Research on Cultivating Applied Talents in Rail Transit Vehicle Engineering under the Background of New Engineering Education

Jue Xie[1 a], Xiaoyan Luo[2b], Bo Yang[1*]

[1] Southwest Jiaotong University Hope College, Chengdu, Sichuan, China
[2] Sichuan Vocational college of Art, Chengdu, Sichuan, China

[a] 7972773@qq.com; [b] 535317517@qq.com; *349227399@qq.com

Abstract. China has now built the world's largest higher education system, of which engineering education accounts for one third, providing a necessary and powerful support for China's industrial modernization. However, the new industrial revolution is accelerating, and the construction of new engineering education is also imperative. Therefore, the training of applied engineering talents who are positioned to serve the development of local economy and industry and engage in front-line production or service activities ushered in new opportunities and faced with new challenges. Taking vehicle engineering (rail transit) as an example, on the basis of deconstructing the connotation of new engineering construction, starting from the goal of application-oriented talent training, the implementation path and specific practices of talent training are proposed from the aspects of training program, curriculum system, teaching method, evaluation mechanism and education mode, and corresponding safeguard measures are proposed from the levels of school, society and government.

Keywords: new engineering education; application-oriented; talent cultivation; vehicle engineering

1 Introduction

At present, emerging technologies such as big data, virtual reality, and artificial intelligence are constantly breaking through, and related industries are experiencing explosive growth, forming an unprecedented huge impact on the progress of the world economy and society. Against the background of accelerating the global technological revolution and constantly reshaping the economic pattern, China has proposed a series of major strategies, such as "the Belt and Road Initiative", "Made in China 2025", "Internet+", to drive the transformation and upgrading of industrial structure and the transformation of new and old economic drivers. In order to actively respond to the new round of technological innovation and industrial revolution, align with major national strategic needs, and support service innovation driven development, the Ministry of

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Education actively promotes the construction of new engineering disciplines. The comprehensive launch of the construction of new engineering disciplines is an important measure for China's higher engineering education to actively layout the engineering and technical talents needed for future strategies in the face of profound changes in the international environment, national demand, and resource conditions.

Under the background of new engineering, the demand for talents in modern society has shown a trend of diversification. Research talents, such as scientists and researchers in various fields, are needed to explore scientific principles and discover objective laws. It also needs applied talents who apply scientific principles and objective laws to transform the world and create value for human society, such as field engineers from all walks of life, front-line teachers, clinicians, etc.With the rapid development of our country's rail transit industry, vehicle engineering majors in some colleges and universities continue to send a large number of applied talents to related enterprises and institutions, which plays an important role in the development of local economy and society. However, in the process of talent training in recent years, there are still problems such as dilution of industry characteristics, inaccurate talent positioning, obsolete professional curriculum system, single education and teaching model, and lack of training quality evaluation mechanism. Therefore, local applied universities should take the new engineering construction as an opportunity, take the new industrial model and the new economic form as a guide to the demand for engineering talents, and constantly deepen the reform of engineering education, explore the practice of engineering education, so as to perfectly match the training of applied talents of vehicle engineering major with the social demand.

2 The essential connotation of the construction of new engineering education

Since February 2017, the Ministry of Education has actively promoted the construction of new engineering. Scholars have carried out theoretical research and practical exploration of new engineering construction from the aspects of concept, characteristics, essence, connotation and framework. Wu Aihua (2017) pointed out that the new engineering discipline is a dynamic concept and proposed a construction framework of "new concepts" in engineering education, "new structures" in disciplines and majors, "new models" in talent cultivation, "new quality" in international competition, and "new systems" with Chinese characteristics[1]. Ye Min (2018) believed that the " new " of new engineering lies in the understanding and response to the new model of future business forms, and proposed to integrate the CDIO international engineering education concept into China 's new engineering construction[2]. Sun Yinghao (2019) concluded in practice that the characteristics of the new engineering concept are to take the industrial demand as the orientation, take the interdisciplinary integration as the starting point, take the initiative to layout for the future, and cultivate new talents with comprehensive quality, outstanding innovation ability, and can adapt to the needs of The Times[3]. Zheng Qinghua (2020) discussed the necessity of constructing new engineering disciplines from the perspective of the development of higher engineering education

connotation, and pointed out that the construction of new engineering disciplines includes three levels of connotation: creating new majors, crossing existing majors, and upgrading traditional majors[4].

