

Original Paper

Research on the Practical Paths of Vocational Education Serving the Development of Chongqing's Local Characteristic Industries

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Abstract

Against the strategic backdrop of Chongqing's accelerated efforts to build a modern manufacturing cluster system, vocational education—as the core pillar supporting the development of local distinctive industries—faces challenges such as a disconnect between program development and industrial needs, a disparity where schools are enthusiastic about industry-education integration while enterprises remain lukewarm, a shortage of dual-qualified teachers, and a lack of digital resources. Based on an integrated perspective combining industry-education integration theory, human capital theory, and regional economic theory, this paper constructs a three-dimensional analytical framework encompassing the demands of local distinctive industries, program design, and talent cultivation. The study finds that the construction of an industry-education integration network is a multi-layered embedded process involving supply-demand alignment, resource transformation, and value co-creation. New human capital theory requires shifting the focus of talent cultivation from rapid job readiness to sustainable development capabilities, while regional economic theory emphasizes that vocational education must be deeply aligned with regional resource endowments. Accordingly, this paper proposes a set of strategies from three dimensions: innovation in talent cultivation models under the framework of industry-education integration, development of teaching resources under the framework of human capital theory, and the establishment of policy safeguards under the framework of regional economic theory. These strategies include the establishment of substantive industry-academic colleges, the improvement of mechanisms for dynamic program adjustment, the development of digital teaching resources, and the strengthening of dual-qualified faculty. This explores the construction of a new vocational education paradigm characterized by the deep integration of local industrial chains, distinctive clusters of majors, and talent pools, thereby providing theoretical support and practical solutions for vocational education to serve the high-quality development of local distinctive industries.

Keywords

Vocational Education, Local Distinctive Industries, Collaborative Development, Practical Pathways

1. Introduction

1.1 Research Background

At the symposium on promoting the development of the western region in the new era, presided over by General Secretary Xi Jinping in Chongqing, he emphasized: “We must persist in taking the development of distinctive and advantageous industries as the main focus, and develop emerging industries in accordance with local conditions,” and “We must build service industries such as tourism into pillar industries of the region. We must develop new-quality productive forces in accordance with local conditions, explore the development of modern manufacturing and strategic emerging industries, plan and build future industries, and form new momentum for regional development.” Against this backdrop, vocational education—as the core pillar supporting the development of Chongqing’s local distinctive industries and a key driver of regional supply-side structural reform—urgently needs to proactively seek change and adapt scientifically. It must empower industrial upgrading through high-quality program development and talent cultivation systems, thereby injecting new momentum into Chongqing’s strategies for becoming a “hub of intelligent manufacturing” and promoting “mountain-water cultural tourism.”

However, the structural contradictions between traditional vocational education models and the modernization needs of Chongqing’s distinctive industries are becoming increasingly apparent. First, there is a disconnect between program development and the demands of local distinctive industries. The program renewal cycles at some vocational institutions are too long, failing to keep pace with emerging local sectors such as digital cultural tourism, resulting in a mismatch between talent supply and Chongqing’s strategic goals of becoming a “Smart Manufacturing Hub” and a “Mountain-Water Cultural Tourism” destination. Second, the phenomenon of “enthusiastic schools but lukewarm enterprises” in industry-education integration is prominent. School-enterprise cooperation often remains at the level of mere agreements; enterprises lack sufficient depth in participating in curriculum development and technology sharing, and training bases have low alignment with real production scenarios. Third, there is a structural shortage of “dual-qualified” (industry-academic) faculty. Vocational college teachers generally lack first-hand experience in local specialty industries and have weak innovation and iteration capabilities, making it difficult for them to meet the demands of new-quality productive forces for multi-skilled talent. Fourth, there is a scarcity of digital and regionally distinctive teaching resources. Curriculum content has failed to incorporate unique elements such as Chongqing’s mountainous economy, inland openness, and culture, while the application of digital teaching methods—such as virtual simulation—remains insufficient, thereby limiting the effectiveness of talent cultivation for distinctive industries like cultural-tourism integration and cross-border e-commerce.

