internalize professional dedication while mastering technical inspection standards, methods, and procedures. The teaching approach emphasizes the cultivation of both technical skills and moral values, ensuring that students not only acquire professional competencies but also foster integrity, responsibility, and dedication to quality and safety in engineering practices. This educational reform promotes the harmonious integration of skill-based education with value guidance, contributing to the advancement of civil engineering education and nurturing a new generation of highly skilled, ethically grounded technical professionals who are capable of supporting the high-quality development of the industry.

Keywords

Craftsman spirit; Professional ethics; Civil engineering structure testing; Practical teaching; Technical quality training

Introduction

As the civil engineering industry increasingly focuses on structural safety and durability, structural testing technology, as a crucial means of quality control, is gaining more attention. At the same time, issues such as a lack of responsibility and insufficient professional competence have been exposed in engineering practice, prompting a deeper reflection on the model for cultivating specialized talent. In the teaching process, how to organically integrate the meticulous craftsmanship spirit and rigorous professional ethics into technical skills training has become a key path to improving the quality of civil engineering education and building a high-quality workforce.

1. The Current Situation of Structural Detection Teaching and the Core Problems in Personnel Training

1.1 The Current Civil Engineering Structure Testing Course Setting is Insufficient

Civil engineering structure testing, as one of the core courses in civil engineering, is of great practical and technical

significance. However, in actual course settings, many universities still emphasize the explanation of theoretical knowledge, lacking practical components closely integrated with real engineering projects. Traditional structure testing courses focus excessively on the transmission of technical skills while neglecting the comprehensive cultivation of students' professional qualities (Li et al., 2024). This results in students having weak abilities to solve complex problems in practical work and being unable to meet the actual needs of structured testing sites.

In addition, the outdated and lagging nature of teaching content is also a significant issue in curriculum design. With the continuous development of new technologies in civil engineering, existing teaching materials have not been updated in a timely manner, failing to fully incorporate modern testing techniques and methods. Although traditional testing methods and equipment still hold practical value, under the impetus of new materials, structures, and technologies, the course content urgently needs to be adjusted and upgraded according to industry developments.

1.2 Lack of Practical Teaching Links

In the teaching of civil engineering structure testing, although classroom theoretical instruction occupies a significant proportion, students have relatively few opportunities for practical operation. Many universities' structural testing courses mainly rely on static tests in laboratories, neglecting dynamic practices that integrate with actual engineering projects. Without sufficient on-site internships and project practices, students' technical skills and ability to handle unexpected issues on-site cannot be adequately developed.

At the same time, existing practical training programs often fall short of industry needs. Many projects are highly simulated, lacking genuine engineering project backgrounds and challenges. When students participate in these trainings, they mostly follow teachers to complete standardized operations, missing out on opportunities to solve real-world engineering problems. This results in students lacking the ability to tackle complex engineering issues and struggling to integrate theory with practice effectively.

1.3 Lack of Professional Quality Education

Civil engineering structure testing is not only a technical task but also an industry with significant responsibilities and stringent requirements. The current educational system overly emphasizes the cultivation of students' technical skills while neglecting the education of their professional ethics, especially in terms of craftsmanship and professional ethics (He, Li, & Cheng, 2024). Although structural testing itself demands precision and rigor, existing courses have failed to effectively integrate these professional qualities into teaching, leading to insufficient responsibility for project quality and inadequate attention to detail among students.

In terms of professional ethics, the current teaching system lacks specialized courses on professional ethics. Students' sense of responsibility and professional conduct often remain at the technical level, failing to deeply reflect in their actual work performance. Especially during on-site internships, students tend to focus more on the technical operations themselves, neglecting a profound understanding of quality management and safety responsibilities in the work process.

2. The Implementation Path of Integrating Craftsman Spirit into Testing Teaching

2.1 The Integration of Craftsman Spirit in Curriculum Content Design

In the content design of structural inspection courses, it is essential to integrate the core values of craftsmanship, such as striving for excellence, pursuing perfection, and stringent quality requirements, into the course objectives and syllabus. By analyzing the current trends in structural inspection technology, incorporate best practices and innovative technologies from the industry into the course content. This ensures that students not only master the foundational knowledge but also develop a work attitude focused on excellence.

In addition, the course content design should focus on cultivating a sense of professional responsibility. By integrating engineering examples, it can illustrate potential issues and challenges in structural inspection, guiding students to pay attention to details and enhance their problem-solving skills. At the same time, incorporating content related to quality control, standards, and work ethics ensures that students not only master inspection skills but also embody the "precision" and "high standards" principles of craftsmanship in their practical work.

