

REVIEW ARTICLE

China's vocational education at the global frontier: Model innovation and system advancement

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Abstract

Against the backdrop of global industrial transformation and technological revolution, China's vocational education is undergoing a strategic shift from scale-driven expansion to quality-driven development, with the move toward global leadership emerging as a critical priority. Drawing on case synthesis and systematic data analysis, this paper explores the internal logic and practical pathways underlying this historic transition, constructing an analytical framework of "model innovation-system optimization-international advancement" and systematically analyzing the driving forces behind China's vocational education development. The analysis shows that China's vocational education innovation manifests across three core areas: A new model of industry-education integration characterized by industry-education-city integration, the restructuring of the digital ecosystem centered on the National Smart Education Platform, and a branded path of standard dissemination through Luban Workshops and international conferences. System upgrading focuses on the vertical connection and horizontal integration of the hierarchical structure, modern governance with multi-stakeholder coordination (encompassing both government and market actors), and an adaptive framework that is precisely aligned with national, regional, industrial, and diplomatic strategies. The paper also identifies long-term challenges in current development, including insufficient systematic coordination, inadequate in-depth quality-driven development, and limited platform-enabled effectiveness. To address these challenges, the paper recommends deepening institutional innovation to strengthen industry-education coordination, advancing digital transformation to reshape the core of teaching practice, and actively participating in global vocational education governance to advance China's contributions to the field.

Keywords

China, vocational education, model innovation, system improvement

INTRODUCTION

As human society enters an era of digital intelligence and green, development, technically skilled personnel have become key strategic resources for determining national competitiveness, and the global vocational education system is undergoing profound changes. Traditional vocational education leaders such as Germany have promoted the digital transformation of their dual-system vocational training through initiatives such as "Vocational Education 4.0" (Guo *et al.*, 2023), and the European Union has sought

to address skills gaps through its Digital Education Action Plan (Zhang & Zhou, 2025). In the global landscape, the development trajectory of China's vocational education is particularly noteworthy. Since the early 20th century China's vocational education system has evolved profoundly. While it initially drew on Western models, it later followed the Soviet model after the founding of the People's Republic of China, eventually pursuing a localized development path after the reform and opening up. China has since made remarkable progress, building the world's largest vocational education system and extending far-


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reaching influence over global vocational education development (Zan *et al.*, 2025). Through a series of institutional innovations grounded in China's domestic context and oriented toward the world, China has profoundly reshaped the global vocational education landscape (Zan *et al.*, 2025). China's development logic has moved beyond mere economic adaptability, integrating deeply into the grand narrative of national modernization and global governance and achieving a distinctive shift from "largest scale" to "model innovation" and from "international participation" to "global leadership", as the following empirical sections demonstrate. To truly understand this phenomenon, it is necessary not only to summarize China's development achievements but also to examine the new path of vocational education modernization. This study employs an inductive qualitative case study approach, integrating case synthesis with thematic data analysis, to systematically examine the trajectory of vocational education reform in China. To achieve this, the analysis constructs a tripartite framework of "model innovation-system upgrading-international advancement".

THE GLOBAL RISE OF CHINA'S VOCATIONAL EDUCATION: DEMONSTRATING SCALE ADVANTAGES AND STRATEGIC VALUE

The fundamental reason that China's vocational education has reached the global stage lies in its scale advantages and strategic value, which are reflected not only in quantitative growth but, more importantly, in close alignment with the demands of economic and social development.

Construction and optimization of the world's largest system

China has built the world's largest and most comprehensive modern vocational education system. As of 2024, there were 11,000 vocational colleges and universities nationwide with nearly 35 million students, forming a significant scale advantage compared with traditional vocational education leaders such as Germany and the United States. More crucially, the system structure has been continuously optimized. Vocational undergraduate education has expanded rapidly from its inception, with the number of institutions expected to reach 51 in 2024; higher vocational education has expanded steadily, and the foundation of secondary vocational education has been continuously consolidated. These development have together built a vertically connected academic system, established vocational education as an independent track within the education system, and overcome the hierarchical constraints that once limited earlier talent-training models.

A core pillar supporting national strategies

The development of China's vocational education is deeply integrated into national modernization, serving as a key driver of industrial upgrading and an important foundation for improving people's well-being. Data show that vocational colleges and universities train more than 10 million graduates annually on average, accounting for more than 70% of new front-line practitioners in key fields such as modern manufacturing, strategic emerging industries, and modern services (Ministry of Education of the People's Republic of China, 2022), becoming an important talent pool supporting the transformation from "Made in China" to "Created in China". Meanwhile, vocational education provides more than 500 million participants of various social trainings annually, offering strong support for building a skilled society and promoting the construction of a lifelong learning system. From training workers for overseas projects under the Belt and Road Initiative to implementing the "Million High-Quality Farmers Training Program" to boost the rural revitalization strategy (Gu *et al.*, 2025), vocational education has become an indispensable pillar of major national strategies.