In response, this paper, guided by the strategic imperative of “developing new-quality productive forces in accordance with local conditions,” adheres to the principles of industry-education integration and collaborative innovation, as well as the developmental patterns of vocational education. Grounded in Chongqing’s unique positioning as a “hub of intelligent manufacturing,” “city of mountain-water culture and tourism,” and “Inland Open Hub,” systematically elucidates the theoretical logic, practical challenges, dynamic adaptation mechanisms, and policy innovation pathways for vocational education to serve the development of distinctive industries. It explores the construction of a new vocational education paradigm featuring deep coupling among “local industrial chains, distinctive major clusters, and high-end talent pools,” providing practical solutions to address the challenges of coordinated

development between vocational education and industry, and holds significant theoretical value and practical significance.

1.2 Research Significance

At the theoretical level, this paper offers a new perspective for deepening the theory of industry-education integration. Traditional research on vocational education has largely focused on the cultivation of general-skill talent, while lacking systematic exploration of the issue of insufficient adaptability to local distinctive industries. By constructing a three-in-one theoretical framework of “local distinctive industry demand—high-quality program design—high-caliber talent cultivation,” this study enriches the theoretical implications of the coordinated development of vocational education and the regional economy, and reveals the interactive logic between local distinctive industries and vocational education. Simultaneously, this study helps expand the theoretical boundaries of interdisciplinary fields such as the economics of education and industrial sociology. It provides a theoretical foundation for exploring pathways through which vocational education can serve the high-quality development of local distinctive industries, thereby addressing the theoretical gap in existing research regarding the lack of adaptability to such industries.

From a practical perspective, this paper offers actionable solutions for vocational education to precisely serve local distinctive industries. By analyzing talent shortages in these industries, it guides vocational education institutions in adjusting their program structures and developing specialized curriculum systems, thereby achieving synchronized alignment between talent cultivation and industrial upgrading. Furthermore, the findings of this study can serve as a basis for local governments in Chongqing to formulate policies promoting industry-education collaboration. This will facilitate the establishment of joint school-enterprise training bases and other platforms, thereby reducing the time lag and skill gap between the supply of skilled talent and industrial demand. It will foster a virtuous cycle where distinctive industries support vocational education and vocational education empowers distinctive industries, ultimately contributing to the sustainable development of the regional economy.

2. Theoretical Foundation and Literature Review

2.1 Theoretical Foundation

This paper constructs a theoretical framework for vocational education serving Chongqing’s local distinctive industries, centered on the theories of industry-education integration, human capital, and regional economics. First, the theory of industry-education integration emphasizes the deep coupling of the education chain and the industrial chain, achieving dynamic alignment between teaching processes and production workflows through school-enterprise collaboration, thereby promoting synchronized development between program offerings and industrial upgrading; Second, human capital theory focuses on the driving role of skill accumulation in industrial transformation, arguing that vocational education must cultivate versatile talents equipped with digital literacy, interdisciplinary capabilities, and an innovative mindset to resolve the mismatch in talent supply arising from technological iteration and internal management processes; Finally, regional economic theory, grounded in local resource endowments and spatial layout, posits that vocational education should facilitate the high-quality development of regional distinctive economies through multi-stakeholder coordination mechanisms. Together, these three perspectives form a theoretical chain of logic, laying the analytical foundation for addressing practical issues such as the lag of vocational education behind industrial upgrading and insufficient service effectiveness.

2.2 Research on the Relationship between Vocational Education and Local Industrial Development under the Theory of Industry-Education Integration

