International Journal of Education and Social Development
ISSN: 3078-9931 (Print), ISSN: 3078-2287 (Online) | Vol. 5, No. 3, 2025

Research on the Reconstruction of Vocational Education Talent Cultivation Mode for Transportation Infrastructure Construction

Kunpeng Shi, Jincheng Ning

Henan College of Transportation Zhengzhou, Henan 451460, China

Abstract: With the rapid development of transportation infrastructure construction, the cultivation of talents in civil engineering and transportation-related majors is facing new opportunities and challenges. Currently, vocational education is disconnected in aspects such as curriculum design, teaching methods, and industry-education integration, making it difficult to meet the industry's demand for high-quality, highly skilled personnel. Therefore, it is essential to reconstruct the talent cultivation mode for civil engineering and transportation majors, starting from industry needs. This includes precisely setting talent cultivation goals, optimizing the curriculum system, strengthening practical teaching, fostering innovation ability, and establishing a diverse digital evaluation and feedback system. This approach will promote deeper school-enterprise cooperation, strengthen cross-disciplinary capabilities, and focus on technical application, effectively improving the overall quality and industry adaptability of talent, ensuring that the education system is highly aligned with industry development, and training high-quality talents that meet the needs of transportation infrastructure construction.

Keywords: Vocational Education; Transportation Infrastructure Construction; Talent Cultivation Mode; Industry-Education Integration.

1. Introduction

Driven by policies such as the outline for the construction of a transportation power and the outline for the construction of an educational power (2024-2035), and guided by the policy objectives of the new "transportation strong province" and "four high and four first", the field of transportation civil engineering has become an important pillar of economic growth in many countries [1-2]. This trend requires vocational education to cultivate a large number of high-quality and highly skilled talents to meet the needs of the industry. At present, the talent training of transportation civil engineering is facing unprecedented opportunities and challenges, especially in how to precisely meet the industrial demand and improve the quality of education, there are still significant structural problems [3]. Therefore, how to reconstruct the vocational education talent training mode for transportation infrastructure construction through systematic reform has become the core issue of vocational education.

2. Formulating Talent Cultivation Goals to Match Supply and Demand

At present, the cultivation goals of civil transportation engineering are still overly reliant on traditional civil engineering techniques and lack attention to emerging fields such as intelligent transportation and BIM technology. The curriculum tends to emphasize basic theory and neglects the cultivation of technical applications and innovation capabilities [4]. As a result, students master basic theories but are significantly lacking in practical operation and problem-solving skills, making it difficult for them to quickly adapt to technological changes in the industry. The existing vocational education system is poorly aligned with enterprise needs. While some schools have tried to collaborate with enterprises, the depth and breadth of such collaborations are limited, and the course content is still theory-heavy, lacking in practical applications and failing to incorporate technologies from fields such as intelligent transportation and green building, causing students to fall behind the industry's development pace.

To address these issues, vocational education should start from industry needs, accurately identifying the talent requirements of the sector. The rapid development of transportation infrastructure construction not only requires traditional civil engineering skills but also demands talents with innovation capabilities, a cross-disciplinary knowledge system, and the ability to adapt to changes. Vocational education should conduct industry research to clarify the direction of talent cultivation, ensuring that the educational content meets current industry needs and trains talents for future technological development and industry upgrading.

Talent cultivation goals should focus on "application" and "practicality," emphasizing the development of students' practical operation and innovation abilities. Currently, many students in civil engineering and transportation-related majors need extensive post-graduation training to adapt to the practical demands of enterprises [5-6]. This indicates that vocational education overly focuses on academic theory while neglecting the development of practical skills. Therefore, schools should collaborate deeply with enterprises to jointly develop project-based courses based on real engineering projects, allowing students to engage with actual engineering cases and solve real problems, thereby improving their practical and innovative capabilities.