MODEL INNOVATION OF CHINA'S VOCATIONAL EDUCATION TOWARD GLOBAL LEADERSHIP

Model innovation grounded in China's domestic circumstances and responsiveness to contemporary demands has driven its vocational education system toward the global frontier, reshaped the framework of vocational education development, and provided a new theoretical model for global vocational education development. China's vocational education model demonstrates remarkable innovation across three core aspects: Building a distinctive organizational form of industry-education integration, implementing comprehensive digital empowerment, and creating a new paradigm of branded, standardized international exchange.

A new model of "vertical and horizontal integration" in industry-education integration

From a global perspective, industry-education integration takes multiple forms, such as the enterprise-led dual system in Germany and the national qualification framework model in Australia. Breaking through traditional paradigms, China has pioneered a distinctive path guided by the government, driven by the market, and coordinated by multiple stakeholders, deepening the two-way integration between the industrial chain and the regional economy (Shi, 2024). This has not only transformed China's forms of cooperation but also its institutional innovation—promoting the deep integration of educational, talent-development, industrial, and

innovation ecosystems.

Horizontal integration: Municipal industry-education consortia deeply integrated into regional economic development

The "horizontal" dimension focuses on enhancing the integration of vocational education with local economic development, including using "municipal industry-education consortia" with key industrial parks as the starting point for integrating various stakeholders, such as local governments, vocational colleges and universities, and enterprises in the parks. This model moves beyond the traditional school-enterprise cooperation model and aims to build an ecosystem that integrates talent training, technological innovation, and social services within a specific geographical area. Relying on the industrial advantages of German-funded enterprises, Taicang City, Suzhou, established the "Sino-German Intelligent Manufacturing Industry-Education Consortium". Beyond merely replicating the German dual system, this model is widely regarded as exemplary for resolving the perennial "school-hot-enterprise-cold" dilemma in Chinese vocational education through deep institutional coupling. It not only implements the German dual-system training model but also innovates, transforms, and disseminates international experience by building a dual-system industrial park and a national German-funded vocational qualification examination center, forming a unique "Taicang Model" (Yang, 2020). As of 2024, 34 national-level municipal industry-education consortia have been built across the country, forming a collaborative framework covering eastern, western, southern, and northern regions, becoming important nodes supporting regional industrial upgrading and promoting new urbanization.

Vertical integration: Industry-education integration communities precisely aligned with industrial chains

The "vertical" dimension focuses on strengthening the adaptability of vocational education to the development needs of national strategic industrial chains, using leading enterprises, top vocational colleges and universities, and scientific research institutions as lead units to form cross-regional "industry-education integration communities" as the primary platforms. Focusing on technical problems and talent shortages in specific industries such as advanced rail transit equipment and nonferrous metals, the communities carry out coordinated talent training, key technological research and standard formulation, overcoming the limitations of traditional point-to-point school-enterprise cooperation and promoting the deep integration of educational resources with the upstream and downstream of the industrial chain (Zhou, 2025). The National Industry-Education Integration Community for Rail Transit Equipment has not

only promoted the reform of domestic talent training but also extended its international influence by establishing "High-Speed Rail Workshops" in Malaysia, Mexico, and other countries. Relying on the "CRRC + Colleges + Localities" model, it has systematically exported 31 standards, developed 25 sets of professional textbooks, and trained more than 1500 local employees, effectively advancing the alignment of China's vocational education resources with global capacity cooperation. Data from 2024 show that 928 industry-education integration communities have been built nationwide, covering key sectors of the national economy, with major industrial provinces such as Shandong, Jiangsu, and Guangdong ranking highest in the number of constructions.

The core theoretical value of the new "vertical and horizontal integration" model lies in adapting to the diverse and complex needs of a large economy for technical and skilled workers through a matrix governance structure: The "horizontal" dimension ensures rapid adaptation to the characteristics of regional industries and labor markets, and the "vertical" dimension guarantees strong support for national strategic industries and technological innovation. The two work together to form an industry-education integration network with both local rootedness and industrial foresight. This practice has effectively solved common bottlenecks in traditional industry-education integration, such as misaligned incentives between schools and enterprises, fragmented cooperation, and disconnection from industrial upgrading, demonstrating the strong mobilization and coordination capabilities of China's vocational education system at the organizational and institutional levels (He et al., 2026).

Digitally driven innovation in teaching and governance

Amid the global wave of digital transformation in vocational education, China's strategy goes beyond the mere application of technical tools. By building the National Smart Education Platform and implementing a data-driven governance framework, it has carried out comprehensive, systematic reforms, realizing a shift in some fields from catching up to leading.

National smart education platform promotes resource integration and builds a global digital ecosystem

The cornerstone of China's vocational education digital transformation is the National Smart Education Platform for Vocational Education. Launched in 2022, the platform released an international version in 2024, achieving a leap from serving the domestic market to reaching a global audience (Research Group of Renmin University of China, 2025). Its innovation lies in a government-led integration

model that goes beyond the nature of a simple curriculum website, developing into a comprehensive ecosystem covering functional modules such as professional teaching resource libraries, high-quality online courses, virtual simulation training, textbook resources, and teacher development. By the end of 2024, the platform had integrated more than 7.15 million resources and served more than 23 million users, with the highest daily visits exceeding 35 million (Research Group of Renmin University of China, 2025). Compared with the market-driven and scenario-based models in some countries, the advantage of China's platform lies in its comprehensive vision and openness. Through cooperation with more than 3000 enterprises to build resources, it has synchronized curriculum content with industrial development; shortened the update cycle of core courses to 3 months; built a full-process digital system covering resources, teaching, evaluation, and certification; and begun to form a new digital vocational education ecosystem supporting ubiquitous lifelong learning.

