Journal of Contemporary Educational Research, 2025, Volume 9, Issue 9
http://ojs.bbwpublisher.com/index.php/JCER
ISSN Online: 2208-8474
ISSN Print: 2208-8466

# The Role Dilemmas and Resolution Paths of Vocational Education from the Perspective of the Integration of Education, Technology, and Talent

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**Abstract:** The integration of education, technology, and talent is a strategic institutional arrangement for China to build a high-quality education system and achieve innovation-driven development in the new era. As the main platform for cultivating technical and skilled talents, vocational education faces dilemmas such as ambiguous role positioning, conflicting role expectations, and insufficient role capabilities when it comes to the coupling of the three functions of "education-technology-talent". Based on the analytical framework of role theory and structural functionalism, this paper proposes three paths: clarifying role positioning through the integration of vocational and general education, reconstructing role expectations through the integration of science and education, and enhancing role capabilities through the integration of industry and education. These paths provide theoretical references and practical guidance for optimizing the function of vocational education in the collaborative innovation system.

**Keywords:** Vocational education; Integration of education, technology and talent; Integration of vocational and general education; Collaborative innovation

**Online publication:** Oct 22, 2025

## 1. Introduction

Against the backdrop of the Fourth Industrial Revolution and the restructuring of the global industrial chain, education, technology, and talent have become core elements in the process of national modernization. The 20th National Congress of the Communist Party of China (CPC) for the first time made an integrated deployment of the three, emphasizing the strategic orientation of "prioritizing the development of education, achieving self-reliance and self-strengthening in science and technology, and driving development with talent leadership" [1]. The Third Plenary Session of the 20th CPC Central Committee made important arrangements for building an institutional mechanism to support comprehensive innovation and advancing the integrated reform of the institutional mechanisms for education, technology, and talent in a coordinated manner [2]. As a key link connecting education and industry, the role positioning and practical paths of vocational education urgently

need systematic reconstruction [3].

From a theoretical perspective, the dual lenses of role theory and structural functionalism provide an analytical framework for analyzing the functional positioning of vocational education in the collaborative system. According to Merton's role set theory, social subjects need to assume multiple institutional roles simultaneously in a specific field; these roles not only have functional complementarity but may also generate structural tensions [4]. Parsons' structural functionalist view of education, with its unique theoretical framework, outlines the multi-dimensional role of education in the social system. As a subsystem, vocational education not only needs to meet the traditional role expectation of being a "transmitter of technical skills" but also undertakes the new mission of being an "integrator of innovative elements". The expansion and reconstruction of this role set will inevitably lead to institutional dilemmas such as role ambiguity and role overload, which urgently require institutional innovation to achieve a paradigm shift from a "participant of elements" to a "constructor of the system". Combined with cutting-edge policy trends and industrial transformation trends, this paper systematically deconstructs the role dilemmas of vocational education and proposes resolution paths.

## 2. Reconstruction of the mission of vocational education under the integration of education, science and technology and talent

The report of the 20th National Congress of the Communist Party of China clearly sets the strategic goal of building a powerful educational country by 2035, positions education, science and technology, and talent as the core support for comprehensively building a modern socialist country, and emphasizes the need to coordinately promote the strategies of rejuvenating the country through science and education, strengthening the country through talent, and innovation-driven development [5]. General Secretary Xi Jinping further pointed out during the fifth collective study session of the Political Bureau of the Central Committee that the construction of a powerful educational country, a powerful science and technology country, and a powerful talent country has inherent synergy, and systematic integration is required to unleash the efficiency of high-quality development [6]. As a key component of the modern educational system, vocational education is in a critical period of transformation and upgrading, and its strategic positioning and mission of the times have been endowed with new connotations.

### 2.1. Structural optimization: Integration of vocational and general education to build a diverse educational ecology

Against the backdrop of the coordinated development of education, science and technology and talent, promoting the integration of vocational and general education and reforming the educational structural system have become core issues in achieving high-quality educational development [7]. The integration of vocational and general education eliminates the traditional barriers between vocational and general education through mechanisms such as modular curriculum integration, credit bank systems, and coordinated resource allocation, constructing a flexible and diverse educational supply model. This measure can not only broaden the channels for students' personalized development but also significantly enhance the social recognition of vocational education.

The systematic optimization of the educational structural system is a crucial part of the educational modernization process. It is necessary to achieve deep coupling of the two types of education through dynamic adjustment of training objectives, structured connection of curriculum systems, and integrated design of evaluation criteria. Such a reform path can cultivate innovative talents with both theoretical literacy and

technical application capabilities, effectively meet the new demands for human capital posed by technological revolutions and industrial transformations, and thus provide intellectual support for the sustainable development of the economy and society.

The in-depth promotion of the integration of vocational and general education and the continuous improvement of the educational structural system will lay an institutional foundation for the integrated development of education, science and technology, and talent, ultimately forming a more inclusive and adaptable modern educational ecology.