At the same time, the formulation of talent cultivation goals should also emphasize the cultivation of students' cross-disciplinary capabilities. Modern transportation infrastructure construction involves a wide range of rapidly changing technological fields, and students must have strong cross-disciplinary knowledge and innovation abilities to address increasingly complex engineering projects and technological

challenges. Therefore, the talent cultivation goals of vocational education should not only focus on professional skills but also strengthen students' ability to integrate knowledge across disciplines and improve their overall quality. Students should possess systemic thinking and the ability to adapt flexibly to problems, allowing them to function effectively in different technological domains.

Clearly, vocational education should adopt an "industry-driven, industry-guided, enterprise-based, employment-oriented, vocational alignment" cross-sector collaborative mechanism to ensure that talent cultivation goals are accurately aligned with industry needs. Through deep cooperation between industry, schools, and enterprises, vocational education can cultivate high-quality skilled talents that meet market demands and promote the continuous development of transportation infrastructure construction.

3. Constructing a Reasonable Industry-Education Integrated Curriculum System

With the rapid development of transportation infrastructure construction technologies, the existing vocational education curriculum system faces significant challenges. Many schools continue to rely on traditional teaching modes, overly focusing on theoretical knowledge and neglecting the cultivation of practical skills and innovation capabilities. Although courses cover basic engineering knowledge, they fail to reflect the industry's demand for new technologies in a timely manner, leaving graduates unprepared to effectively adapt to technological developments and practical demands in enterprises [7].

To solve this problem, industry-education integration becomes the key to reforming the curriculum system. School-enterprise cooperation is central to achieving this integration. By collaborating with enterprises, schools can directly obtain the latest technological requirements and development trends from the industry, bringing real-world problems into the classroom, designing project-based courses, and helping students enhance their practical abilities, innovative thinking, and teamwork skills by solving real engineering problems. This method not only helps students gain theoretical knowledge but also strengthens their ability to solve practical problems.

The curriculum system should adopt a modular design, effectively distinguishing between basic courses, core courses, and elective courses to ensure that students gradually enhance their professional abilities at different stages [8]. The basic module includes courses like engineering mechanics and fundamentals of civil engineering, helping students build a solid academic foundation; the core module focuses on transportation civil engineering courses such as road design and bridge structures, cultivating students' professional capabilities; the elective module provides more options based on students' interests and market demand, covering emerging fields such as intelligent transportation and BIM applications, broadening students' perspectives and enhancing their cross-disciplinary abilities.

Additionally, the updating of course content is crucial. As transportation infrastructure construction technologies evolve, the curriculum system must keep pace with these changes [9-10]. To ensure timely updates, schools should strengthen their cooperation with enterprises and industry associations, keep track of industry dynamics and technological progress, and regularly update the curriculum to ensure that students learn content that meets industry standards and technological specifications. Especially with the widespread application of BIM technology in transportation projects, educational institutions should incorporate it into the curriculum and collaborate with enterprises to develop specific BIM application courses to help students master this cutting-edge technology.

Moreover, optimizing the curriculum structure is equally important. The curriculum system should follow the design principles of "shared foundation, separate core, elective expansion, and progressive ability," ensuring that students gradually enhance their professional skills and innovative abilities at each stage. Shared foundational courses include general courses and interdisciplinary courses, helping students master general knowledge; separate core courses, such as road and bridge design, focus on transportation civil engineering skills; elective expansion courses offer more choices, encouraging students to delve deeper into emerging fields like intelligent transportation and green building, enhancing their cross-disciplinary abilities. This design ensures that students not only acquire solid foundational knowledge but also receive comprehensive enhancement in professional skills and innovative abilities.

Schools should invest more in practical teaching, constructing better laboratories and training bases to ensure that students can practice in real working environments. Collaborations with enterprises will provide students with more internship and training opportunities, allowing them to enhance their skills through practice, better understand industry demands, and improve their professional literacy and employability. Through such school-enterprise cooperation, students can smoothly transition from theory to practice, from school to enterprise.