Data-driven governance: Professional dynamic adjustment mechanism achieves precise supply-demand matching

China's substantive innovation of digitalization is reflected in the transformation of its macro-governance model of vocational education, of which the data-driven professional dynamic adjustment mechanism is a prime example (Zhu, 2024). China has built a national management and public information service platform for vocational college program offerings integrating real-time data on key indicators such as enrollment, and employment to enable dynamic monitoring and early warning of program performance. Education management departments implement precise early warning and adjustment based on data analysis, issuing warnings and guiding the closure of programs with high repetition rates and low employment rates. In 2024, the state established a dynamic revision mechanism for the Catalog of Vocational Education Programs to effectively meet the needs of emerging industries.

The 2021 revision of the National Catalogue of Vocational Programs resulted in an adjustment amplitude of 260%—calculated as (newly added + discontinued + substantially revised programs) / the baseline number of vocational undergraduate programs—and established an integrated framework linking secondary, higher vocational, and undergraduate education (Research Group of Renmin University of China, 2025). It promotes the clustering of colleges and universities into industrial parks, breaks down traditional professional barriers, and forms interdisciplinary professional clusters. Through measures such as enterprises investing in training equipment and jointly building training bases (the value of equipment invested in by enterprises

reached 18,769 billion yuan in 2024), it achieves the two-way integration of the education chain and industrial chain in physical infrastructure and curricular content. Compared with the model of regular evaluation by industry associations in Germany and independent adjustment by community colleges in the United States, China's national-provincial-college three-level collaborative governance mechanism leverages big data to demonstrate refined and forward-looking governance capacity for the large-scale vocational education system, greatly reducing the risk of human resource mismatch.

International brand building and standard export

China's vocational education internationalization has achieved a major leap from the "initial exploration stage" to the "scale development stage". China has promoted vocational education internationalization through multiple pathways (Zong, 2025). These include establishing overseas institutions, exporting professional standards and curricula, and jointly training skilled workers with enterprises. This process interacts closely with the Belt and Road Initiative, forging a distinctive pathway characterized by the synergy of infrastructure connectivity (hard connectivity), standards and technology alignment (soft connectivity), and people-to-people bonds (heart connectivity).

Brand carrier: Global expansion and local adaptation of Luban Workshops

Luban Workshops have become a benchmark brand for the internationalization of China's vocational education. They are not simply overseas branch schools but vocational and technical education and training projects jointly built with partner countries, adhering to the principles of "equal cooperation, adapting to local conditions, and quality first" (Bai et al., 2024). Their core characteristics are standardized Chinese equipment, localized Chinese standards, and locally implemented teaching. As of 2024, China has built 34 overseas Luban Workshops in Asia, Africa, Europe, and other regions. The strategic layout in Central Asia and Africa highlights the initiative's important role in promoting international capacity cooperation and supporting national diplomatic strategies. It has achieved full coverage in 10 Association of Southeast Asian Nation (ASEAN) countries, has built 17 modern craftsman colleges and 54 training centers, and has shared 199 resources on the vocational education cloud platform, forming a multi-dimensional cooperative network. This branding strategy ensures the uniqueness, sustainability, and replicability of international cooperation.

Standardization leadership: From the Tianjin Consensus to the Beijing Protocol

China's international ambitions in vocational education are

reflected in the shift from single project export to actively participating in and leading the formulation of international rules and standards. The 2nd World Vocational and Technical Education Development Conference in 2024 became an important milestone, yielding two landmark outcomes: First, the Tianjin Consensus, signed by education ministers of 32 countries (J. P. Li, 2025), established a common vision of building a "fairer, more inclusive and more sustainable" global vocational education system, earning wide international recognition and providing a shared framework for global vocational education cooperation. Second, the conference introduced the concept of a Beijing Protocol for global vocational education quality certification, aiming to promote equivalence of academic qualifications and credit recognition between global vocational education systems, unify quality standards and accreditation mechanisms, enhance the resilience of vocational education in responding to the challenges of industrial transformation, and lay a solid foundation for skills cooperation in service of a shared global future.

China plays a key role in assisting partner countries in formulating national vocational standards. The "Tanzania National Vocational Standard Development Project" is a representative example: China assisted Tanzania in formulating 93 vocational standards, successfully transforming Chinese technical specifications into internationally recognized standards and sharing "Chinese + Vocational Skills" digital resources through the cloud platform to build a standardized model of integrated online and offline delivery.

The model innovation of China's vocational education is a systematic and interrelated practice with progressive and hierarchical development characteristics. The innovative model of "vertical and horizontal integration" of industry-education integration effectively aligns talent training with industrial needs; the digitally driven transformation improves the responsiveness and governance efficiency of the education system; and branded, standardized international export enhances global influence by building on the solid foundation of the preceding two innovations (Jia & Cao, 2025). Together, these three innovations constitute the core competitive advantage of China's vocational education on the path to global leadership.

