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# Thoughts and Exploration on the Establishment of a Practical Platform for Graduate Students Majoring in Civil Engineering

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**Abstract:** ***With the ongoing development of current educational technology, innovative ideas and methods have achieved significant results in improving daily training. Among these, the establishment of practical platforms plays a crucial role in the process of graduate education, serving as an essential component for improving comprehensive quality and fostering innovation. In light of the current situation of reform and development of graduate education in civil engineering, this article discusses the challenges that may be encountered in seeking and developing practical platforms, and offers several recommendations for platform construction. In the process of continuous development of training concepts and higher education reform, emphasizing the assessment and verification of practical operation ability is the goal pursued by many educators. Consequently, the importance of establishing high-quality practical platforms has been widely recognized and paid attention to. It is both necessary and urgent to guide graduate students majoring in civil engineering to apply engineering thinking to various processes of civil and architectural engineering, and ultimately achieve the expected construction goals of the engineering system. Therefore, it is essential to actively contact and develop relevant civil engineering practice platforms to cultivate graduate students with certain innovative abilities. Simultaneously, to meet the practical requirements of large-scale talent cultivation, the construction of civil engineering practice platforms needs to be comprehensively considered in terms of both quantity and quality. While ensuring the normal production of enterprises, strengthening the consolidation and expansion of the platform's professional technical practice functions can play a strong supporting role in extending and maintaining the platform's technical team functions.***

**Keywords:** Practice base, Graduate education, Complex engineering problems, Enterprise mentors, Civil engineering, Thinking and Exploration**.**

## 1. Introduction

With the continuous advancement of higher education reform both domestically and internationally in recent years, the innovation and reform of talent training models have become increasingly active to better align with the practical needs of national economic development. Teaching methods and training theories that are closely integrated with real-world demands are being prioritized, with many already in implementation or in need of further application within talent training programs [1-2]. Through extensive research and development over the years, the education sector has gained valuable experience in enhancing the comprehensive literacy of graduate students. For example, the construction of core training systems, the seamless integration of theory and practice, the specific execution of course teaching processes, real-time evaluation of training outcomes, and the refinement of feedback mechanisms have all been enriched and have made significant progress, providing strong guidance for graduate education reform research [3-4]. To adapt to today's rapidly evolving technological and information age, these concepts—developed during the conception, proposal, improvement, evaluation, and refinement stages of educational strategies—have undergone continuous scrutiny and long-term cyclical improvement in practical teaching applications, classroom instruction, and training models, thereby playing a crucial role in supporting the higher education system.

To enhance the quality of education for all types of master's students, higher education authorities at various levels have issued guiding suggestions and opinions on education quality reform through macro-level planning and meso-level control. Typically, these efforts focus on one or more themes, providing guidance under the constraints and maintenance of policy directives. This approach has played a crucial role in ensuring the success of teaching reform, with the specific implementation process carried out by relevant teaching units, through the organic integration of the necessity and purpose of the teaching reform. This has formed a closed-loop operational model within the higher education talent training system. As stated in a document issued by the Ministry of Education of the People's Republic of China on November 24, 2023, graduate education will, for the foreseeable future, aim to improve the quality of independent training for top-notch innovative talents and to build a high-quality graduate education system. The document further emphasizes the promotion of a graduate education classification model, thereby providing policy foundations and guidance for educational institutions at all levels, and planning distinct training systems for academic and professional degrees. The goal is to gradually achieve the development objectives for both degree types [5]. At the local level, some provinces and cities have also issued relevant documents on graduate talent training, creating the necessary macro conditions for the reform of graduate education in these regions.

Therefore, it is necessary to distinguish discipline categories in a targeted manner based on the nature of each major and then implement specific measures to strengthen and consolidate the training system for master's degrees in these fields [6-7]. For example, in science majors, the training process emphasizes the cultivation of fundamental theories, where new discoveries are achieved through theoretical deduction, calculations, and corresponding experimental analysis, leading to the development of subsequent

propositions [8]. In contrast, for master's students in civil engineering, which has a strong engineering focus, there are clear requirements for hands-on problem-solving. Students must conduct field tests and perform engineering mechanics calculations in conjunction with engineering cases during their studies to accumulate professional theoretical knowledge and engineering skills [9-10]. Based on the professional characteristics of civil engineering master's students, this paper discusses methods for cultivating high-quality graduates in this field, focusing on the construction of practical platforms and the development of innovative abilities, with the aim of providing a reference for talent training practices and exploration.