2.2 The Combination of Teaching Method Innovation and Craftsman Spirit

Traditional teaching methods often focus on lectures, making it difficult to stimulate students' practical interest and active thinking. To effectively integrate the spirit of craftsmanship into structural inspection teaching, traditional methods should be reformed, encouraging students to participate in project-based learning and scenario simulations to cultivate a spirit of continuous improvement. During the teaching process, project-driven instruction can be used to organize students in specific inspection projects, from project planning and technology selection to on-site testing, allowing students to experience the importance of craftsmanship through hands-on practice.

At the same time, innovations in teaching methods can also strengthen the inheritance of craftsmanship through cooperative learning and mentorship. Teachers should not only be transmitters of knowledge but also guides for their students, leading them to continuously challenge themselves and strive for perfection in practice. In the mentorship-based teaching process, teachers can help students gradually build a solid technical foundation and develop a strong sense of responsibility towards work quality through personal guidance.

2.3 Cultivation of Craftsman Spirit in the Arrangement of Practical Training

Practical training is a crucial venue for students to transform theoretical knowledge into practical skills, so integrating the spirit of craftsmanship into this process is particularly important. In structural inspection practical training, challenging tasks should be designed, requiring students to complete high-precision inspection tasks within a specified time and evaluate them through a rigorous quality control system. Such high-standard, stringent training arrangements can effectively encourage students to pay attention to every detail, embodying the spirit of craftsmanship (He & Liu, 2024).

To strengthen students' craftsmanship spirit, practical training should integrate industry standards and real cases in teaching, emphasizing how to maintain accuracy, reduce errors, and ensure safety in challenging testing environments. By engaging students in real engineering projects or on-site internships, they are placed in authentic work settings, facing varied on-site issues and high-pressure work requirements. This approach cultivates their ability to maintain precision under pressure, gradually fostering an intrinsic drive for craftsmanship.

3. Integration Mechanism of Professional Ethics Education in Skill Training

3.1 The Combination of Responsibility Awareness and Skill Training

In the training of civil engineering structure inspection skills, a sense of responsibility is one of the core aspects of students' professional ethics cultivation. In practical teaching, case studies and on-site training should be used to strengthen students' sense of responsibility for work quality and safety. By explaining historical engineering accidents or inspection errors, students can understand that a small mistake during structural inspection can lead to significant consequences, thereby deepening their understanding of responsibility.

At the same time, during practical training sessions, teachers can set up project responsibility systems to have students take on different tasks in team collaboration, ensuring that each student feels the importance of personal responsibility. Through this approach, students not only accumulate experience in skill operations but also gradually develop a strong sense of responsibility in real-world scenarios, ensuring they maintain a high level of attention to structural safety and quality in their future work.

3.2 Establishment of Normative Awareness and Integration of Technical Standards

Normative awareness is another critical component of professional ethics education. Civil engineering structure testing has stringent requirements for technical standards and industry norms. In the teaching process, instructors need to use standardized teaching methods to help students deeply understand the requirements of industry standards, laws and regulations, and professional ethics. During technical training, teachers should incorporate relevant norms as an essential part of the curriculum, ensuring that students strictly adhere to these standards during operations, thereby reinforcing their recognition and enforcement of norms (Liang et al., 2024).

In addition, to organically combine normative awareness with technical skills, the teaching process should adopt a reverse teaching method. By analyzing examples that do not meet standards, students can be guided to identify flaws and shortcomings in technical operations. Through hands-on practice, students will master standardized

procedures and testing methods, fostering their ability to handle complex issues according to norms. This, in turn, cultivates professional ethics and technical standards.

3.3 The Integration of Quality Awareness and Refined Operation

Quality awareness is a crucial professional ethical requirement in the inspection of civil engineering structures, directly impacting both project safety and social responsibility. In skill training, students must recognize the impact of each inspection operation on the quality of the project. Therefore, cultivating students' quality awareness should be achieved through meticulous teaching methods and high-standard practical training requirements. In classroom instruction, teachers should emphasize the importance of quality management, explaining how precise inspection data and scientific analytical methods can ensure structural safety.

In the practical teaching process, teachers can set strict quality assessment standards, requiring students to be meticulous and thorough in every training session. By involving students in quality control processes and enforcing quality inspection standards, their awareness of quality is further enhanced, helping them develop a professional attitude that always maintains high standards and strives for excellence.

4. Optimize the Teaching Mode of Building A “Virtue and Skill” Education System

4.1 The Construction of Integrated Teaching Mode

The key to the “equal emphasis on virtue and skill” education system lies in the integrated design of teaching models, which requires the organic integration of technical and professional ethics education. First, course design should combine theory with practice, embedding technical standards, norms, and professional ethics into the teaching process. For example, when explaining technical standards for structural testing, real-world cases from the industry can be used to emphasize standardized operations and quality control, highlighting the responsibilities of society and individuals. This helps students understand the moral responsibilities and social values behind the technology (Wu, 2025).