As the core mechanism through which vocational education serves local industrial development, the concept of industry-education integration has continuously evolved with the times. Some scholars have pointed out that building a vocational education system based on industry-education integration is a strategic goal for the reform and high-quality development of China's vocational education in the new era. Since the 1980s, this goal has evolved through stages ranging from internal communication within the education sector to alignment with the labor market, and finally to using industry-education integration to drive system development. Industry-education integration has thus risen from a model of school operation to one of institutional design and ecosystem construction (Zhu, 2026). This perspective highlights the central role of industry-education integration in building a leading educational nation. Furthermore, research has elucidated the four-fold essence of a vocational education system based on industry-education integration: coordinated interaction among diverse governance entities; synergistic collaboration among diverse educational stakeholders; collaborative restructuring of key teaching elements; and joint cultivation of technical and skilled talent through collaborative efforts (Shi & Hao, 2026). At the level of operational mechanisms, research employing procedural grounded theory has found that the construction of industry-education integration networks is essentially a value-creation process based on supply-demand alignment, resource transformation, and value co-creation, with pathways involving multi-layered nesting of business-technical embedding, relational-structural embedding, and institutional-cognitive embedding (Li et al., 2026). Research from the perspective of industrial evolution dynamics emphasizes that the challenges of industry-education integration often stem from the fact that the formal integration of industrial and educational systems fails to address the underlying dynamic mechanisms. It is necessary to construct a framework that unifies the institutional logic, production objectives, and collective actions of the government, enterprises, and universities through interactive embedding (Long, 2026). At the level of practical implementation, some scholars, based on policy text analysis, point out that although industry-education integration policies have achieved significant results, issues such as insufficient goal attainment, uneven regional progress, and a lack of policy coherence still exist (Sun et al., 2026). Regarding coordinated provincial-level development, research reveals that China's industry-education integration organizations remain trapped in a dilemma of fragmented collaboration, necessitating the reconstruction of a new ecosystem featuring three-tiered spatial nesting and the integration of four-domain chains (Li, 2025). Against the backdrop of digital transformation, an analysis based on the TOE theoretical framework found that current Industry-education integration faces issues such as inadequate digital platforms at the technological level, a mismatch between supply and demand between schools and enterprises at the organizational level, and insufficient policy support at the environmental level (Xia & Luan, 2026). The effectiveness of industry-education integration is ultimately reflected in the quality of talent cultivation. Empirical research based on data from vocational colleges nationwide indicates that industry-education integration can significantly improve the quality of graduate employment, with varying promotional effects across different types of institutions (Xie & Fan, 2026). From the perspective of talent-matching mechanisms, vocational education needs to establish a three-pronged ecosystem comprising external adaptation to industrial transformation, internal adaptation through innovative training models, and self-adaptation to enhance effectiveness (Pan et al., 2026).

2.3 Research on the Relationship between Vocational Education and Local Industrial Development under Human Capital Theory

The evolution of human capital theory has laid a solid theoretical foundation for vocational education research. From traditional theories focusing on the economic returns of educational investment to new human capital theories emphasizing the multidimensionality of competencies and the value of non-cognitive abilities, scholars have continuously expanded theoretical boundaries to address the demands of the times. Wei and Liu (2024) systematically traced the evolutionary trajectory of human capital theory, noting that it has undergone a process of expansion from a focus on economic returns to an emphasis on skill spillover effects, and then to an emphasis on the multidimensionality of competencies. Wei et al. (2023) further explicitly proposed, based on the new human capital theory, that in the digital economy era, the focus of competency development for technical and skilled workers should shift from employment-oriented rapid on-the-job readiness to career-long continuous development capabilities; from passive receptive abilities to knowledge transfer capabilities; and from mechanical processing skills to interpersonal communication skills. This shift reveals the critical role of non-cognitive abilities in human capital accumulation. Within this theoretical framework, the mechanism of action of vocational education—as a vital form of human capital investment—is thoroughly elucidated. Taking undergraduate-level vocational education as an example, Xu and Cui (2021) point out that it operates through a mechanism that aligns with the nature of vocational education, conforms to the demands of socio-economic development, and meets the public's educational investment needs. It exerts an optimizing effect by addressing funding constraints, optimizing resource allocation, and alleviating the imbalance between the supply and demand for highly educated talent. Lan and Shi (2023), from the perspective of building a skills-based society, argue that the core mission of vocational education in supporting this endeavor is to promote the appreciation and accumulation of skills-based human capital. Wei and Zhang (2021), in the context of intelligent development, emphasize that vocational education must span the entire human capital lifecycle of technical and skilled personnel, improve the lifelong vocational skills training system, and cultivate innovative technical and skilled talent.

