

# THE MATCHING STRATEGY BETWEEN VOCATIONAL EDUCATION RESOURCES AND RAIL TRANSIT EQUIPMENT INDUSTRY IN SICHUAN PROVINCE

KaiWen Wang\*, Biao Chen, Qing Zhang, BaoPeng Zhao, FanHui Meng, Jiao Wang  
*Department of Rail Transit Engineering, Sichuan Vocational and Technical College of Communications, Chengdu 611130, Sichuan, China.*  
*Corresponding Author: KaiWen Wang, Email: kevinwang0526@163.com*

**Abstract:** This paper focuses on the research of the matching strategy between vocational education resources and the rail transit equipment industry in Sichuan Province. It analyzes the deficiencies in the setting of rail transit-related majors, talent cultivation models, and the matching of teaching resources, and then proposes the main contents of the reform, including measures such as major optimization, talent cultivation innovation, curriculum modularization, resource construction, teacher improvement, and joint construction of training bases. At the same time, it elaborates on the reform content from multiple aspects such as the establishment of an industry-education consortium, the establishment of an operating mechanism, the construction of an evaluation system, and the strengthening of safeguard measures, and gives specific reform measures from multiple aspects such as innovating the talent cultivation model, constructing curriculum resources, constructing training bases, building a teaching staff, and carrying out skills training relying on the platform, in order to promote the in-depth integration and coordinated development of vocational education and the rail transit equipment industry.

**Keywords:** Vocational education resources; Rail transit equipment industry; Curriculum and major design; Talent cultivation model; Municipal Industry-Education Consortium

## 1 SIGNIFICANCE OF THE REFORM

The research on the matching strategy between vocational education resources and the rail transit equipment industry is an important direction for the reform and development of vocational education in the new era. To promote the development of the rail transit equipment industry, it is necessary to lead by modern rail transit equipment leading enterprises and high-level colleges and vocational schools, and form a cross-regional industry-education integration community with the participation of schools, scientific research institutions, upstream and downstream enterprises, etc., so as to gather industry-education resources, support the cultivation of high-quality technical and skilled talents, and serve the technological transformation, process improvement, and product upgrading of industry enterprises.

The research on the matching strategy between vocational education resources and the rail transit equipment industry is an inevitable demand for the high-quality development of the rail transit industry. The high-quality development of the industry is inseparable from the support of high-quality technical and skilled talents. The precise matching of vocational education resources and the rail transit industry can not only provide the technical and skilled talents required for the development of the industry, but also provide vocational training for the improvement of the capabilities of enterprise employees, and can also solve the technical problems such as technological transformation, process improvement, and product upgrading for industry enterprises.

The research on the matching strategy between vocational education resources and the rail transit equipment industry is the fundamental guideline for the cultivation of high-quality talents in rail transit. Through the research on the matching of vocational education resources and the rail transit equipment industry, relying on the construction of an industry-education integration community, it is possible to deeply understand the talent needs, training needs, and technological needs of the industry development, and based on this, carry out the dynamic adjustment of vocational education majors, the timely revision of talent cultivation programs, and the timely update of curriculum and textbook content.

## 2 PRACTICAL PROBLEMS

According to the supply and demand theory, the allocation of vocational education resources needs to be adjusted according to the market talent demand. It is necessary to research the talent demand of the industry, reasonably set majors, adjust courses, and optimize teaching resources, so that the supply of vocational education is adapted to the needs of the industry and society, avoiding the imbalance between talent supply and demand, and improve the utilization efficiency of resources and the pertinence of talent cultivation [1]. According to the theory of industry-education integration, industry-education integration emphasizes the in-depth cooperation between vocational education and the industry. Through the close cooperation between schools and enterprises, the connection between education and teaching and production practice is realized, and the goals of resource sharing, complementary advantages, and coordinated development are achieved, including the docking of major settings with industry needs, the conformity of teaching content with professional standards, and the integration of practical teaching with industrial practice [2].