Combined with the existing research and the current development, it can be considered that the new engineering is essentially a new type of engineering education, and it is a new requirement for the training of new engineering and technical talents in the new era.Specifically, the construction of new engineering disciplines is based on the background of the new economy and new formats, with the development needs of new industries as the direction and the application achievements of new technologies as the driving force. It establishes new concepts in engineering education, sets up new professional structures and curriculum systems through cross integration or transformation and upgrading, adopts modern education and teaching models, optimizes evaluation mechanisms to promote new quality, and constructs an open and shared collaborative education system, Ultimately cultivate new talents that meet the needs of the new era society.

3 The training objectives of applied talents

With the formation of the popularization pattern of higher education in China, the personalization and diversification of talent cultivation in China are increasingly valued. The cultivation of applied talents positioned to serve the development of local economic industries and engage in frontline production or service activities has gradually extended from vocational colleges to undergraduate levels, forming a relatively complete talent cultivation system, which has also sparked a research boom in academia. Shi Jinfei (2020) proposed that applied talents have four major characteristics: specialized education, comprehensive quality, standardized activities, and standardized practices. The cultivation of applied talents is positioned as professional talents needed by the market, and the corresponding teaching mode should also adopt a practical oriented approach centered on the work process rather than a theoretical oriented approach[5]. Cui Yan (2022) believes that applied undergraduate programs need great innovation under the background of the new engineering era, and puts forward new measures to solve the problems of inaccurate positioning and backward concept in the current talent training[6]. Zhang Jun (2023) repositioned the training objectives of applied finance and accounting talents in the intelligent era by investigating the talent needs of 300 enterprises, and built a new model of talent training from the aspects of curriculum system setting, teacher training, talent evaluation system, etc[7]. Xu Liqin (2023) analyzed the characteristics of applied undergraduate talents and believed that the differences between applied undergraduate talents, academic undergraduate talents, and vocational college talents are mainly reflected in three aspects: training objectives, training specifications, and teaching systems[8].

The above research indicates that establishing training objectives is crucial in the cultivation system of applied talents, and the formulation of training objectives should be based on talent demand analysis. There are structured differences in the quality standards for applied talents among different industries and positions, but their essence

is to define talent characteristics from aspects such as knowledge, ability, and quality. This article takes the Vehicle Engineering (Rail Transit) major as an example to analyze the training objectives of applied talents, as shown in Figure 1.

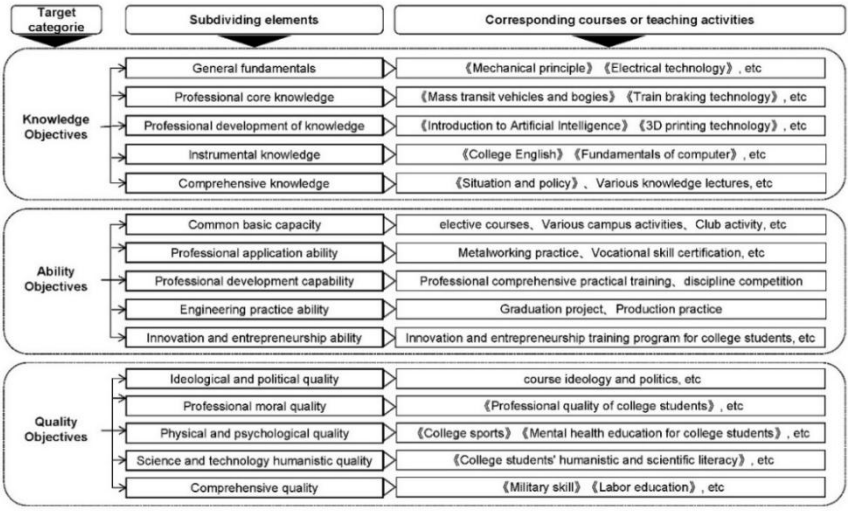

Fig. 1. Training Objective Matrix for Applied Talents in Vehicle Engineering

4 The Implementation Path of Cultivating Applied Talents in Vehicle Engineering under the Background of New Engineering Education

