

Theory and Practice of Cultivation for Master of Transportation Engineering under New-Old Kinetic Energy Conversion

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Abstract. To meet the requirements of transportation industry under the transformation of new-old kinetic energy (replacing old growth drivers with new ones), through reforming the existing curriculum system, engineering practice and quality assurance system (“Three Reforms”), a curriculum system aimed at the transportation industry requirements, a practice system oriented by improving engineering capability and a quality assurance system with the training of applied talents as the main line (“Three Systems”) will be established. It can be anticipated to solve the problems of insufficient knowledge ability, insufficient engineering practice ability and insufficient application-oriented characteristics (“Three Deficiencies”) for improving the training quality of Master of Transportation Engineering and providing talent support for the healthy and rapid development of transportation industry.

Introduction

Transportation engineering includes railway transportation, highway transportation, waterway transportation, air transportation, and pipeline transportation, which covers the main modes of transportation in modern society. Transportation, as the foundation and pioneer of social and economic development, has always been the focus, and “Transportation First” has become the consensus. With the rapid growth of China’s economy and the construction of comprehensive transportation system, a good opportunity has been provided for talent cultivation in the field of transportation engineering. In the general plan and implementation plan of the major project of new and old kinetic energy conversion in Shandong Province, it is emphasized that the support of new and old kinetic energy conversion should be strengthened, the infrastructure network of intelligent safety should be improved, the construction of transportation infrastructure such as roads, railways, aviation and ports should be coordinated, and the integration of transportation and logistics should be promoted. Transportation as one of the three major supporting guarantees focuses on the emerging transport infrastructure with intelligent, energy-saving, safe, and green characteristics. It can be said that transportation will play an important role during the new and old kinetic energy conversion [1].

Transportation industry is in a critical period of transformation and upgrading, and higher requirements have been put forward for the transformation of old and new kinetic energy. It is of great significance that actively serving the needs of the transportation industry and training high-level application-oriented talents such as composite and applied master of transportation engineering for improving the overall quality of high-level application-oriented talents in the transportation industry and consolidating the new support for the transformation of old and new kinetic energy. Talent cultivation for transportation industry, especially high-level talent cultivation such as Master of Transportation Engineering, has become an urgent task. The field of transportation engineering aims at the talent cultivation of applied, compound, high-level engineering and management talents with solid foundation, comprehensive quality, strong engineering application ability and certain innovation ability. With the rapid development of engineering degree postgraduate education in China, the number of universities cultivating Master of Engineering is increasing. As an application-oriented

engineering field with distinct characteristics, the Master of Transportation Engineering still exist some the problems such as insufficient knowledge ability, insufficient engineering practice ability and insufficient application-oriented characteristics (“Three Deficiencies”), which need to be solved urgently. Therefore, in order to meet the requirements of the new-old kinetic energy conversion and strengthen the supporting role of transportation, the training of Master of Transportation Engineering should adapt the trend with reform and innovation.

Current State of Cultivation of Master of Transportation Engineering

With the rapid development of engineering degree postgraduate education, the training of Master of Transportation Engineering has entered the fast lane and has provided strong talents and intellectual support for the development of transportation. The training management systems including the administrative management system and academic management system are gradually improved, and the classified training mode has been formed. The quality of students is gradually improved, the enthusiasm of candidates is obviously enhanced, and the social recognition is higher. The training program is reasonably formulated following the training directions, the curriculum has a clear professional and technical orientation, and the topic of the paper is directly derived from production practice or clarification. The actual engineering background ensures the implementation of engineering practice through the “Double Tutorial System”. These measurements have effectively guaranteed the training quality of Master of Transportation Engineering and have achieved remarkable results.