At the practical application level, human capital theory provides analytical tools for understanding the relationship between vocational education and regional development as well as national strategies. Guo (2017) analyzes the logic of synergy between vocational education and regional economic development from a multi-perspective approach, pointing out that, from the perspective of human capital theory, vocational education drives industrial upgrading by enhancing the quality of the labor force, creating an interactive cycle between the two. Li (2024), based on an analysis of human capital dimensions since the reform and opening-up, reveals that the linkage between vocational education strategies and regional economic development is closely related to factors such as the improvement of human capital quality, the optimization of educational attainment structures, and coordinated urban-rural development. In the field of rural revitalization, Wei et al. (2024) view the revitalization of rural talent as the development and optimization of rural human capital, proposing that vocational education should cultivate innovative production and management talent, multi-skilled rural governance talent, and lifelong-learning scientific and technological talent. Wei and Liu (2024) further applied human capital theory to research on how vocational education promotes common prosperity, pointing out that the heterogeneity, spillover effects, and multidimensional nature of investment in human capital education correspond to the three-tiered demands of common prosperity: differentiation, universality, and

comprehensiveness. Vocational education transmits economic utility, releases social utility, and activates cultural utility through three forms: inclusive, lifelong, and holistic. However, existing research has also revealed numerous challenges. Lan and Shi (2023) point out issues such as an imperfect vocational education system, a lack of skill forecasting mechanisms, and uneven allocation of human capital; Wei and Zhang (2021) highlight dilemmas, including an overemphasis on academic credentials at the expense of practical training, redundant and inefficient institutional operations, and a severe bias toward technical skills. In response to these challenges, scholars have proposed countermeasures such as enhancing cross-disciplinary thinking, optimizing skills training, improving resource allocation, and prioritizing the development of non-cognitive skills, thereby charting a course for vocational education reform.

2.4 Research on the Relationship between Vocational Education and Local Industrial Development under Regional Economic Theory

Regional economic theory provides a foundational analytical framework for understanding the interactive relationship between vocational education and local industrial development. Some scholars have long argued that, in accordance with the principles of regional economics, the nature of vocational education must align with the specific characteristics of the regional economy, and the implementation of vocational education development strategies inevitably requires guidance from regional economic development theory (Xiao & Ding, 2009). This proposition emphasizes the dependence of vocational education on regional resource endowments and industrial structures. From a multidisciplinary perspective, the coordinated development of modern vocational education and the regional economy follows an intrinsic logic of interconnection, requiring the breaking down of institutional barriers between the two and the establishment of a dynamic linkage mechanism between program offerings and industrial development (Guo, 2017). An analysis of historical evolution since the reform and opening-up era reveals that the linkage between vocational education strategies and regional economic development is closely related to human capital in terms of quality enhancement, optimization of educational attainment structures, and coordinated urban-rural development, exhibiting characteristics such as comprehensiveness, historical dynamism, economic interdependence, and policy guidance (Li, 2024). In the context of coordinated urban-rural development, Some studies, using Chongqing as an example, point out that the essence of coordinated urban-rural vocational education lies in the coordinated development of urban and rural human capital, which requires the establishment of a symbiotic cycle system for the coordinated development of urban and rural vocational education through economies of scale, scope, and agglomeration (Zhu & Lin, 2010). From the perspective of optimizing industrial layout, some scholars, drawing on the “wooden bucket theory,” have pointed out that the inability of higher vocational education to fully meet development needs stems from an excessive emphasis on educational and academic aspects at the expense of vocational and economic dimensions (Qiu, 2016). At the practical application level, an empirical analysis based on panel data from China’s 31 provinces, autonomous regions, and municipalities from 2011 to 2023 shows that the scientific and technological activities of local applied universities significantly promote regional economic development, and the implementation of university classification policies can reinforce this effect (Bao & Cao, 2026). From a broader perspective, in the face of imbalances and inadequacies in regional higher education development, universities—as core vehicles for talent cultivation, innovation generation, and cultural leadership—must serve national strategies by deeply integrating into regional development through structural, model, and systemic reforms (Yan, 2026).