SYSTEM IMPROVEMENT OF CHINA'S VOCATIONAL EDUCATION TOWARD GLOBAL LEADERSHIP

Optimization and integration of hierarchical structure

For a long time, vocational education has been regarded as a

terminal track with no pathway to higher education, which has significantly undermined its attractiveness. China solved this problem through high-level institutional design, with the core goal of establishing vocational education's status as an independent track within the education system and building a composite talent-training framework with vertical connection and horizontal integration on this basis.

Vertical connection: Formulating independent and complete academic standards for vocational education

The qualitative improvement of China's vocational education system is first reflected in the fundamental restructuring of its hierarchical framework. The Law of the People's Republic of China on Vocational Education (revised 2022) legally establishes that vocational education is equally important as general education, building an education system vertically connecting secondary vocational education, junior college-level higher vocational education, and vocational undergraduate education. In 2024, there were 51 vocational undergraduate colleges and universities nationwide with 406,800 students, evolving rapidly from non-existence to scale. This change represents not only quantitative growth but also a qualitative leap in the overall completeness of the system. The vocational college entrance examination system with "cultural quality + vocational skills" as its core serves as the main channel for further education, providing a clear path for vocational education students and effectively removing barriers to their academic advancement. In the 2024 academic year, vocational undergraduate students admitted through the vocational college entrance examination accounted for 13.34% of all new entrants to vocational undergraduate programs, and junior college-level vocational education students accounted for 43.34% of new junior college enrollments (Research Group of Renmin University of China, 2025).

Horizontal integration: Promoting two-way integration of vocational education and general education in institutions and resources

In striving to achieving vertical connection, "integration of vocational and general education" has become an important indicator of the flexibility and inclusiveness of the system (Ma et al., 2025). More than a simple merger, this integration refers to the realization of resource sharing and mutual recognition of academic systems while preserving the characteristics of each track, with the institutional framework centering on two-way flows of enrollment and credit transfer. The comprehensive high school model represents the main form of China's promotion of vocational and general education integration (Kuang, 2025). Some regions have piloted the construction of comprehensive high schools or combined vocational-general classes, allowing

students to transfer between ordinary high schools and secondary vocational schools under certain conditions or according to their interests and abilities, while also exploring credit mutual recognition. In 2024, more than 40,000 ordinary high school students in Shandong Province transferred to secondary vocational schools. The model also promotes the co-construction of courses and resource sharing, integrating professional training facilities and vocational experience centers of vocational colleges and universities into mainstream primary and secondary school education, and incorporating vocational awareness courses into the standard curriculum. The two-dimensional framework of "vertical connection, horizontal integration" aims to meet society's needs for diverse talent development paths, provide institutional support for the national policy commitment to "everyone can become talented and give full play to their workers", and enhance the inherent attractiveness of vocational education.

Modernization of the governance system

Promoting diversified school running and cultivating a socialized school running ecosystem

While public colleges and universities remain the primary providers of vocational education, China actively encourages the participation of industries and enterprises in school operation, fostering a coordinated public-private development model (Research Group of Institute of Industrial Economics-Chinese Academy of Social Sciences, 2025). In 2024, private secondary vocational schools accounted for 30.60% of the total number of secondary vocational schools nationwide, while private higher vocational colleges accounted for 25.60%. The flexible structure of private vocational education has enriched the supply of educational services and improved responsiveness to market demand. The extensive participation of enterprises in school operation is reflected in wide-ranging integration: 4609 enterprises across the country jointly issued annual reports on talent training quality with 1187 higher vocational colleges, and enterprises have invested a total of 18,769 billion yuan in training and teaching equipment, demonstrating their key role in the cultivation of technically skilled workers.

Achieving standardization and inclusiveness in resource provision

Solid public financial investment is a unique cornerstone of China's vocational education system. The state places vocational education in a priority investment position. Between 2012 and 2023, the per capita public financial budget education funds for secondary and higher vocational colleges and universities grew significantly (He, 2025). On this basis, China has built the world's largest vocational education student funding system, with funding exceeding

60 billion yuan in 2024, institutionally guaranteeing equity in educational opportunities (Research Group of Renmin University of China, 2025). At the same time, building a "dual-qualification" teacher workforce—defined as educators possessing both academic instructional competence and practical industry expertise—has become the core of quality assurance. China has established a systematic framework for the identification, development, and training of dual-qualification teachers. Over the past decade, central and local governments have invested more than 10 billion yuan in teacher training. In 2024, the proportion of dual-qualification teachers in national vocational colleges and universities reached 58%, and more than 80% of the first batch of "Double High Plan" (China's initiative to build high-level vocational schools and high-level professional programs) colleges and universities had a dual-qualification teacher ratio exceeding 60% (Research Group of Renmin University of China, 2025). Together, robust public investment and the systematic professionalization of the teaching workforce have laid a solid foundation for the high-quality vocational education development.

Strategic framework serving national development

The strategic structure of China's vocational education system is highly compatible with national macro-policies, as it forms a response network that seamlessly aligns with the needs of regional development, industrial upgrading, and global cooperation.