In the teaching process, interdisciplinary interaction should be increased to promote the integration of technical skills and moral qualities. Through project-based learning, students can experience the relationship between technical decision-making and professional ethics in real or simulated engineering projects. For example, when students undertake structural inspection tasks, they must adhere to strict technical standards while also maintaining a sense of responsibility for work quality and safety, thus forming a comprehensive quality that values both virtue and skill.

4.2 Teaching Design Supported by Technical Standards

A high-quality civil engineering structure inspection talent cultivation system should first be built on the foundation of technical standards. The teaching content should revolve around industry standards, technical specifications, and operational procedures for structural inspections, ensuring that students acquire essential technical knowledge and practical skills. On this basis, it is also necessary to integrate elements such as craftsmanship and quality control, so that students not only learn how to do things but also understand why they are doing them, thereby voluntarily adhering to technical standards in their actual work.

In addition, classroom teaching and practical training should be closely integrated to ensure that technical standards can be implemented in practice. In terms of teaching methods, case analysis and scenario simulation can be adopted to encourage students to continuously correct their technical operations in simulated or real projects, thereby reinforcing their understanding and execution of technical specifications.

4.3 The Educational Path Guided by Value

The core of “emphasizing both virtue and skill” is not only to cultivate students' technical abilities but also, more importantly, to guide them in establishing correct professional values. The teaching system should be designed around three core values: “professional ethics, social responsibility, and continuous improvement,” guiding students to develop a sense of responsibility towards their work and an awareness of contributing to society. Through various methods such as course lectures, moral case analyses, and role-playing, students should be encouraged to think about and judge ethical issues in structural inspection work.

In addition to classroom teaching, schools can also convey the core concepts of professional ethics to students through teacher-student interactions and industry expert lectures. During practical training, students face various challenges and decisions on-site. Through these real-life scenarios, students are guided to understand the close relationship between technical choices and moral decisions, fostering correct professional values. By guiding their values, students will be able to make technical decisions that meet societal ethical standards in their future work, ensuring that the principle of “equal emphasis on virtue and skill” is implemented in practice.

5. Conclusion

By effectively integrating the spirit of craftsmanship and professional ethics into civil engineering structural testing education, we can cultivate high-quality talents who possess both solid technical skills and a strong sense of responsibility and professional integrity. By optimizing teaching models, reforming course designs, and innovating practical components, not only can students’ professional skills be enhanced, but they can also be guided to establish correct professional values, achieving the goal of “morality and skill in equal measure.” The implementation of this educational model will undoubtedly foster more outstanding technical talents in the field of civil engineering, promoting sustainable industry development and the fulfillment of social responsibilities.

References

- He, Y. Y., Li, M. N., & Cheng, Y. G. (2024). Teaching Design and Practice of Ideological and Political Education for the “Civil Engineering Surveying” Course. *Century Bridge*, 19, 103-105.
- He, Y., & Liu, X. (2024). A Preliminary Study on Integrating the “Craftsman Spirit” into the Teaching Mode of “Principles of Steel Structure Design”. *Wind Science and Technology*, 19, 28-30.
- Lensjø, M. (2025). From Craftsman to Vocational Teacher: A Narrative Study of Tacit Knowledge and the Nexus between Complex Cultures. *Vocations and Learning*, 18(1), 2.
- Li, H., Chen, F. F., Yi, L., et al. (2024). The Role of the History of Civil Engineering in Ideological and Political Education in Civil Engineering Professional Courses. *Journal of Higher Education*, 10(13), 180-183+188.
- Liang, C., Cui, Z., Fu, R., et al. (2024). Discussion on the Teaching Reform of Civil Engineering Courses under the Background of Ideological and Political Education in Courses: Taking the Civil Engineering Surveying Course as an Example. *Science Consultation*, 10, 180-183.
- Wu, T. (2025, February 20). Construction of Ideological and Political Teaching System for New Engineering Civil Engineering Courses. *Hebei Economic Daily*, p. 009.
- Zhang, C., & Wu, Y. (2024). An Exploration on the Teaching Reform Method of Integrating “Craftsman Spirit” into the Curriculum of Environmental Design Major under the Background of Integration of Production and Education. *Frontiers in Educational Psychology*, 5(1).
- Zhang, F., & Zhu, J. (2024). Under the concept of Craftsman spirit, the ideological and political teaching reform of the course “Mechanical drawing practice”. In *SHS Web of Conferences* (Vol. 187, p. 02016). EDP Sciences.