3. Practical Pathways for Vocational Education to Serve the Development of Chongqing's Local Distinctive Industries

3.1 Innovation in Talent Development Models within the Framework of Industry-Education Integration

Based on the network-building logic of industry-education integration—which emphasizes supply-demand alignment, resource transformation, and value co-creation (Li et al., 2026)—Chongqing's vocational education must overcome the traditional dilemma of “schools being enthusiastic while enterprises remain indifferent” and establish a community of shared interests for collaborative talent cultivation. First, drawing on the analytical framework of unified institutional logic, unified production objectives, and unified collective action driven by industrial evolution (Long Rongjun, 2026), the model of industry-specific colleges operating as independent entities should be promoted. We should encourage vocational colleges to collaborate with leading enterprises in the industry chain—such as Changan Automobile and CEC Semiconductor—to establish specialized industry colleges. This involves jointly setting standards, developing curricula, and training faculty with enterprises, transforming real-world production scenarios into teaching resources to achieve deep integration between the teaching process and production workflows. Second, based on the multi-layered nesting mechanisms of business-technology embedding, relational-structural embedding, and institutional-cognitive embedding within the industry-education integration network, we should innovate training models such as order-based classes and modern apprenticeship programs. Promote a dual-track education model where enrollment equals employment and enrollment in school equals employment in the factory, establishing a collaborative education framework led by institutions and involving enterprises. In agriculture-related fields, promote models such as field-based colleges and customized industry colleges, moving classrooms to the front lines of production. Third, following the logic of three-tier spatial nesting and four-domain chain integration in the coordinated development of industry-education integration organizations (Li Peng, 2025), we will refine the integrated training system. Finally, in specialized fields with long training cycles and high skill requirements—such as intelligent connected new energy vehicles and artificial intelligence—we will implement long-term integrated training programs to achieve the organic integration of the education chain, talent chain, industrial chain, and innovation chain.

3.2 Development of Regionally Distinctive Teaching Resources and Reform of Teaching Models

Based on research regarding the shift from cognitive to non-cognitive abilities in new human capital theory (Wei et al., 2023), as well as the core imperatives of skill-based human capital appreciation and accumulation (Lan & Shi, 2023), Chongqing's vocational education must focus on the “33618” modern manufacturing cluster system to develop digital teaching resources with regional characteristics and drive profound reforms in teaching models. First, in accordance with the human capital theory's emphasis on lifelong learning, innovative thinking, and the cultivation of talent possessing both humanistic literacy and technical competence (Wei & Zhang, 2021), a mechanism for the dynamic adjustment of programs should be established. A linkage mechanism should be established between industry talent demand forecasting and program development, with regular publication of white papers on skilled talent needs in key industries. A color-coded early warning system for program development should be refined, and a full-cycle mechanism integrating admission, cultivation, evaluation, and exit should be established to ensure that talent cultivation aligns with industry demands. Second, in accordance with the new human capital theory's emphasis on cultivating competencies in career development, deep learning and knowledge transfer, and collaborative interpersonal communication

(Wei et al., 2023), we will develop digital teaching resources with distinctive features. Leveraging the opportunity presented by the “Digital Chongqing” initiative, we will build an integrated teaching platform featuring AI teaching assistants, virtual simulation training, and smart skills assessment. We will prioritize the construction of virtual simulation training bases in high-demand fields such as integrated circuits and industrial robots, support industry-academia collaboration in developing digital twin systems, transform real-world enterprise production scenarios into teaching resources, and promote the migration of high-quality training resources to the cloud to enable remote access and training for vocational colleges in both urban and rural areas. Third, in response to human capital theory's emphasis on the premium effect of non-cognitive skills (Wei & Zhang, 2021), we will advance innovations in teaching models. We will promptly incorporate new methods, technologies, processes, and standards into the curriculum, promote models that use competitions to enhance teaching and learning, integrate vocational skills competition standards into daily instruction, and encourage teachers to transform competition-based technologies into teaching projects, thereby creating a virtuous cycle where competition success translates into industrial value.