In conclusion, constructing a reasonable industry-education integrated curriculum system helps cultivate high-quality skilled talents and promotes the development of the transportation civil engineering industry. By working closely with enterprises and combining industry needs and technological advancements, schools can train professionals who meet industry standards, providing strong support for transportation infrastructure construction and fostering continuous innovation and progress in the industry.

4. Strengthening a Student-Centered Teaching Mode

With the rapid development of technology and standards in the field of transportation and civil engineering, the traditional teaching mode mainly focuses on the teaching of theoretical knowledge, ignoring students ' practical ability and innovative thinking [11]. The construction of modern transportation infrastructure puts forward higher requirements for the comprehensive ability of talents, especially in construction management, quality control and intelligent operation. Therefore, strengthening the " student-centered " teaching mode has become the key to improving the quality of talent training.

The ' student-centered ' teaching mode emphasizes that students are the main body of learning, while teachers are turned into guides and supporters. This model focuses on the improvement of students ' needs, interests and abilities, and revolves the teaching design around students. First of all, the basic stage should pay attention to the cultivation of students

' professional cognition, help students understand the basic knowledge and technical framework of transportation and civil engineering, and lay the foundation for subsequent skills training. However, theoretical knowledge alone is far from meeting the needs, and students must strengthen special skills training. Teachers should pay attention to the combination of practice and skills, and help students accumulate experience in solving practical problems by simulating actual engineering scenarios. The strengthening of practical teaching is also very important. The training of traffic civil engineering professionals depends not only on classroom learning, but also on practical operation and project management experience. Practical teaching should go beyond classroom experiments, through cooperation with enterprises, with the help of real engineering projects for teaching. Students apply the knowledge they have learned to operate and solve problems in the actual project of the enterprise, so as to improve their comprehensive ability and innovation ability. Jointly carrying out practical teaching with enterprises can enable students to fully understand project construction, quality control, cost management and other aspects, and cultivate the whole process ability from project planning to construction, management and operation.

Enterprise internship is an important part of realizing the " student-centered " teaching mode. Through enterprise internship, students can go deep into the industry, directly participate in the actual work, and improve their professional ability in the real working environment. This process not only helps students to enhance their professional skills, but also enables them to better adapt to the requirements of the industry and master the standards and processes in practical work. Close cooperation with enterprises can also help schools understand industry needs and technology applications in a timely manner to ensure that teaching content and curriculum settings are synchronized with industry development.

In order to realize this teaching mode, it is necessary to build a clear practice chain in the teaching system to ensure that each teaching link is conducive to the improvement of students ' ability. From professional cognition to special training, to professional practice and enterprise practice, each stage should pay attention to the gradual progress of ability. Through scientific design of courses and practical arrangements, students can enhance their professional ability, operational skills, innovation ability and comprehensive problem-solving ability at each stage, and ultimately become highly skilled talents who can independently undertake projects in the field of transportation infrastructure construction.

This student-centered teaching mode not only pays attention to students ' knowledge learning, but also pays attention to the cultivation of comprehensive quality. Students not only need to master traditional civil engineering technology, but also must have the ability to adapt to future industry changes. Therefore, the teaching mode should cultivate students ' innovative thinking and teamwork ability. Through project-based learning and problem-oriented teaching, students can better cope with the variability and complexity of future work. In addition, the leadership ability, communication ability and teamwork ability cultivated in practice can help students play an active role in the team and promote the smooth implementation of the project.

In a word, strengthening the student-centered teaching mode can improve the professional ability, practical ability and innovative spirit of students majoring in transportation and civil engineering. This teaching mode helps students better transition from theoretical learning to practical operation and comprehensively enhance their competitiveness in future positions by optimizing the teaching system of ' professional cognition, special training, professional practice and enterprise practice '. In the end, this model will provide a large number of compound talents with both solid foundation and high skills in the field of transportation infrastructure construction, and promote industry development and technological innovation.