## 2. Construction of Civil Engineering Practical Platforms

In training master's degree students in civil engineering, it is essential to consider the students' actual circumstances and provide professional and technical guidance for those pursuing professional degrees. Every step of civil and hydraulic engineering construction, along with the equipment used, must be analyzed to understand the impact of each construction stage on subsequent processes. This approach ensures a seamless connection between phases, with a well-designed training plan and its effective implementation serving as prerequisites and guarantees for the construction of high-quality projects. Clearly, practical teaching plays a crucial role in the postgraduate education of civil engineering students, and the practice platform, as the vehicle for this practical teaching, is indispensable for achieving educational goals. Therefore, it is necessary and urgent to establish and develop relevant civil engineering practice platforms to cultivate master's students with innovative abilities. The construction of these platforms must be comprehensively considered in terms of both quantity and scale.

### 2.1 Seeking Suitable Platforms for Practice

Colleges and universities in different regions have unique characteristics and their educational models are influenced by the local economic and regional development. Each major evolves over time, developing distinctive training characteristics at various stages of teaching and training. To enhance the ability to solve complex engineering problems, it is crucial to demonstrate theoretical knowledge in real-world environments. In this context, practical training bases can be used as platforms for hands-on teaching, guiding students to apply their knowledge and actions in engineering settings through a clear display of the entire construction process on site. For master's degree students in civil engineering, finding a practice platform of sufficient size and scale is especially important for comprehensively improving their ability to address on-site issues and make informed judgments. The applicability of such practice platforms to the training of civil engineering master's students is illustrated in Table 1.

**Table 1:** The applicability of the practice platform to the training of master's degree students in civil engineering

| Platform Category | Technology Coverage | Training Scale | Utilization Efficiency |
|---|---|---|---|
| Large enterprise platform | It comprehensively covers most of the typical processes in civil engineering, including industrial and civil construction, road and bridge engineering, and underground space engineering, with the overall technology implemented first. | Able to accept large-scale training trainees, according to the specific situation of different project departments need to be determined according to the site, the overall acceptance capacity of the group enterprise is large. | On the enterprise platform, most types of engineering can be studied, with extensive learning opportunities in both professional knowledge and on-site management. The platform's practical functions are highly utilized. |
| Midsize enterprise platform | Some typical processes of civil engineering such as conventional industrial and civil construction projects, roads and bridges, and underground space projects shall be carried out first with a certain range. | Able to accept a certain scale of training trainees, the regular training ability is strong, according to the specific situation of different project departments need to be determined according to the site. | In the enterprise platform, you can learn common engineering type knowledge, professional knowledge and on-site management have a wide range of learning, and the utilization efficiency of the platform's practical functions has certain limitations. |
| Small business platform | It has a limited typical process with strong civil engineering majors such as industrial and civil construction engineering, roads and bridges, and underground space engineering, and has strong professionalism in individual technical fields. | The scale of accepting trainees depends on the engineering projects undertaken by the enterprise platform, and the acceptance capacity has certain limitations. | According to the situation of the project undertaken, the enterprise platform can learn the knowledge of independent engineering types with strong professionalism, and the utilization efficiency of the platform's practical functions is relatively weak. |

### 2.2 Engineering Practice and Talent Training are Compatible

In the teaching process for professional degree master's students in various fields, it is important to incorporate a proportion of practical coursework alongside theoretical knowledge. This practical content may include engineering surveying, course design, professional practice, field research, experimental testing, questionnaire surveys, engineering practice, numerical calculations, and case analysis. Such practical experiences are highly beneficial for reinforcing and absorbing the material covered in professional courses. By mastering basic concepts and theories and applying them in field operations, students can reinforce their learning through cyclical review, ensuring that professional knowledge becomes ingrained. When faced with similar problems in future engineering scenarios, they can easily retrieve this knowledge from their memory, thus creating a strong knowledge base for solving diverse engineering issues. Beyond theoretical knowledge, valuable experience is gained through practical engagement and exploration in the engineering field. As students' knowledge systems mature, they become capable of proposing practical solutions to complex engineering problems. Therefore, it is crucial to design practical training programs—such as on-site practice, engineering design, examinations, research, analysis and testing, industry research, and construction follow-up—that are tailored to the professional direction of master's degree students in civil engineering. Table 2 provides a comparison of practical training components for professional degree master's students across different fields.