Aligning with the regional coordinated development strategy

The layout and program offerings of vocational education colleges and universities are closely aligned with major national and regional strategies, showing differentiated and precise characteristics (Wang et al., 2025): The eastern region increasingly focuses on high-tech industries and modern services and boasts the highest proportion of vocational undergraduate institutions; the central region focuses on advanced manufacturing, consolidating the dominant position of junior college-level higher vocational institutions; the western region strategically promotes the construction of vocational undergraduate education to support the development of distinctive industries and undertake industrial transfer; the northeastern region focuses on consolidating the foundation of secondary vocational education to upgrade traditional industries and develop modern agriculture (Z. Li, 2025). This framework, adapted to the functional positioning of the regional economy, ensures that the human resource supply provided by vocational education matches regional demand for local development.

Adapting to the needs of a modern industrial system

Vocational education has established a professional dynamic adjustment mechanism, seamlessly aligned with the pace of industrial development, with the core of relying on a data-driven early warning system to phase out obsolete programs in a timely manner (Xiu & Liu, 2026). In 2024, 5052 obsolete programs were closed nationwide, and colleges and universities were encouraged to add program related to national strategic emerging industries such as integrated circuits and artificial intelligence (AI). In 2024, national higher vocational education offered 62,020 programs, of which 31.39% were aligned with national key industries, 34.95% served regional pillar industries, and 33.86% effectively served local distinctive industries; in the strategic frontier areas of 14 key national industrial chains such as advanced manufacturing, integrated circuits, AI, and machine tools, 2123 new programs were systematically added. This flexible professional development mechanism, with the capacity to expand and adjust, ensures the precise alignment of talent training with industrial needs (Research Group of Renmin University of China, 2025).

Integrating vocational education into China's broader international engagement strategy

The internationalization of vocational education is deeply integrated into national diplomatic strategies, forming a systematic framework supporting the implementation of the Belt and Road Initiative, and is characterized by a regional focus, platform support, and standard leadership (Sun *et al.*, 2026). In the ASEAN region, with Guangxi as the strategic gateway, China engages in wide-ranging cooperation with 10 countries, jointly formulates standards, develops textbooks and courses, and promotes the deepening of capacity cooperation. In Central Asia, with four Luban Workshops as the core hub, China implements a customized cooperation strategy of "one country, one policy", focusing on renewable energy, logistics, and other fields. In Africa, 17 Luban Workshops have been built, focusing on training localized technically skilled workers for major infrastructure projects such as the Mombasa-Nairobi Railway and the Addis Ababa-Djibouti Railway. Resource sharing is facilitated through digital platforms such as the China-ASEAN Vocational Education Cloud Platform. More importantly, the focus of cooperation has shifted from project-based cooperation to systematic standard export, exemplified by the formulation of 93 national vocational standards for Tanzania. The World Vocational and Technical Education Development Conference has become an important platform for promoting the implementation of the Tianjin Consensus and advocating the formulation of the international Beijing Protocol for vocational education quality certification, demonstrating that China's role in shaping the global vocational education governance landscape is increasingly

prominent (Wang, 2025).

China's vocational education system is undergoing a comprehensive transformation, from internal structure to external function and from institutional construction to resource allocation: By building a coherent academic framework that bridges vocational segments vertically and integrates them horizontally with general education, it effectively addresses the longstanding problems of unclear track positioning and limited pathways for academic advancement in vocational education; by establishing a modern governance model based on collaborative stakeholder coordination and standards leadership, it improves the operational efficiency and quality standards of the system; and through the strategic path of skills provision with economic priorities, vocational education is effectively positioned as an important component of national strategy (Pan & Nie, 2026). This increasingly mature and expanding system provides a solid institutional framework and operating platform for the model innovations discussed above, jointly supporting China's vocational education in achieving a major transformation from prioritizing scale to prioritizing quality and influence.

CHALLENGES AND PATH OPTIMIZATION

China's vocational education is undergoing a historic transformation from scale expansion to quality-driven development, and from international participation to standard export. To truly build the world's largest vocational education system into a global benchmark, it is necessary to confront deep-seated development challenges and promote systematic optimization with strategic determination (Research Group of Institute of Industrial Economics-Chinese Academy of Social Sciences, 2025).

*Existing systematic challenges**Challenges of systematic coordination*

Despite the progress outlined above, significant structural imbalances persist. Deficiencies in regional coordination and industry-education integration remain. For example, the spillover effects of innovative resources from key regions to less developed areas are limited, failing to effectively drive the development of underdeveloped areas, and the development gap between vocational education in the eastern, central, and western regions remains. The core challenge of industry-education integration is the prominent problem of supply-demand mismatch, characterized by "hot schools and cold enterprises"—where institutions are eager while enterprises remain reluctant (Yao & Qiu, 2025), the root cause of which is the imperfect benefit- and risk-sharing mechanism. Data show that the average update cycle of textbooks in vocational colleges and universities is 5.3 years, much

slower than the rapid iteration cycle of 1.8 years for manufacturing technology, leading to a disconnect between talent training and industrial development (Zheng, 2025). Although higher vocational colleges and universities undertake a considerable number of national-level scientific research projects, their patent conversion rates are low, indicating that the substantial support potential of vocational education for the innovation chain has not been fully realized.