Exploring a new full-time Master of Transportation Engineering training system is one of the main tasks in the field of Transportation Engineering in the future. Innovating and diversifying the training mode of transportation talents are included. Taking the practical application of transportation as the orientation, taking the vocational demand of transportation as the goal, taking the improvement of comprehensive quality and applied knowledge ability as the core are the main strategies for cultivating applied and compound high-level talents. It is necessary to explore a new mode of selecting supervisors and double selection between supervisors and students and to establish a vocational and technical certification system for transportation engineering. Focusing on the core technical engineering practical ability for transportation engineering, curriculum system should be optimized, and the assessment methods of engineering practice should be diversified. The management system can be reformed, exploring the standard system of training master of transportation engineering, establishing the linkage mechanism of enrollment, training and employment, exploring the new model of award system and education management. The management of practical teaching can be explored, keeping the co-win operation mechanism between students and universities [2].

On the other hand, “Three Deficiencies” including knowledge ability, engineering practice ability, and application characteristics are still the “bottle-necks” that restrict the quality of Master of Transportation Engineering training. We should further analyze the reasons and solve as soon as possible.

Practice and Exploration for Talent Cultivation of Master of Transportation Engineering

In view of the “Three Deficiencies” including loss of knowledge ability, engineering practice ability and application-oriented characteristics for Master of Transportation Engineering and its solutions, domestic experts have also made useful exploration and practice.

For knowledge system and curriculum system, Shuai et al. proposed that the training of engineering master should establish a multi-disciplinary and multi-field knowledge system according to the comprehensive and application characteristics of transportation engineering and the integration of natural science and social science [3]. Zhao et al. analyzed the urgency of optimizing the curriculum system of full-time Master of engineering, and proposed to build a curriculum system in line with

social needs [4]. Huang et al. believed that engineering practice is an important phase in the cultivation of postgraduates majoring in transportation engineering. The cultivation of engineering ability should strengthen the cultivation of engineering practice ability, and innovation ability and leadership ability [5]. Zhou started with four characteristics of full-time engineering master's practical teaching including personal experience, knowledge construction, integration of knowledge system and pragmatism of teaching content, and pointed out the main problems of current practice: insufficient understanding of purpose and essence, inadequate understanding of function, unsatisfactory construction of teaching staff and lack of systematization, then put forward some suggestions as follows: constructing practical teaching system with engineering practice characteristics, optimizing practical content, expanding practical channels, perfecting supervisory system of tutors, innovating evaluation means and improving evaluation effectiveness, etc. [6]. Zhang believed that the quality of training is the core of Engineering Master and the quality assurance system of the whole process from candidates source, teaching, management to tracking should be established [7]. Zhang [8], Du [2], and Liu [9] analyzed and considered how to improve the training quality of Master of Transportation Engineering under combination with the construction of engineering education certification, training system and quality assurance system. Ma [10] and Sun [11] respectively studied the cultivation of master of engineering from the perspective of innovation-driven development and collaborative mechanism construction. Based on the analysis of the social and economic development of Yunnan Province in China, Chen et al. put forward the optimization countermeasures for improving the training quality of postgraduates majoring in transportation engineering, and pointed out the influence of curriculum design, interdisciplinary education, quality assessment, practice assessment, incentive system and government support on the training quality [12].

Strategies and Goals of Cultivation of Master of Transportation Engineering

Focusing on the requirement of new and old kinetic energy conversion, serving the transportation industry and regional development is the fundamental follow of personnel training in the field of Transportation Engineering in Shandong Province. The general idea for the transformation of new and old kinetic energy in Shandong is to build a comprehensive transportation system and implement the “Five Major Projects” of channel construction and upgrading, wisdom leading, industrial integration, green upgrading and service upgrading. Through five to ten years’ efforts, a high-quality transportation infrastructure network, a high-level intelligent transportation network and a high-efficiency transportation service network will be built, promoting Shandong from a major transportation province to a strong transportation province. It mainly includes: speeding up the improvement and upgrading of Expressway network, strengthening the upgrading and transformation of ordinary highway, developing modern port and shipping, building comprehensive transport hub, and actively providing traffic support for “Three-core Leading” and “Multi-point Breakthrough”. According to this idea, the training of Master of Transportation Engineering should focus on the “Five Major Projects”, focusing on solving the problems of Master of Transportation Engineering's lack of knowledge ability, engineering practice ability and application-oriented characteristics, focusing on improving the quality of training, providing high-level application-oriented talents for the development of the transportation industry, and consolidating the basic support for the transformation of new and old kinetic energy.