3.3 Establishment of Policy Support Mechanisms

Based on the core proposition in regional economic theory that “the nature of vocational education must correspond to the nature of the regional economy” (Xiao & Ding, 2009), as well as the logic of synergistic development between vocational education and the regional economy (Guo, 2017), Chongqing needs to establish a systematic and comprehensive policy support system to overcome institutional and systemic barriers hindering vocational education's ability to serve local industrial development. First, following the pathways to achieving economies of scale, scope, and agglomeration emphasized in the coordinated urban-rural development of vocational education (Zhu & Lin, 2010), the city should strengthen legal safeguards and top-level design. Second, drawing on the characteristics of skill enhancement, optimization of educational qualification structures, and coordinated urban-rural development revealed by human capital dimension analysis (Li, 2024), the city should improve policy incentives and financial support. In accordance with regulations, provide enterprises engaged in industry-education integration with a combination of financial, fiscal, land, and credit incentives; implement relevant tax and fee preferential policies in accordance with the law; establish a municipal-level special fund for industry-education integration and incorporate it into the fiscal budget; and prioritize support for the construction of demonstration projects, public training bases, and industry colleges. Use enterprises' participation in school-enterprise cooperation as a key reference in the selection of various model enterprises to stimulate their intrinsic motivation to participate in vocational education. Third, based on the three major pathways of structural, model, and systemic transformation in the interaction and integration between higher education institutions and the region (Yan, 2026), we must improve the mechanism for building a dual-qualified faculty. We will improve the teacher training and development system. refine the two-way exchange and appointment system for professional talent, and facilitate channels for enterprise managers, technical specialists, and highly skilled professionals to teach in schools, as well as for school teachers to take up positions in enterprises, thereby promoting the two-way flow of talent between schools and enterprises. Finally, we will establish an information service platform for industry-education integration, integrating resources such as industrial demand, talent supply, and policy information to break down information barriers, promote precise matching between schools and enterprises, and achieve the symbiotic growth of vocational education and the regional economy.

4. Conclusion

Against the backdrop of the new era, which sees the promotion of a new pattern for the Great Western Development and the accelerated implementation of the national strategy for the development of the hinterland, Chongqing, as a key base for modern manufacturing and an inland open hub in China, shoulders the strategic mission of driving high-quality development through its distinctive and competitive industries. This paper systematically examines the theoretical logic and practical challenges of vocational education in serving the development of Chongqing's distinctive local industries. It reveals existing issues such as structural misalignment between program development and industrial demand, the deep-seated contradiction of "enthusiastic schools but lukewarm enterprises" in industry-education integration, insufficient support from "dual-qualified" faculty, and lagging development of digital teaching resources. In the face of these changes, isolating emphasis on either supply-side reform in vocational education or demand-side traction from industry is no longer sufficient. Innovation in industry-education integration mechanisms and dynamic adjustments to academic programs are not mutually exclusive policy options, but rather constitute an organic whole that supports and evolves in tandem. Industry-education integration injects sustained momentum into aligning academic program development with industrial needs by establishing operational platforms and innovating talent cultivation models; conversely, a dynamically optimized academic system based on regional endowments provides precise focal points and a solid foundation for deep industry-education integration. The coordinated advancement of these two approaches is the only way to break the deadlock of vocational education lagging behind industrial upgrading, to facilitate a virtuous cycle between the education chain and the industrial chain, and ultimately to achieve the symbiotic and mutually beneficial development of vocational education and local characteristic industries. This requires us to adopt a systemic perspective and strategic thinking, persist in deepening the typological reform of vocational education, establish a long-term mechanism for dynamic adjustment of programs, and improve the multi-stakeholder collaborative governance system. In the process of innovating talent cultivation models, developing regionally distinctive teaching resources, and strengthening policy support and supply, we must steadily advance this strategic synergy, continuously enhance the capacity of vocational education to support modern manufacturing clusters and technological innovation initiatives, and solidly promote the steady and far-reaching development of a modernized New Chongqing.

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