Internationally, significant adaptability challenges also remain. For example, overseas expansion brands such as Luban Workshops face deep-seated problems of localized adaptation in standard and model export across different cultural settings. Additionally, current cooperation is still dominated by skills training, and the sustainability of cooperation depends on the effective integration of Chinese standards and curricula with the cultural, industrial, and educational contexts of partner countries-realizing the transformation from "China-led export" to "Sino-foreign collaborative development". Meanwhile, in international vocational education governance, there is an urgent need to enhance China's capacity for agenda setting, agenda guidance, and rule formulation (Cai, 2025).

Challenges of enhancing quality-driven development

At present, the diffusion of high-quality development remains constrained. The demonstration effect of the "Double High Plan" is limited for several reasons. The advanced governance models and curriculum frameworks of "Double High Plan" colleges and universities are difficult to replicate due to differences in resource endowments and institutional environments. This creates a core tension between cultivating isolated "bonsai" (elite model colleges) and fostering a thriving "forest" (a robust, sector-wide ecosystem) (Zhang, 2022). Teaching reform faces significant bottlenecks, as current digital teaching reforms remain confined to the instrumental application of generic digital tools, and deeper education model reforms driven by big data and AI, such as personalized learning and process evaluation, have not been widely adopted. Additionally, although the institutional framework for vocational-general integration has been established, many technical and institutional problems in operation-such as credit mutual recognition and course sharing-as well as barriers to student mobility between different education systems persist. Key resource constraints persist as well. Although the proportion of dual-qualification teachers has significantly increased, gaps in the quantity and quality of the teaming workforce remain. Whereas enterprise technical experts face institutional barriers such as rigid staffing systems, misaligned salary structures, and inflexible professional-title evaluation mechanisms when entering colleges and universities to

teach, college teachers generally lack enterprise practical experience and cannot keep up with the latest industrial developments-constraints that materiality limit the quality of talent training.

Challenges of platform effectiveness

A significant efficacy gap persists between platform deployment and actual utilization. The smart platform's intelligent application functions remain underdeveloped. Although the National Smart Education Platform for Vocational Education has gathered considerable resources, its functions are still mainly resource storage and display, and the core "smart" functions such as data-driven personalized learning recommendation, intelligent diagnosis and intervention of teaching process are still in their early stages. The platform lacks effective integration with offline daily teaching and has not become an essential tool for reshaping teaching practice, and digital literacy disparities among teachers and students may exacerbate new educational inequities.

A disconnect also persists between participation in the World Vocational Colleges Skills Competition and engagement with the World Vocational and Technical Education Conference. The elite characteristics of the World Vocational College Skills Competition contradict the principle of educational inclusiveness, and the advanced technical standards and crafts displayed in the competition have not been effectively and integrated into mainstream courses and updated teaching materials in a timely manner. As an important platform for diplomacy and development, the World Vocational and Technical Education Development Conference suffers from a disconnect between the production of intellectual outputs and their operationalization. Consequently, these outputs fail to translate into substantive cooperative actions, binding multilateral agreements, or globally recognized standards at the national level.

Future optimization paths

Strengthening systematic coordination and building an integrated vocational education community

The primary task is to deepen industry-education integration and build a benefit-sharing community. Vocational education must move beyond project-based cooperation based on institutional construction, establish industry-education integration entities with independent legal personality (jointly funded by the government, industry, enterprises, and colleges and universities) (Kuang & Zhu, 2024), clarify the rights, responsibilities, and interests of each stakeholder, and fundamentally solve the problem of mismatched enthusiasm between schools and enterprises. It must also establish a dynamic early warning and rapid

response mechanism for professional adjustment based on industrial technology development data and substantially shorten the revision cycle of talent training programs and textbooks.

A second priority is to implement targeted regional coordinated development strategies by establishing national, regional, and provincial vocational education collaborative promotion mechanisms, encouraging developed regions to explore innovative models and promote them nationwide; implementing targeted capacity-building assistance plans of "one county, one policy" for underdeveloped regions and key counties for rural revitalization; focusing on cultivating characteristic small programs fitting local industries; and promoting the formation of sustainable endogenous development momentum.

A third priority is to advance a comprehensive strategy of deepening the localization of international cooperation by repositioning brands such as Luban Workshops from traditional training centers to comprehensive cooperation platforms covering technology promotion, academic education, cultural exchange, and joint research and development; establishing special funds to support Chinese and foreign teams to jointly develop vocational education standards and curricula adapted to national conditions to realize the reconstruction of Chinese standards by integrating local needs; and taking the lead in, or actively participating in, the formulation of regional and global vocational education quality certification standards.

Deepening quality-driven development and stimulating internally driven momentum for high-quality growth

The primary task is to upgrade the "Double High Plan" and drive overall improvement. This requires launching the "Double High Plan" experience-sharing initiative, building a pairing assistance system between "Double High" colleges and ordinary colleges and universities, and promoting the interoperability of high-quality resources; improving the evaluation framework of the "Double High Plan" to assess its actual contributions to industrial upgrading, regional economic development, and reform leadership; and building a classification system of higher vocational colleges with Chinese characteristics to encourage colleges and universities to develop distinctive profiles and compete differentially, promoting the formation of a diversified development landscape.