4.1 New concept: Take the industry demand as the guidance, formulate the talent training program

Under the background of new engineering, the formulation of application-oriented talents training program for vehicle engineering should be guided by the needs of rail transit industry and based on the development of local economy and society. The training goal should be oriented towards the future of the rail transit industry, so that students can become application-oriented engineering and technical talents with rich professional knowledge and solid professional skills, innovative thinking and professional ethics, and can adapt to the requirements of the information age[9]. Therefore, under the background of new engineering, combined with the training goal of application-oriented talents in vehicle engineering, the top-level design of talent training program can be carried out with reference to the CDIO education concept. CDIO (Conceive-Design-Implement-Operate) is an internationally recognized engineering education concept, which takes the whole life cycle of product system from development to operation as the carrier. Through systematic engineering training, students are trained in professional basic knowledge, personal ability, teamwork and communication ability, professional quality and attitude, so that students can have the comprehensive ability to

conceive, design, implement and operate products in the enterprise and social environment.

4.2 New structure: Build a professional curriculum system with the guidance of emerging technologies

When setting up the course system for applied talents, the vehicle engineering major should solve some common problems in traditional engineering education, such as the aging of the professional course knowledge system, the lack of interdisciplinary integration, the emphasis on theory rather than practice, and the narrow course orientation, and explore the construction of a new course system by taking the construction of new engineering as an opportunity and the guidance of emerging technologies.(1) Closely combining national strategies such as "the Belt and Road", "Transportation power" and "Made in China 2025", actively build professional courses embracing emerging technologies to serve the development needs of modern industries.(2) Appropriately reduce the number of basic theoretical courses and class hours, timely remove outdated content from professional courses, and increase engineering practical courses, especially practical courses that combine practicality and innovative ability cultivation.(3) Build a course platform that deeply integrates vehicle engineering with cutting-edge disciplines such as big data, robotics, intelligent manufacturing, and autonomous driving, in order to cultivate new engineering and technical talents with cross-border integration and innovation and entrepreneurship capabilities.

4.3 New model: Student-centered status, change the teaching method

With the development of The Times, under the background of new engineering construction, the central position of students in teaching should be further clarified, and advanced teaching mode should be adopted to improve the teaching effect and quality.(1) Implement PBL (Project-Based Learning) teaching mode for specific courses. Through the "combination of learning and doing" approach, it can not only stimulate the interest and potential of all students, but also protect the creativity and innovation of different students, so as to achieve the integration and diversity of application-oriented talent training.(2) Organic integration of modern information technology and teaching. Through education informatization, it can not only change the way students passively receive information, but also "live" and "move" boring and even obscure engineering knowledge, and break the limitations of time, space and resources to achieve all-round education.(3) Actively exploring new teaching models such as flipped classroom, blended learning, and micro lesson teaching, promoting classroom teaching revolution, and improving education quality and efficiency.

4.4 New quality: to sustainable development as the main line, the establishment of dynamic evaluation mechanism

In traditional engineering education, the quality evaluation of talent training is often characterized by "exam-oriented", "one-time" and "one-size-fits-all", which is not conducive to the continuous progress and all-round development of students. The purpose of training applied talents in vehicle engineering is to meet the actual industrial demand, so only by establishing a scientific dynamic evaluation mechanism can we ensure the effectiveness of new engineering construction. First of all, comprehensively sort out the training objectives of professional talents and the components of core competence, set evaluation indicators targeted, and implant them into every link of daily teaching activities. Secondly, carry out in-depth research on the talent needs of industry-related government functional agencies, enterprises and institutions, and timely adjust the talent training standards and evaluation system according to the research results. Moreover, Establish a multi-party joint evaluation mechanism of government, school and enterprise associations, adopt a process monitoring operation mechanism, and form a closed-loop feedback and dynamic adjustment guided by actual work results. Finally, According to the evaluation results, the personnel training should be re-examined, the professional structure should be optimized, the evaluation system should be reconstructed, and the benign interaction between talent supply and industrial demand should be realized.