**Table 2:** Comparison of the practice of master's degree students in different fields

| Areas of Expertise | Practical Requirements | Form of Presentation | Effect Analysis |
|---|---|---|---|
| Liberal Arts | Grasp the change law of a certain phenomenon, find out the influencing factor indicators, and analyze them qualitatively or quantitatively. | Questionnaires, seminars, mathematical statistics, etc. | The ability to improve the ability to explain words or the ability to compare and analyze the impact factors. |
| Science | Physical or chemical process analysis is carried out for certain quantitative and semi-quantitative factors. | Analytical calculations, experimental analysis, verification analysis, etc. | Experiments prove the consistency of a certain phenomenon or a certain principle phenomenon. |
| Engineering | Carry out engineering practice in combination with on-site conditions for engineering problems, deal with the problems that arise, and put forward reasonable solutions. | Experimental testing, engineering research, scheme design, etc. | Improved ability to solve complex engineering problems. |

## 3. Development of Postgraduate Training Resources

In the initial stage of developing postgraduate training resources, it is advisable to start with the research direction and prioritize it as a key factor. The number of trainees should be planned based on the scale and capacity of the target platform, while also considering the professional diversity it offers. The aim should be to cover as many research directions as possible, thereby demonstrating the platform's integration and enabling a broad range of students to receive systematic and continuous engineering training within the platform. Experience from the development and utilization of numerous postgraduate training resources shows that enterprise platforms with a high degree of integration are often the preferred choice for colleges and universities. It has been proven that students trained on such platforms typically exhibit higher overall literacy and a greater likelihood of taking on important roles within construction units.

### 3.1 Practical Improvement of the Quality of Postgraduate Training

In today's era of rapidly evolving educational concepts, employers' demands for talent are also advancing. The primary goal of talent training is to enhance students' comprehensive quality, enabling them to complete tasks within specified deadlines and achieve the expected goals and outcomes. As students are fully engaged in their training, the role of the practice platform becomes increasingly significant. Recent research in higher education has shown that practical training can significantly improve the quality of graduate education, particularly for civil engineering master's students. By utilizing the various equipment and facilities provided by the platform and engaging in real engineering environments, students gain personal experience with each step of the construction process. They can plan, reason, and develop solutions based on their observations and reflections. While less experienced graduates may initially face judgment errors and temporary challenges in engineering practice, these issues will diminish as they accumulate experience. Over time, continuous growth and exploration of technical skills will lead to substantial improvements in the quality of graduate training.

### 3.2 Practice the Daily Operation and Maintenance of the Platform

In the preparatory stage of applying for a practice platform, it is advisable to engage with professional construction enterprises to understand their operational mechanisms and construction processes through mutual exchanges. Given the competitiveness and diversity in today's civil construction industry, strong performance reflects an enterprise's capabilities and reputation, which often play a crucial role in securing major engineering projects. Large-scale enterprises typically exhibit significant competitiveness and technological prowess. For example, some large firms have organizational structures that include "management → operation → business → construction → research and development → quality assurance → monitoring → feedback," creating a comprehensive industrial production system. These enterprises integrate "production, learning, and research" functions throughout their operations, contributing to effective civil engineering construction and personnel training. Therefore, ensuring the smooth operation of such enterprises and enhancing the professional and technical functions of the practice platform can significantly support the development and maintenance of the platform's technical expertise.

### 3.3 Continuous Improvement of Postgraduate Training Methods

Similar to the development of functional institutions in the education sector, the construction of professional and master's degree training platforms inevitably involves various complex issues. For example, in civil engineering training, enterprises must provide students with comprehensive safety conditions. In addition to ensuring that on-site learners adhere to safety regulations, enterprises should also conduct regular or periodic safety training to mitigate the risk of accidents. To enhance the objectivity and effectiveness of on-site learning, the practice base should be staffed with a sufficient number of enterprise mentors. Under the guidance of these mentors, who possess extensive engineering knowledge, students can promptly acquire construction site knowledge, understand safety precautions and work essentials, and receive timely answers and feedback on any issues. As a training platform for professional degree master's students, the combination of on-campus and enterprise tutors enables students to gain substantial engineering knowledge over 3.0 to 3.5 years. This exposure allows them to analyze and resolve engineering problems and develop design and research skills through continuous engineering experience.