A second priority is to deepen curriculum reform and promote teaching innovation. This entails building an interdisciplinary and project-based curriculum framework to promote the comprehensive transformation of teaching content and methods through real enterprise projects; using

AI and big data technology to promote the deep integration of digital technology and education and teaching to enable personalized learning recommendation and intelligent teaching evaluation; breaking the integration barriers of vocational and general education systems; improving the national qualification framework; standardizing credit mutual recognition and course sharing; and broadening the development channels of technically skilled workers.

A third priority is to strengthen teacher resources and governance mechanism construction and to consolidate the foundation for sustainable development. This involves formulating a plan for recruiting and cultivating excellent dual-qualification teachers; breaking institutional and process barriers; establishing a mechanism for two-way exchange, joint employment, and resource sharing of school-enterprise personnel; promoting the modernization of college governance, optimizing the internal governance structure, strengthening data-driven decision-making mechanisms and risk management capabilities, and improving the adaptability and sustainability of institutional development.

Maximizing platform effectiveness and building a smart and innovative transformation engine

The core goal is to promote the upgrading of the smart education platform to an intelligent data-driven platform by strengthening the core function of data intelligence; developing personalized learning engines and teaching decision support systems; improving the precise service capacity of the platform; increasing investment in digital infrastructure in underdeveloped areas; implementing training programs to improve the digital literacy of teachers and students; bridging the digital divide; promoting the fair sharing of high-quality educational resources; promoting the deep integration of the platform with the whole process of teaching; and encouraging innovative models such as blended teaching and project-based learning so that the platform can truly become a boost to improve teaching quality and efficiency.

A second goal is to promote the transformation of the World Vocational College Skills Competition into a catalyst for educational innovation by establishing a long-term mechanism for integrating competition standards, crafts, and resources into conventional courses to achieve seamless and timely alignment between cutting-edge technologies, advanced methods, and evaluation standards and teaching content; expanding the inclusive reach of competition achievements so that more students can benefit from competition-driven educational innovation, and strengthening the cultivation of broad technical skills.

A third goal is to promote the upgrading of the World

Vocational and Technical Education Development Conference to a core platform for global governance by positioning the conference as a cradle for leading global vocational education ideas, a cooperation platform for international standard formulation, and a core hub for cross-border cooperation; proactively setting international agendas and disseminating the concepts, models, and standards of China's vocational education; strengthening the collaboration between the conference and industries, colleges and universities, and international organizations to form a virtuous circle of conference-driven integration and development, and enhancing China's voice and influence in the global vocational education arena.

CONCLUSION

The course of China's vocational education toward global leadership is a dynamic development process in which remarkable achievements coexist alongside challenges. Drawing on case synthesis and systematic data analysis, the model innovation, system upgrading, and international advancement examined in this paper are not only a theoretical summary of China's rapid development to date but also a its future development trajectory. To effectively meet these challenges, China must address coordination problems with systematic institutional innovation, reshape educational practice through extensive digital transformation, and engage in global governance. Only by doing so can China transform current obstacles into stepping stones to higher-quality development.

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REFERENCES

- Bai, L., Wang, H., & Xu, J. (2024). [Ten years of the Belt and Road Initiative: Achievements, Shortcomings and Prospects of the Internationalization Development of Higher Vocational Education]. *Education and Vocation*, (2), 13-20. <https://doi.org/10.13615/j.cnki.1004-3985.2024.02.008>
- Cai, Y. (2025). [Dual attributes and development strategies of Luban Workshop from the perspective of community theory]. *Vocational Education Research*, (11), 81-87.
- Gu, J., Liu, Y., & Zhao, Q. (2025). [Typical Models and Innovative Pathways for Achieving Common Prosperity Driven by Humanistic Economy]. *Journal of Shanghai Jiaotong University (Philosophy and Social Sciences)*, 33(10), 64-81. <https://doi.org/10.13806/j.cnki.issn1008-7095.2025.10.005>
- Guo, H. N., Zhang, L., & Wang, X. (2023). [Preliminary exploration of the direction and path of China's vocational education digitalization reform: Based on the analysis of German's "Vocational Education 4.0"]. *Chinese Vocational and Technical Education*, (18), 31-37.
- He, Y. J. (2025). [A Study on the Prediction of Higher Education Resource Demand and Configuration Optimization in Jiangxi Province Based on the Changes of School-Age Population]. *Journal of Zhaotong University*, 47(6), 60-75.
- He, Z. P., Wu, K., & Sun, L. (2026). [Key Tasks, Practical Dilemmas and Breakthrough Paths for the Construction of Higher Vocational Colleges under the Background of the Second Phase of "Double-high Plan"]. *Vocational and Technical Education*, 47(2), 12-19.
- Jia, C. R., & Cao, H. T. (2025). [Modern industrial system construction of China's future industries: Driving logic, path selection and optimization countermeasures]. *Scientific Research*, 43(6), 63-73. <https://doi.org/10.19445/j.cnki.15-1103/g3.2025.06.007>
- Kuang, Y. (2025). [Policy evolution, practical exploration and future direction of vocational-general education integration in China during the "14th Five-Year Plan" period]. *Vocational & Technical Education Forum*, 41(11), 30-37.
- Kuang, Y., & Zhu, Z. R. (2024). [The key to deepening industry-education integration in vocational education is to realize the entity operation of cross-border organizations]. *Journal of Hebei University (Philosophy and Social Science)*, 49(2), 81-92.
- Li, J. P. (2025). [The leading system and development path of China's vocational education internationalization "going out"]. *Educational Research*, 46(3), 22-27.
- Li, Z. (2025). [Population change and optimal allocation of vocational education resources in China: From the perspective of population economics]. *Vocational & Technical Education Forum*, 41(12), 19-28.
- Ma, L. H., Zhang, W., & Liu, Q. (2025). [Basic connotation, generation logic and practical framework of "vocational-continuing education integration" serving aging society]. *Research in Educational Development*, 45(19), 50-61. <https://doi.org/10.14121/j.cnki.1008-3855.2025.19.006>
- Ministry of Education of the People's Republic of China. (2022, May 24). More than 70% of new frontline personnel in modern manufacturing come from vocational college graduates. Retrieved May 19, 2026, from http://www.moe.gov.cn/fbh/live/2022/54487/mtbd/202205/t20220525_630315.html
- Pan, H. S., & Nie, R. Y. (2026). [Tension and adjustment of local government governance functions in the process of vocational education industry-education integration]. *Journal of Higher Education Management*, 20(2), 77-88. <https://doi.org/10.13316/j.cnki.jhem.1673-8381.2025-1655>