Industry-education integration requires breaking the boundaries between schools and enterprises and integrating the resources of both sides. Schools and enterprises should jointly formulate talent cultivation programs, build training bases, and carry out teacher training to ensure that vocational education resources align with industrial practices, cultivate talents with strong practical abilities and high professional qualities, and promote the coordinated development of vocational education and the industry. According to the system theory, the matching of vocational education resources should be considered from a systematic perspective, comprehensively considering the mutual influence of various factors, and focusing on the optimization of the overall function. For example, when adjusting the major settings, it is necessary to take into account the supporting conditions of teaching resources such as the industry demand, school teaching staff conditions, and training facilities; at the same time, a dynamic adjustment mechanism should be established to optimize the resource allocation in a timely manner according to the industry development. However, there are still the following problems in vocational education that is in line with the development of rail transit equipment.

### **2.1 Problems in Major Settings**

At present, there is a certain discrepancy between the setting of rail transit majors in vocational colleges in Sichuan Province and the actual job needs of the industry. From the perspective of the distribution of the number of majors, some traditional rail transit majors are relatively surplus, resulting in greater competitive pressure on the graduates of related majors in the job market and the problem of difficult employment. At the same time, with the rapid development of the rail transit industry in the direction of intelligence and greening, some emerging majors are in short supply. For example, in the majors related to rail transit intelligence, involving intelligent operation and maintenance, intelligent dispatching and other fields, there are few majors in colleges and universities that can accurately cultivate professional talents in these fields, and it is difficult to meet the urgent needs of the industry for talents with emerging technical skills.

The in-depth analysis of the reasons shows that the main reason is the poor communication and untimely information feedback between the education and industry sectors. When educational institutions set and adjust majors, they fail to form an effective linkage mechanism with the industry sector. On the one hand, educational departments do not have a deep understanding of the industry development trends, especially the changes in new business forms, new occupations, and new positions brought about by new technologies, and it is difficult to capture the new trends of the industry's talent demand in a timely manner. On the other hand, the industry sector also lacks an effective channel to timely feedback the changes in talent demand to educational institutions, resulting in a disconnection in major settings between the two sides. Moreover, the supply and demand dynamics in the regional labor market are not reflected in a timely manner, making it difficult for vocational colleges to flexibly adjust the major layout according to the actual supply and demand situation in the market, and finally resulting in the situation that the major settings lag behind the industry development.

### **2.2 Problems in the Matching of Talent Cultivation Models**

The existing vocational education talent cultivation models are not adapted to the requirements of the rail transit industry for talents in many aspects.

First, in terms of the cultivation objective, some colleges and universities still focus on the traditional theoretical knowledge imparting and basic skill cultivation, ignoring the new characteristics of the industry's high demand for information and strong composite abilities of talents.

Second, in terms of the curriculum system, the teaching content of traditional courses is updated slowly, and there is a significant gap from the skills required in the actual work scenarios of enterprises.

Third, in terms of teaching methods, the proportion and quality of practical teaching links need to be improved, and there are deficiencies in cultivating students' composite abilities. Although many colleges and universities have set up practical training courses, some practical training projects are too simple and isolated, and fail to simulate the real complex working environment and multi-position collaborative operation scenarios of enterprises, resulting in students' insufficient ability to solve comprehensive problems in actual work.

The factors causing these problems mainly stem from the constraints of traditional educational concepts and insufficient teaching resources. At the same time, due to limited teaching resources, such as obsolete and untimely updated practical training equipment, which cannot simulate the latest production processes of enterprises; and the insufficient in-depth cooperation of off-campus internship bases, students have difficulty in truly participating in the actual projects of enterprises, all of which restrict the effective matching of the talent cultivation model with the industry demand and affect the improvement of the quality of talent cultivation.

### **2.3 Problems in the Matching of Teaching Resources**

The construction of vocational education teaching resources suffers from a lack of systematic and comprehensive planning, which has caused many problems.

First, in terms of curriculum textbooks, the situation of untimely update is relatively prominent, and the content of some textbooks still remains at the stage of traditional technology and process, out of line with the cutting-edge technology of the industry.

Second, the insufficient practical ability of the teaching staff is also a major problem. Although colleges and universities encourage teachers to participate in enterprise practical projects, the actual participation degree and effect are uneven. Some teachers lack long-term and in-depth practical training opportunities in the front line of enterprises. Moreover, the proportion of part-time teachers who are enterprise experts with rich practical experience is generally low, and their advantages in practical teaching have not been fully utilized.