5. Constructing a Diverse Digital Evaluation and Feedback System

In modern vocational education, establishing a diverse digital evaluation and feedback system is an important means of enhancing education quality and optimizing talent cultivation. Traditional assessment systems no longer meet the industry's demand for highly skilled talents. By integrating teaching, student, industry, and graduate feedback into a digital platform, schools can accurately monitor the talent cultivation process and optimize education content to better align with industry needs [12].

First, the establishment of a teacher-student growth database is the basis for building a digital evaluation feedback system. The database records students ' academic performance, professional ability, practical experience and other data, helping schools to grasp students ' learning progress in real time and optimize personalized teaching. Teachers ' teaching effect, industry docking and scientific research results should also be included in the database to support schools to dynamically adjust teaching objectives, methods and course content.

In addition to the teacher-student growth database, the digital platform can also generate teacher-student ' portraits ' to provide support for precision teaching. Students ' portrait is not only a simple record of grades, but also a comprehensive assessment of students ' learning style, innovation ability, problem solving ability and professional quality. Through the integrated analysis of the data platform, this process helps teachers to understand students ' learning situation more clearly, optimize teaching strategies and improve the effect of classroom interaction. Teacher portraits can help schools identify teachers ' professional advantages and shortcomings, and timely adjust teachers ' training directions and teaching methods, so as to promote teachers ' continuous progress and development.

The core of building a multivariate digital evaluation system is also to introduce evaluation elements from industries, enterprises and governments. First of all, industrial contribution is an important evaluation index, which mainly measures the influence of schools in the industry and their role in promoting industrial development. By tracking the performance of graduates in practical work and understanding their contributions to project implementation, technological innovation and management optimization, schools can evaluate the actual effect of their own education quality and talent training. Secondly, the quality of employment is a direct reflection of the evaluation of educational achievements. By analyzing the employment rate of graduates, the matching degree of jobs and the salary level, the school can evaluate whether the education meets the market demand and whether the employability of graduates meets the industry standards.

In addition, the evaluation index of student development focuses on the career development and promotion of graduates, and whether they can achieve sustainable growth in the workplace. Through the feedback of this dimension, schools can understand the long-term benefits of talent training and provide a basis for future curriculum reform and teaching content renewal.

In order to realize the deep integration of education and industrial needs, schools also need to establish a tracking and feedback mechanism for graduates ' career development. This mechanism can help schools understand the career trajectory, job performance and skill improvement of graduates in real time. These data can not only help schools optimize the curriculum, but also provide more real employment needs information for the industry and enterprises. Through cooperation with enterprises, schools can obtain more accurate industry feedback and understand the latest needs of the industry for talents, so as to adjust the training program and make talent training more in line with the development trend of the industry.

In addition to the multi-dimensional design of the evaluation system, the construction of the teaching quality assurance system is also crucial. In order to ensure the teaching effect, the school should strengthen the construction of " double-qualified " teachers to ensure that teachers not only have solid theoretical knowledge, but also have rich industry practical experience. Through the data platform, the school can monitor the teaching quality of teachers in real time, evaluate their teaching methods and practical ability, and provide necessary training and guidance. In addition, schools should promote the diagnosis and improvement of teaching work and implement the closed-loop mechanism of ' monitoring-evaluation-improvement '. Through regular teaching evaluation and classroom feedback, schools can identify deficiencies in teaching, make timely adjustments and improvements, and ensure the continuous improvement of education quality.

Finally, through this multiple digital evaluation feedback system, the school can accurately adjust the educational objectives and contents and improve the teaching quality under the dynamic industrial demand. Through the comprehensive data collection and analysis of students, teachers and industries, schools can identify problems in education in real time and adjust them in time. The introduction of digital platform makes education more accurate and personalized, and the learning results of teachers and students can be evaluated and fed back more comprehensively, so as to promote the continuous updating and optimization of teaching content.