4.5 New system: With the four-chain integration as the starting point, to create a collaborative education platform

Under the background of new engineering construction, the training of applied talents of vehicle engineering should take the "three-chain integration" as the starting point, that is, the organic connection of the education chain, the industrial chain, the innovation chain and the talent chain, the creation of a new system of collaborative education, and the training of new engineering and technical talents facing the future.(1) By building and co-managing industrial colleges, sharing and sharing training bases, entering the classroom with corporate mentors, and entering the field with students, we will bridge the industrial demand side and the education supply side, and promote the deep integration of the education chain and the industrial chain.(2) Through multi-party cooperation such as government guidance, association organization, enterprise participation and school guidance, a platform for mass innovation and entrepreneurship activities is built to realize the integration of innovation and entrepreneurship into the whole process of talent training and promote the combination of education chain and innovation chain.(3) Promote the "1+X" certificate system to become a normalized teaching model for applied colleges, connecting the two educational paths of academic certificates and vocational skill level certificates, which is more in line with the new engineering thinking of "combining learning and practice", and achieving a smooth connection between the education chain and the talent chain.

5 Safeguard measures for training applied talents in vehicle engineering under the background of new engineering Education

5.1 At the school level: strengthen the construction of teachers and build a double-skilled and double-capable team

Although the reform of talent training mode under the background of new engineering is essentially student-centered and puts forward higher requirements, it actually brings greater challenges to teachers in disguised form. As mentioned above, the applied talents required by the new engineering industry need to have the theoretical knowledge of "professional integration" and "both broad and deep", the multi-dimensional composite ability system, as well as high professional ethics and comprehensive literacy. As the main body of the implementation of education reform, teachers need to assume more responsibilities and tasks. On the one hand, they need to further strengthen their original professional knowledge and skills[10]. On the other hand, they also need to meet the requirements of cross-disciplinary teaching and the cultivation of students' innovative consciousness and engineering practice ability. At present, the teachers who can match the above demands are mainly dual teachers. Therefore, application-oriented colleges and universities should take a series of effective measures such as "internal training and external introduction", enterprise training, vocational skills evaluation and so on to strengthen the construction of teachers and promote the transformation of in-service teachers to the direction of dual professional and dual ability.

5.2 At the social level: Increase resource investment and improve the quality of the second classroom

Taking the new engineering construction as an opportunity, in the process of training applied talents, we should further strengthen the construction of the second classroom, polish the quality of the second classroom, and pay attention to practice education. Through various scenarios and paths such as enterprise visits, on-the-job internships, discipline competitions, innovation and entrepreneurship, and research trips, the collaboration, extension and expansion of the first classroom of course teaching are formed, and the comprehensive quality of students is comprehensively promoted. In addition, in the second classroom system, ideological and political elements should be integrated into the education process to better train "red and professional" applied talents for the Party and the country. However, in order to build a rich form and excellent quality of the second classroom education system, we need the joint participation of all sectors of society, increase the investment of various resources, constantly gather the "three full education" force, and focus on bacon casting soul educating new people.

5.3 At the government level: accelerate the landing of support policies and open up the barriers to four-chain integration

The establishment of any kind of talent training system can not be separated from the external environment and independent existence, it is the product of education and political, economic, social, cultural and other factors intermingled. Therefore, when constructing the system of application-oriented personnel training, it is necessary to include the government as an important functional organization. In the trend of new engineering construction, it is particularly crucial to construct multi-subject education model. The education chain needs to be deeply integrated with the industrial chain, innovation chain and talent chain, broaden the path of school-enterprise cooperation, deepen the collaborative innovation of industry, university and research, and achieve a virtuous circle of education, science and technology and talent promotion. This requires the government to give full play to the role of guidance, coordination, management and service, accelerate the implementation of relevant support policies, constantly integrate the resources of all parties in society, and actively construct a mechanism for collaborative education of institutions of higher learning, basic education units, research institutes, enterprises and institutions, associations and other forces, break through the barriers of mutual integration, and stimulate the enthusiasm of joint participation in education work. Give play to the role of "1+1 > 2", and strive to form the maximum of collaborative education.

6 Conclusion

To sum up, new engineering is essentially a new type of engineering education, including "new concept", "new structure", "new model", "new quality" and "new system". The construction and development of new engineering is directly related to the training quality of applied engineering talents in the future, and also puts forward new standards and requirements for the talent training system of applied colleges. For the training of application-oriented talents in vehicle engineering, it is necessary to comprehensively sort out the objectives and positioning of talent training, and then build a new talent training path from the aspects of training program, curriculum system, teaching method, evaluation mechanism and collaborative education on the basis of a deep understanding of the connotation of new engineering. Finally, it is necessary to provide corresponding safeguard measures from all levels of school, society and government to escort the training of application-oriented talents in vehicle engineering under the background of new engineering.

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