Third, in terms of the construction of training bases, there is a significant gap between training facilities and real-world enterprise production environments. The training bases in some colleges and universities have obsolete equipment and single functions, and cannot simulate the real production processes and complex working conditions of enterprises.

Fourth, the temporary school-enterprise cooperation relationship is an important reason why these problems are difficult to solve. At present, many school-enterprise cooperations are often temporarily formed based on a single project, lacking a long-term and stable cooperation mechanism and in-depth integration.

### **3 MAIN CONTENTS OF THE FREORM**

#### **3.1 Optimization of Major Settings**

First, closely follow the development trend of intelligence technologies. Relevant vocational colleges should introduce specialized directions such as intelligent operation and maintenance in the major settings to adapt to the digital and intelligent development of the industry. Second, meet the requirements of green development. Some colleges and universities should transform or add professional expansion courses such as the application technology of new energy in rail transit. Third, combine the construction of new-format rail transit. Set up majors and courses in the manufacturing and operation and maintenance of innovative rail transit equipment such as mountain railways, maglev, and monorail. Fourth, integrate and update majors. Sort out and integrate the majors that are out of line with the current development needs of the rail transit industry and have a continuously depressed employment market, optimize the allocation of educational resources, and improve the adaptability and rationality of major settings.

#### **3.2 Innovation of Talent Cultivation Models**

First, be oriented by the industry demand, closely focus on the industry development trend, job skill requirements, and future talent needs, and accurately set majors and talent cultivation objectives. Second, carry out industry-education integration and collaborative education, break the barriers between school education and enterprise production, jointly build industry colleges and training bases, and jointly recruit and cultivate students according to the specific job needs of enterprises. Third, promote the modern apprenticeship cultivation model, jointly formulate the cultivation plan by schools and enterprises, clarify the learning and practical tasks of students at different stages, implement diversified evaluations, and ensure that apprentices can develop comprehensively and meet the requirements of enterprises and the market. Fourth, strengthen digital drive, leverage big data to accurately understand the learning status and needs of students, and provide personalized learning paths for students with the support of artificial intelligence technology.

#### **3.3 Modular Curriculum System**

The reason for modularizing a system is to decompose a complex system, so that people's understanding and design of the complex system can be more intuitive and simplified. To some extent, this reflects the philosophical thought of "reductionism" and also reflects the internal driving force of "human beings' pursuit of certainty" as described by Dewey [3].

According to the skill requirements of different job groups in the rail transit industry, divide the curriculum system into multiple modules, reconstruct the courses according to the modules, so that students can choose the corresponding modules for systematic learning according to their career development plans, and at the same time allow students to flexibly choose and combine curriculum modules according to their own characteristics and market needs to realize personalized learning paths.

#### **3.4 Construction of High-Quality Curriculum Resources**

Hongfeng Li and others have proposed that efforts should be made to synergistically promote the "integration of industry, academia, research, training, and innovation" on-site model. This on-site model requires placing students in authentic enterprise settings, integrating elements such as real production, practical training teaching, technology research and development, social training, innovation, and entrepreneurship for comprehensive construction [4].

Establish a curriculum development mechanism with in-depth school-enterprise cooperation, reconstruct the curriculum teaching content based on the actual production process with the background of the industry development, jointly develop professional teaching resources by schools and enterprises with the real project cases of enterprises as the carrier, build a digital curriculum resource platform with complete functions, integrate various curriculum resources, and jointly develop core courses by schools and enterprises.

#### **3.5 Construction of New-Type Textbooks**

Schools and enterprises jointly build a textbook writing team, and write digital textbooks, loose-leaf textbooks, work manual textbooks and other new-type textbooks with pertinence, practicality and timeliness based on the technical application in the production line, job skill requirements and actual work cases.