- Research Group of Institute of Industrial Economics-Chinese Academy of Social Sciences. (2025). [Deepening high-quality development of China's industry during the "15th Five-Year Plan" period: New situation, new tasks, new measures]. *China Industrial Economics*, (12), 5-23. <https://doi.org/10.19581/j.cnki.ciejournal.2025.12.001>
- Research Group of Renmin University of China. (2025). [*Annual Report on Chinese Modernization Development (2024)*]. China Renmin University Press.
- Shi, X. J. (2024). [Theoretical research review, practical exploration and promotion strategies of "two-wing" industry-education integration construction]. *Education and Vocation*, (21), 46-53. <https://doi.org/10.13615/j.cnki.1004-3985.2024.21.005>
- Sun, J. W., Li, H., & Wang, Q. (2026). [Key tasks and practical paths for promoting the formation of a new pattern in the large-scale development of the western region during the "15th Five-Year Plan" period]. *Journal of Northwest Normal University (Social Sciences)*, 63(1), 5-15. <https://doi.org/10.16783/j.cnki.nwnus.2026.01.001>
- Wang, L. (2025). [Research on International Discourse Power of China Participating in Global Vocational Education Governance: A Case Study of Global Luban Workshop]. *Research in Educational Development*, 45(3), 26-36. <https://doi.org/10.14121/j.cnki.1008-3855.2025.03.012>
- Wang, T. P., Li, S., & Chen, X. (2025). [The 2024-2035 Master Plan on Building China into a Leading Country in Education Promotes the High-quality Development of Basic Education]. *Chinese Journal of ICT in Education*, 31(9), 11-24.
- Xiu, N., & Liu, Q. (2026). [The Logical Mechanism and Practical Path of Multi-Agent Embedding in Municipal Industry-Education Consortiums]. *Contemporary Vocational Education*, (1), 54-62. <https://doi.org/10.16851/j.cnki.51-1728/g4.20260120.001>
- Yang, P. (2020). [*Skill formation and regional innovation: Functional analysis of school-firm collaboration in vocational education*]. Social Sciences Academic Press.
- Yao, H., & Qiu, J. M. (2025). [From Aid to Mutual Benefit: Research on Regional Coordinated Development of East-West Collaboration in the New Era]. *Research on Development*, (6), 15-23. <https://doi.org/10.13483/j.cnki.kfj.2025.06.002>
- Zan, T., Li, M., & Chen, S. (2025). [Roundtable Discussion: Multidimensional Perspectives on the Global South]. *Social Sciences International*, (6), 20-86+243-244.
- Zhang, B. Z. (2022). [*Research on innovative development of modern apprenticeship with Chinese characteristics from the perspective of international comparison*]. Chemical Industry Press.
- Zhang, L., & Zhou, L. (2025). [The Game Dynamics of Global Digital Education Governance and China's Strategic Choices—Based on the "Agent-Structure" Theoretical Perspective]. *Journal of National Academy of Education Administration*, (11), 27-38.
- Zheng, C. Y. (2025). [*Prospective research on China's economic development "15th Five-Year Plan"*]. China Renmin University Press.
- Zhou, W. (2025). [Analysis of paths and policies for promoting high-quality development of new industrialization during the "15th Five-Year Plan" period]. *Theory Monthly*, (11), 5-19. <https://doi.org/10.14180/j.cnki.1004-0544.2025.11.001>
- Zhu, G. L. (2024). [*Research report on Chinese government development (2022-2023)*]. National Academy of Governance Press.
- Zong, C. (2025). [The Internationalization of China's Vocational Education: A Review of the 14th Five-Year Plan Period and an Outlook for the 15th Five-Year Plan Period]. *Journal of Vocational Education*, 41(11), 38-46.