6. Conclusion

The talent training mode of transportation and civil engineering specialty needs to be reconstructed urgently, so as to accurately meet the needs of the industry, optimize the training objectives, construct the curriculum system of integration of production and education, and strengthen the cultivation of practical teaching and innovation ability. These reforms will ensure the synchronization of education content and industry technology by deepening school-enterprise cooperation, and cultivate high-quality and compound skilled talents. With the continuous iteration of industry technology, the talent training model must remain flexible and forward-looking, and continue to pay attention to changes in industry needs and technological updates. Only through continuous innovation and reform, vocational education can ensure a high degree of fit with industrial needs, provide a steady stream of technical support and high-quality talents for transportation infrastructure construction, and lay a solid foundation for the sustainable development and technological innovation of the industry.

Acknowledgement

This work was financially supported by the 2025 Henan Provincial Federation of Social Sciences Research Project(SKL—2025-1160).

References

[1] Chen Yingshu, Liu Bingxue. The Value Implication, Provincial Practice, and Optimization Path of the Training of Long-Term System Talents in Vocational Education [J]. Chinese Vocational and Technical Education, 2025, (11): 32-41.

[2] Huai Fule, Fu Zhaobo. High-quality Development of Vocational Education Enhancing the Construction of A Powerful Education Country: Logic, Problems and Paths [J]. Vocational and Technical Education, 2025, 46(16): 14-20.

[3] Gao Ming, Lian Xin, Zhang Decheng. Challenges and Prospects: Liaoning's Practice in Constructing a Provincial Modern Vocational Education System [J]. Journal of Shenyang Normal University Educational Science Edition, 2025, 4(04): 37-44.

[4] Wu Zhaohui, Wu Xiaobo, Wang Liang. Prospect of Development Trend of Smart Transportation under the Background of Building China into a Country with Strong Transportation Network [J]. Transport Research, 2019, 5(04): 26-36.

[5] Zhao Jingjing. Research on accelerating the deep integration development of industry, university and research in Henan [J]. Journal of Jiaozuo Normal College, 2025, 41(03): 39-42+76.

[6] Liu Yongliang, Li Wanting.Research on the Structural Imbalance between the Demand for Ecological Health Talents and the Supply of Vocational Education and the Collaborative Path—Based on the Practical Investigation in Southern Shaanxi Province [J/OL]. Journal of Chengdu Aeronautic Polytechnic, 2025, 1-6.

[7] Li Xuyang, Qiu Dongfang, Wang Lin, Cheng Xinfeng, Ma Yuan, Zhang Lin. Exploring the collaborative education mechanism of modern industrial colleges from the perspective of industry-education integration [J]. Journal of Nanyang Normal University, 2025, 24(03): 103-108.

[8] He Lijuan. Research on the reform of the "five-education integration" curriculum system in application-oriented universities under the background of digital education [J/OL]. Journal of Hezhou University, 2025, 1-9.

[9] Zhu Dequan, Gao Chan. What Kind of Vocational Education Evaluation Reform is Needed in the New Era? [J]. Journal of Shenzhen Polytechnic, 2025, 24 (06): 3-14.

[10] Ma Liangjun, Guo Feng, Liu Shujing, Sun Guangming, Wu Likun. Orientation, Challenges and Paths of Apprenticeship with Chinese Characteristics under the Background of Building a Powerful Education Country [J]. Vocational and Technical Education, 2025, 46(27): 39-46.

[11] Li Jianguo, Wu Xueming, Dai Wei, Yang Bingqing. Review of the 14th Five-Year Plan and Outlook for the 15th Five-Year Plan in Undergraduate Vocational Education [J]. Journal of Vocational Education, 2025, 41(11): 47-58.

[12] Zu Ting, Huang Fei, Pan Hongzhi. Research on the Optimization of the Ability Training Mode for Technical and Skilled Talents in Vocational Colleges from the Perspective of

New Quality Productive Forces [J]. Vocational Technology, 2025, 24(11):80-86.