### **3.6 Construction of the Teaching Staff**

Be oriented by the industry development needs, with the goal of building a high-level "double-qualified" teaching staff, establish an industry college, jointly build a talent sharing platform with universities, industry enterprises, scientific research institutes, etc., and jointly build a structured "double-qualified" team with high quality, high level and high skills through various means such as establishing innovation teams, mutual dispatch of school-enterprise teachers, and joint training and cultivation.

### **3.7 Construction of Training Bases**

Jointly build training bases with rail transit enterprises, construct them according to the standards of enterprise production workshops, jointly formulate practical training teaching plans and arrange practical training instructors by schools and enterprises, and realize the seamless connection from campus to enterprise. Actively expand the functions and service scope of the training bases, and carry out vocational skills training and skill appraisal services for enterprise employees to realize resource sharing and complementary advantages.

## **4 REFORM PLAN**

### **4.1 Establishment of a Rail Transit Equipment Industry-Education Consortium**

The consortium is essentially a practical community intertwined by stakeholders. In the Municipal Industry-Education Consortium, the stakeholders mainly include local governments, industrial parks, enterprises, schools, scientific research institutions, etc., and talent is the key to the intertwined interests of these subjects. Each subject cultivates talents through industry-education integration and other practical activities, and promotes the in-depth development of industry-education integration on the basis of talent cultivation, thus forming a virtuous cycle of mutual promotion and mutual growth [5]. In the context of the continuous popularization and expansion of higher education in China, the role and value of colleges and universities in the "triple helix" model are becoming increasingly prominent, and deepening the triple helix relationship among the government, industry and universities has become an important strategy for national and regional coordinated development [6]. The regional industrial agglomeration and innovation demand are the external driving forces for the optimization of the professional structure of higher vocational education, and the talent cultivation objective and the demand for student success are the internal driving forces for the optimization of the professional structure of higher vocational education [7].

Establish a Municipal Industry-Education Consortium, with the government department as the leading role, form a substantive operation mechanism, and through the establishment of a production and learning supply and demand platform, guide the major settings and talent cultivation planning of vocational colleges, and realize the transformation of talent cultivation from "disconnection between production and learning" to "precise docking". Through the coordinated construction of a production and education integration training platform by the government and various industrial chain enterprises, build a "factory in school", realize the transformation of teaching resources from "single support" to "multiple coordination", and comprehensively improve the quality of teaching resources.

### **4.2 Establishment of the Operating Mechanism of the Consortium**

In promoting the construction of Municipal Industry-Education Consortium, local governments should facilitate in-depth cooperation and coordinated development among relevant entities within the consortia, explore the establishment of mechanisms for their physical operation and benefit-sharing, leverage the government's coordinating role, industrial aggregation, enterprise leadership, and the school's principal role, and establish a closely coordinated working mechanism among government, industry, enterprises, and schools [8].

First, establish a resource sharing mechanism. The members of the consortium share educational and teaching resources, industrial resources, technological resources, etc., to realize the complementary advantages of resources and the maximization of their use. Second, improve the production and education supply and demand docking mechanism. Regularly conduct research on industry development and talent demand to realize the precise docking of major settings and talent cultivation with the talent demand of enterprises. Third, establish a mechanism for benefit sharing and distribution. Fully mobilize the enthusiasm of the members of the consortium to realize the sustainable development of the community. Fourth, establish a collaborative education mechanism. The government department plays the role of overall planning, policy guidance and supervision and management, builds a cooperation and exchange platform, breaks the information barrier, and promotes the smooth progress of collaborative education work.

### **4.3 Construction of the Evaluation System of the Consortium**

Ran Jiang, Dan Wang, etc. constructed a quantitative index system for the input of "quality engineering" educational resources based on the matching principle of vocational education resources, and quantitatively evaluated the matching problem from two dimensions of region and major [9].

Therefore, it is necessary to construct a scientific and reasonable evaluation index system, establish evaluation indexes from multiple dimensions such as the dimension of talent cultivation quality, the dimension of industry development level, and the dimension of industry-education integration, measure the quality of talent cultivation, the matching degree of vocational education resources and the depth of industry-education integration. And through the collation and analysis of the data of various evaluation indexes, comprehensively sort out the performance after the implementation of the plan, put forward targeted improvement suggestions and optimization measures, and timely feedback and update to form a dynamic adjustment and continuous optimization mechanism.