## 2.2. Ability upgrading: Digital literacy empowering the cultivation of compound talents

Driven by both technological revolution and industrial transformation, the traditional training model for skilled talents can hardly meet dynamic market demands. Modern vocational education urgently needs to transform from single-skill teaching to interdisciplinary ability construction, focusing on cultivating compound talents with innovative thinking, digital literacy, and interdisciplinary capabilities [8].

This transformation requires the deep integration of cutting-edge technologies such as artificial intelligence and big data into professional curriculum systems, enabling learners to effectively address the challenges of intelligent production scenarios. Research shows that talents with cross-disciplinary knowledge integration capabilities can not only optimize problem-solving efficiency but also provide continuous impetus for industrial upgrading through technological innovation. Such talents have become key nodes linking educational and industrial systems, and the quality of their cultivation is directly related to the enhancement of national competitiveness.

## 2.3. Model innovation: Integration of science and education to drive the improvement of teaching efficiency

Against the background of the current innovation-driven development strategy, vocational education, as a crucial link between education and industry, its development quality directly affects the overall efficiency of the national innovation system. As a new round of technological revolution and industrial transformation accelerates, vocational education must break through traditional school-running paradigms and construct a new talent training system deeply intertwined with technological innovation [9]. International comparative research shows that there is a significant gap in the efficiency of scientific and technological achievement transformation between China and developed countries, which highlights a key shortcoming of vocational education in the innovation value chain [10]. Implementing the "industry-university-research-application" collaborative education mechanism to transform cutting-edge scientific and technological achievements into high-quality teaching resources can effectively improve talent cultivation quality. Specifically, it is necessary to focus on promoting reforms in three aspects: synchronizing curriculum content with industrial technology development, organically integrating teaching scenarios with real production environments, and precisely aligning evaluation criteria with industry talent demands.

The implementation of this deep integration concept can not only cultivate high-quality technical and skilled talents who can adapt to new technological changes but also provide continuous impetus for regional innovative development. In the future, through institutional innovation and policy guidance, the pivotal role of vocational education in the innovation ecosystem should be further strengthened.

## 3. Analysis of the three-dimensional role dilemma in vocational education

### 3.1. Ambiguous positioning: Overlapping of functional boundaries and cognitive biases

According to role theory, role positioning refers to the process where an individual, within specific social relationships and contexts, clarifies their identity, status, responsibilities, and behavioral patterns based on social norms and self-perception. This enables positive interaction with other roles and alignment with social expectations [11]. Vocational education faces a structural contradiction between "high positioning" and "low allocation". The 2024 China Vocational Education Development Report shows that 73% of vocational colleges exhibit the phenomenon of "academic drift", leading to severe homogeneity in talent cultivation. For example, among 10 higher vocational colleges in a certain province, 8 of them have an overlap rate of over 65% between their Internet of Things (IoT) professional courses and those offered by undergraduate universities, failing to highlight the characteristics of technical and vocational skills training.

At present, vocational education is confronted with a dual development bottleneck. First, there exists a systemic bias in social perception, which simply classifies vocational education as a subsidiary of general education, leading to long-term imbalances in resource allocation and policy support. Data shows that the proportion of research funds in vocational colleges accounts for less than 15% of the total investment in higher education, which severely restricts the development of their scientific and technological innovation capabilities [12]. Second, in the process of promoting the integration of vocational and general education, vocational education has not yet formed a differentiated development path, and its talent training goals tend to converge with those of ordinary universities, weakening its distinctive advantages in technical and vocational skills innovation.

### 3.2. Expectation conflict: Tension between educational laws and industrial demands

Role expectation refers to society's anticipation of the behaviors and performance of a specific role [13]. Vocational education is confronted with conflicting role expectations from different stakeholders. A survey conducted by the Ministry of Education reveals that 82% of enterprises expect graduates to be "ready for work upon employment", while 76% of teachers adhere to the concept of progressive cultivation. This contradiction is particularly prominent in rapidly evolving industries such as semiconductors. A chip manufacturing enterprise reported that new employees require an average adaptation period of 6 months, far longer than the 1-month period expected by the enterprise.

At present, the development of vocational education is trapped in a structural contradiction between educational value and industrial demands. The education system emphasizes following the laws of talent cultivation and focuses on developing students' sustainable development capabilities. However, the industrial sector demands the immediacy of talent supply and pursues the rapid transformation of technical skills. This dualistic opposition in value demands leads to role conflicts in the positioning of vocational education's talent cultivation goals.

### 3.3. Capacity lag: Coexistence of faculty shortcomings and resource scarcity

Role competence refers to the knowledge, skills, and qualities required for an individual to perform their role responsibilities [4]. The teaching staff in vocational education presents a "three-low" phenomenon: the proportion of teachers with corporate experience is less than 35%, the number of teachers presiding over scientific research projects at or above the provincial level is fewer than 15% and only 28% of teachers master cutting-edge technologies. The average update cycle of practical training equipment reaches 5.7 years, which makes it difficult to match the iteration speed of industrial technologies. Currently, vocational education is confronted

with systemic challenges in terms of innovative development capabilities.