## 4. Conclusion

In the ongoing teaching reforms at colleges and universities both domestically and internationally, postgraduate training management must address multiple facets. Despite the current focus on classroom-based education, graduate education must integrate more on-site practical teaching. In the enterprise and other platforms to carry out various practical ability of the examination, so as to enhance the ability of students to solve

engineering problems. Different majors have varying standards and requirements for practical operations; therefore, educational institutions need to make informed decisions based on their specific contexts to develop effective practical training plans and programs. This approach ensures the advancement of educational procedures from start to finish, creating a complete feedback loop. By continuously refining the model and addressing negative factors, the effectiveness of both theoretical and practical education can be significantly improved.

In view of the challenges faced in the process of civil engineering degree education, this study analyzes the issues in the preparation stage and construction process of the practice platform, and points out the importance and necessity of platform construction for graduate training. To enhance platform development, it is essential to engage with relevant counterpart enterprises actively. At the end of the first year, after completing basic and professional courses, master's students should be transitioned to these enterprise platforms for specialized technical training. This approach aims to continuously improve their overall competencies. To reinforce the knowledge gained from textbooks, practical learning through these platforms should be integrated, thereby facilitating future civil engineering projects and enabling the selection of effective solutions to real-world problems.

With proper guidance from enterprise mentors, students will be able to broaden their thinking, extending a single engineering problem into a multi-faceted mechanical and microscopic issue. This approach enhances their theoretical analysis skills and advances their engineering design capabilities. Under the combined guidance of both on-campus and corporate mentors, graduate students typically apply their theoretical knowledge to analyze practical problems encountered in the field, integrate disparate knowledge points, and develop a cohesive "theory-engineering-application" system.

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## References

[1] Du Yan, Xie Mowen, Liu Yang, et al. Exploration and practice of entrepreneurship and entrepreneurship talent training mode in colleges and universities based on SEI-ET[J]. Higher Science Education, 2023(05):23-30.
[2] Tong L, Li Y, Ma L, et al. Teaching Reform and Practice of "Low Carbon Technology and Management" in the Context of Dual-Carbon[J]. Journal of Higher Education Teaching, 2024, 1(4)
[3] Wei Jinli, Zhao Yulan, Qi Xinyu, et al. Reform and practice of teaching mode of engineering graduate courses with "research" breakthrough[J]. Journal of Higher Education, 2024, 10(21):155-158.
[4] Hao Xiaoli, Sun Hongxin, Li Shouke, et al. Research and practice on the cultivation mode of innovative and application-oriented talents for graduate students of civil engineering majors in local universities[J]. Higher Architectural Education, 2024, 33(04):59-65.
[5] https://www.gov.cn/zhengce/zhengceku/202312/content_6922068.htm
[6] Wang Wenjian, Pan Keliang. The current situation, problems and suggestions of standardized discipline construction and professional talent training in colleges and universities[J]. China Standardization, 2024(12): 34-37.
[7] Cheng Guangde, Deng Xiaoyang. "Four-in-one": the practical path of cultivating engineers in science and engineering colleges with industry characteristics of "double first-class"—A case study of the team training of master of mechanical engineering in W University[J]. Journal of Hubei Second Normal University, 2024, 41(04):64-69.
[8] Wang Jingya, Zhou Tao, Li Xiangqiang. Exploration on the Innovation of Postgraduate Teaching Management Mechanism under the Background of "Double First-Class" Construction: A Case Study of School of Physical Science and Technology, Southwest Jiaotong University[J]. Heilongjiang Education (Theory and Practice), 2023(12):65-67.
[9] Zhang Yan, Cai Guojun, Zheng Tianyuan, et al. Research and practice of civil engineering postgraduate training mode based on interdisciplinary integration[J]. Journal of Higher Education, 2024, 10(10):148-151.
[10] Yao Future, Liu Yuanxue, Sun Tao, et al. Construction of innovative practice teaching platform for graduate students in civil engineering under the background of new engineering[J]. Higher Architectural Education, 2023, 32(01):31-38.