#### **4.4 Strengthening of Safeguard Measures**

In terms of policy guarantee, actively communicate and coordinate with the governments at all levels in Chengdu City, and strive to issue support policies specifically for the Municipal Industry-Education Consortium of rail transit equipment.

Establish and improve the management organization, establish the council of the Municipal Industry-Education Consortium of rail transit equipment in Chengdu City as the highest decision-making body of the consortium. The members of the council are composed of the heads of relevant government departments, representatives of industry associations, enterprise executives, and presidents of vocational colleges, and the quota is allocated according to a certain proportion to ensure that the interests of all parties are fully reflected. The council is responsible for formulating the development strategy, planning and major decisions of the consortium, coordinating the resources of all parties, and promoting the smooth progress of the work of the consortium.

Clarify the responsibilities of each member unit, formulate detailed consortium charters, and clarify the rights and obligations of each member unit. The government department plays the role of overall planning, policy guidance and supervision and management, and provides policy support and guarantee for the development of the consortium; the industry association is responsible for collecting industry information, formulating industry standards, and organizing enterprise exchanges and cooperation to promote the docking between enterprises and schools; enterprises undertake the tasks of participating in the formulation of talent cultivation programs, providing internship and training positions, receiving graduates for employment, and carrying out technological research and development cooperation; vocational colleges are responsible for carrying out teaching activities, cultivating high-quality technical and skilled talents, and providing teacher and teaching resource support, etc., to ensure that all parties perform their respective duties and cooperate in coordination.

Increase financial guarantee. The government increases the financial investment in the Municipal Industry-Education Consortium of rail transit equipment, and incorporates the construction of the consortium into the local financial budget. Arrange special funds every year to support the infrastructure construction, equipment procurement, teaching staff construction, curriculum reform, etc. of the consortium. Expand diversified financing channels, encourage the member units of the consortium to actively expand financing channels and attract social capital to participate in the construction of the consortium.

### **5 MAIN INITIATIVES**

#### **5.1 Connecting with "Real Industry Projects" to Innovate the Talent Cultivation Model**

In the critical period of the development of vocational education, innovating the talent cultivation model has become the core task to improve the quality of education and meet the needs of the industry. Through taking the industry college as an important carrier, actively practice the on-site engineer cultivation model based on "real environment, project carrier, work-study alternation, and ability progression", and strive to build a comprehensive and systematic practical teaching system framework of "engineering quality + professional basic ability + technical application ability + innovation ability".

#### **5.2 "Deconstructing Courses" with Knowledge Graph to Build High-Quality Curriculum Resources**

Schools and enterprises jointly build the teaching resources of urban rail transit vehicle technology specialty based on the knowledge graph, implement the teaching content reconstruction plan based on the production process, create a digital classroom teaching paradigm, and jointly develop a batch of first-class core courses and high-quality textbooks.

#### **5.3 Creating "Enterprise Digital Scenarios" to Build New-Form Training Projects**

Covering the training functions of urban rail, mountain rail, intelligent rail and other rail transit equipment, build an open regional industry-education integration practice center integrating teaching, training, training, scientific research, competition and popular science; facing the digital production scenarios of "daily inspection, weekly inspection, annual inspection, overhaul and heavy repair", jointly develop typical production practice projects such as intelligent operation and maintenance of the whole life cycle of rail vehicles with Chengdu CRRC ChangKe as the lead.

#### 5.4 Implementing the "Three Hundreds and Three Entries" Initiative to Cultivate a Batch of National Craftsman Teachers

To strengthen the construction of the teaching staff and improve the practical ability and teaching level of teachers, jointly implement the special project of the "Three Hundreds and Three Entries" activity with CRRC Changke, Shudao Group, and other enterprises, aiming to build a high-quality and professional teaching staff.

#### 5.5 Relying on the National Training Platform to Jointly Implement Skills Training and Appraisal by Schools and Enterprises

Make full use of the advantages of the national training platform, actively carry out school-enterprise cooperation, jointly implement skills training and appraisal work to cultivate high-quality skilled talents for the rail transit equipment industry.