Following the basic thought of discovering-analyzing-solving problems, we focus on the reform and innovation of training mode of Master of Transportation Engineering under the transformation of new and old kinetic energy. According to the new requirements of transportation industry for training master of transportation engineering under the transformation of new and old kinetic energy, the shortcomings of existing training methods are found mainly in the aspects of knowledge ability, engineering practice ability and application-oriented characteristics.

Problems and Causes

The insufficiency of knowledge ability is mainly manifested in the narrow scope of knowledge, unreasonable structure, convergence of curriculum system, insufficient emphasis on specialized basic courses, and difficulty in meeting the knowledge needs of high-level talents in the comprehensive transportation system. The insufficiency of engineering practice ability is mainly due to insufficient understanding, unsatisfactory team building, lack of systematicness, lack of opportunities for actual combat and project participation, and lack of Engineering practice. The time and content can not meet the requirements; the lack of application-oriented characteristics is reflected in the difficulty of ensuring the quality of training, poor industry adaptability, difficult to quickly enter the role and so on.

Ideas and Objectives

The general idea is to establish the “Three Systems” and solve the “Three Deficiencies” by reforming the existing curriculum system, engineering practice and quality assurance system (“three reforms”).

The reform of curriculum system should meet the needs of the transportation industry for the transformation of new and old kinetic energy, take the transformation of new and old kinetic energy into a breakthrough, take the demand of transportation industry for the knowledge and ability structure of high-level talents as a guide, further clarify the training direction of Master of Transportation Engineering, adjust the curriculum structure, attach importance to the construction of professional basic courses, and highlight new transportation technologies. The application and transformation will promote the curriculum reform, encourage the diversification of teaching methods, encourage multimedia and on-site teaching, school-enterprise interaction, promote the standardization of curriculum system, and reflect the dynamic adaptability with the transportation industry. By reforming the curriculum system, we can truly meet the needs of the transportation industry and fundamentally solve the problem of insufficient knowledge and ability.

The reform of engineering practice should be guided by the basic requirements of the transportation industry for the engineering practice ability of high-level talents, further clarify and optimize the basic content of the practical ability of master of transportation engineering, expand the engineering practice channels, strengthen the construction of tutors both inside and outside the school, and grasp the engineering practice from the basic point of view, and integrate them. We should emphasize the combination of theory and practice, the combination of inside and outside classroom, and prevent formalization and excessive practice.

The reform of quality assurance system should aim at the application characteristics of Master of Transportation Engineering training. It is clear that the orientation of talent training is to solve more complex practical engineering problems as the main task. It is different from the professional and technical personnel above the doctoral level and below the undergraduate level. Knowledge, quality and ability should meet the basic requirements of Master of Transportation Engineering. Highlighting the project as the basis, through the experience in the project and in the construction process, training talents should truly reflect the application-oriented personnel training characteristics.

Summary

Actively adapting the needs of the transportation industry under the condition of new and old kinetic energy conversion, a curriculum system aimed at serving the needs of the transportation industry, a practice system oriented by improving engineering capabilities and a quality assurance system centered on the training of applied talents (“Three Systems”) are proposed to established by reform and innovation. It will be anticipated to solve the problems such as lack of knowledge, engineering practice ability and application-oriented characteristics (“Three Deficiencies”) for Master of Transportation Engineering. We believe that these measurements will bring about significant results, including really serving the needs of transportation industry, upgrading engineering capabilities (innovation and leadership), reflecting the application-oriented personnel training characteristics.

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