Firstly, it manifests as structural deficiencies in the teaching staff. Teachers generally lack industrial practical experience and technological innovation capabilities, with obvious shortcomings in teaching competence especially in emerging fields such as artificial intelligence. Secondly, it is reflected in the inadequacy of practical teaching conditions, the replacement of practical training facilities lags behind technological development, making it hard to construct real production scenarios. A deeper-level constraint lies in the weakness of the industry-education integration mechanism and the imperfection of the university-enterprise collaborative innovation platform construction, which leads to the delay in technology transformation and teaching update.

## 4. Three breakthrough paths for collaborative innovation in vocational education

Education, science and technology, and talents form a triple coupling system for innovation-driven development, jointly serving the construction of the national innovation system [14]. Under this strategic framework, vocational education must achieve transformation and upgrading in three dimensions: clarifying the positioning of "type-based education", aligning with the needs of industrial development, and enhancing the ability to support innovation. By systematically optimizing the structure of educational supply and strengthening the function of technical and skilled talent accumulation, it will provide talent support for the construction of a modern industrial system.

### 4.1. Positioning anchoring: Institutional innovation for the integration of vocational and general education

The Vocational Education Law has clearly stipulated that vocational education is a type of education with equal importance to general education, yet its social recognition still faces challenges. Currently, it is urgent to advance reforms at three levels: First, establish an institutional system for the integration of vocational and general education, and realize the organic connection of educational resources through mechanisms such as credit recognition and curriculum interoperability; Second, elevate the disciplinary status of vocational education, and it is suggested that vocational and technical education be upgraded to a first-level discipline to strengthen its academic discourse power; Third, improve talent training standards, with a focus on cultivating compound talents who possess both technological innovation capabilities and professional literacy.

Empirical studies show that the technical and skilled talents trained by vocational colleges every year contribute 7.2% to GDP, but the development of their disciplines lags significantly behind the needs of industrial development. In the future, efforts should be made to comprehensively enhance the social recognition of vocational education through the reconstruction of disciplinary systems and the innovation of training models.

### 4.2. Expectation adjustment: Paradigm revolution for the integration of science, technology and education

The essence of "integration of science, technology and education" in vocational education is the in-depth coupling of scientific research and education & teaching, aiming to build a collaborative mechanism for science and technology, education, and talent training. Its implementation paths should focus on the following dimensions.

(1) Construct a three-stage competency training model of "basic scientific research literacy specialized technology R&D ability practice". Design a composite evaluation system of "technical

#### 4.2.1. Adaptive curriculum and talent cultivation

skills + scientific research literacy", and establish a gradient training mechanism covering secondary vocational education, higher vocational education, and vocational undergraduate education.

(2) Cultivate a team of "double-qualified and tri-competent" teachers, and improve the teachers' ability to transform scientific research achievements through the two-way flow of talents between schools and enterprises. Introduce mentors from scientific research institutions and enterprise engineers to form "double-qualified" teams, and increase the participation rate in scientific research projects to more than 60%.

#### 4.2.2. Technological transformation of the education system

(1) Establish the school-running orientation of "technology leadership" and deeply integrate innovation elements into the entire process of professional construction.

(2) Implement a "research-teaching integration" curriculum system, and cultivate students' technological innovation capabilities through real scientific research projects.

### 4.3. Capacity enhancement: Ecological reconstruction for the integration of industry and education

As an important carrier for the accumulation of technical skills, the mechanism of industry-education integration in vocational education directly affects the quality of talent training [7]. Based on the background of the integration of education, science and technology, and talents, the following reform paths are proposed as below.

#### 4.3.1. Construction of integration conditions

(1) Deepen the "two-way flow mechanism for double-qualified talents" and form a teacher development model featuring mutual employment of personnel between schools and enterprises and technology sharing.

(2) Establish a "four-in-one" practical training system, integrating resources from the government, industry associations, enterprises, and schools to build a virtual-real integrated practical teaching platform.

#### 4.3.2. Mechanism optimization and innovation

(1) Jointly establish joint-stock industrial colleges, and form an ecological circle of "joint talent cultivation-joint technology R&D-interests". Promote the joint-stock school-running model, and deepen industry-education cooperation through risk sharing and benefit sharing.

(2) Build industrial technology innovation alliances, and establish service platforms for technology transfer and achievement transformation.

## 5. Conclusions and prospects

To achieve the goal of building a leading education-powered country, vocational education needs to redefine its role positioning through collaborative innovation. It should eliminate role ambiguity via institutional design, balance diverse expectations by integrating science and education, and enhance core capabilities based on the integration of industry and education. Ultimately, it will realize the transformation from "passive adaptation" to "proactive leadership".

Vocational education must respond to the needs of new-quality productive forces with a "one-body-two-wings" model, with the "body" being the collaboration of education, science-technology and talents, and the "two wings" being digital and green transformation. Future research can focus on the reform of AI-driven talent

cultivation paradigms while remaining vigilant against the risks of technological alienation.

## Disclosure statement

The authors declare no conflict of interest.

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