### 6 SUMMARY

This research has carried out a comprehensive and in-depth discussion around the matching strategy between vocational education resources and the rail transit equipment industry in Sichuan Province. Starting from the practical problems, it clearly points out the current situation and reasons that vocational education is not adapted to the development needs of the rail transit equipment industry in terms of major settings, talent cultivation models and the matching of teaching resources, and proposes targeted solutions from multiple dimensions, including optimizing major settings to adapt to the industry development trend, innovating the talent cultivation model to improve the degree of fit between talents and industry needs, constructing a modular curriculum system and high-quality curriculum resources to enhance the effectiveness of teaching content, strengthening the construction of the teaching staff and training bases to strengthen the teaching support conditions, etc. These measures are interrelated and mutually promoting, forming a relatively complete reform framework.

The reform plan further plans the implementation path of the reform from the macro level. By establishing a Municipal Industry-Education Consortium and establishing and improving the operating mechanism, evaluation system and safeguard measures, it ensures that the reform can be carried out in an orderly manner and achieve practical results.

This research provides a comprehensive and systematic idea and method for the matching strategy between vocational education resources and the rail transit equipment industry in Sichuan Province, and has important reference value and practical guiding significance for promoting the high-quality development of regional vocational education and promoting the transformation and upgrading of the rail transit equipment industry. In the future, all parties should further strengthen cooperation, actively implement various reform measures, continuously optimize the allocation of vocational education resources, improve the quality of talent cultivation, and provide more powerful talent support and intellectual guarantee for the development of the rail transit equipment industry.

### COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

### FUNDING

Sichuan Provincial Department of Education. Key Project for Vocational Education Talent Training and Educational Teaching Reform Research 2022-2024: "Research on the Matching Strategy between Sichuan's Vocational Education Resources and the Rail Transit Industry", Project Number: GZJG2022-493. General Project for Vocational Education Talent Training and Educational Teaching Reform Research 2022-2024: "Exploration and Practice of Three Progressions and Three Integration in the Construction of Specialized Creative Integration Courses for Rail Transit in Vocational Colleges - Taking *Rail Transit Station Mechanical and Electrical Equipment* as an Example", Project Number: GZJG2022-524.

### REFERENCES

- [1] Li Yujing. Vocational Education Supply and Demand Matching: Mechanism and Path. *Vocational and Technical Education*, 2022, 25: 1.
- [2] Yan Zhili, Guo Mengjie, Wang Shuhui. Cultivation and Construction of Industry-Education Integration Bodies: Theoretical Research and Practical Orientation. *Chinese Vocational and Technical Education*, 2023, (24): 58-65.
- [3] SIMON H A. The architecture of complexity: hierarchic systems. *Proceedings of the American Philosophical Society*, 1962, 106(6): 467- 482.
- [4] Li Hongfeng, Wang Beisheng, Wang Weimin. Practical Significance, Mechanism Structure and Path Selection of Mixed Ownership School-Running in Modern Industrial Colleges. *Adult Education*, 2024, 44(05): 65-72.
- [5] Li Jia, Yi Xiaoyi. Construction of Municipal Industry-Education Consortium: Practical Implication, Governance Structure and Action Path. *Vocational Education Development and Research*, 2024, (04): 17-24.

- [6] Etzkowitz, H. *The Triple Helix: University Industry Government Innovation in Action*. Taylor and Francis, 2008, 108-133.
- [7] Cheng Zhaoyu. Research on the Construction of the “Dual Theory” Integration Model for Optimizing the Professional Structure of Higher Vocational Education. *Theory and Practice of Education*, 2024, 44(36): 18-22.
- [8] Qian Jiannan, Liu Xiao. The Essence, Operating Mechanism, and Advancement Path of Municipal Industry-Education Consortium: Based on the Perspective of High-Quality Development of Vocational Education. *Education and Vocation*, 2024, (15): 22-29.
- [9] Jiang Ran, Wang Dan, Wang Jian. Research on Performance Evaluation of Higher Vocational Education Resource Allocation Based on Matching Principle-The Case of Quality Engineering in Jiangsu Province. *Education and Vocation*, 2017, 38(14): 60-64.