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Development Challenges and Optimization Paths of Higher Vocational Education in Chongqing under the Perspective of Industry-Education Integration: A Multidimensional Analysis of Policy, Practice, and Resources

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Abstract

Industry-education integration serves as a pivotal mechanism for advancing the high-quality development of higher vocational education and supporting regional industrial upgrading. This study examines Chongqing's higher vocational institutions using a mixed-methods approach combining policy text analysis, case studies, and literature review to systematically explore the current implementation status, core challenges, and optimization pathways of their industry-education integration efforts. Findings reveal significant challenges across three dimensions: policy transmission, mechanism development, and operational effectiveness. Specific manifestations include a lack of detailed policy implementation rules, industry-academia agreements that are substantively weak despite numerous formal agreements, a disconnect between teaching resources and industrial needs, an insufficient proportion of dual-qualified faculty, and difficulties in resource integration due to multi-stakeholder management. To address these issues, this paper proposes systematic countermeasures, including establishing a multi-tiered policy support system, innovating school-enterprise collaborative education mechanisms, deepening curriculum and teaching reforms, building a high-caliber, dual-qualified faculty, and establishing robust quality assurance and continuous improvement mechanisms. The study further suggests that Chongqing's future industry-education integration should evolve toward digitalization, collaboration, and institutionalization, thereby fostering an ecosystem that involves multiple stakeholders to provide high-quality technical and skilled talent for regional economic development.

Keywords: Higher Vocational Education, Industry-Teaching Integration, School-Enterprise Cooperation, Chongqing, Vocational Education

Introduction

Deepening the integration of industry and education represents a key strategic orientation for China's vocational education reform. It holds critical significance for enhancing the quality

of technical and skilled talent cultivation and promoting effective alignment between the education chain and industrial chain (Peng Zhaobo et al., 2025). As a major industrial base and vocational education hub in western China, Chongqing's higher vocational colleges have accumulated local experience while advancing this integration, yet they also face a series of structural contradictions. Although policies such as the Vocational Education Law of the People's Republic of China (2022) and the Implementation Plan for the Action to Empower and Enhance Industry-Education Integration in Vocational Education (2023–2025) provide institutional safeguards for this integration, implementation effectiveness varies significantly across regions (Yin , 2024. Zhang , 2025).

Existing research predominantly focuses on macro-level policies or individual institutional case studies, with insufficient exploration of systemic challenges and collaborative optimization pathways for industry-education integration at the regional level (Li & Huang , 2025. Bai & Zhu, 2024). Particularly against the backdrop of the Chengdu-Chongqing Economic Circle development and industrial digital transformation, systematic empirical research and theoretical frameworks remain scarce on how Chongqing's higher vocational education can achieve precise alignment between talent cultivation and industrial demands through industry-education integration.

Therefore, this study focuses on Chongqing's higher vocational institutions. By integrating policy documents, case materials, and academic literature, it aims to:
(1) Systematically analyze the primary issues and deep-seated obstacles currently facing industry-education integration.
(2) Construct an optimization framework from multiple dimensions, including policy, mechanisms, resources, and faculty.
(3) Propose actionable regional development pathways, providing theoretical references and practical guidance for deepening industry-education integration in higher vocational education in Chongqing and the broader western region.

Literature Review

Industry-education integration stands as a core issue in China's vocational education reform, with its policies and practices exhibiting complex interactions between macro-level guidance and regional implementation. This review examines key research findings from recent years across three dimensions: policy evolution and implementation disparities, institutional challenges and innovations in school-enterprise collaboration, and the alignment of teaching resources with industrial demands.

Policy Evolution and Regional Implementation Differences in Industry-Education Integration: A Comparative Critique Based on Type Positioning and Implementation Effectiveness

At the national level, Wu (2024) systematically traced the evolutionary logic of China's industry-education integration policies as they transitioned from advocating cooperation to institutionally embedded integration, concluding that the current policy framework has largely completed its top-level design. However, Hao (2023) notes in her doctoral research that refined policy texts do not necessarily translate into effective grassroots implementation. Particularly in cross-departmental coordination and corporate incentives, policies risk becoming empty institutional gestures.

In contrast, Peng et al. (2025), analyzing the Jiangsu-Yili counterpart assistance model, argue that strong administrative intervention can significantly boost the organizational density and project volume of industry-education integration in the short term. This view, however, is challenged by Zhang (2025). Based on comparative research in western regions, Zhang (2025) argues that overreliance on administrative mobilization weakens local actors' endogenous motivation, reducing industry-education integration to policy-driven compliance behavio that struggles to establish sustainable mechanisms.

In the Chongqing context, Yin (2024) further reveals the last mile problem in policy implementation, identifying the absence of local supporting regulations and ambiguous departmental responsibilities as key constraints on integration effectiveness. In response, Tang (2026) offers a critical perspective from the standpoint of vocational education's typological positioning. He contends that without institutionally establishing vocational education as an independent educational category, industry-education integration will perpetually lack a stable institutional anchor. This assessment is supported by Yao & Wu (2026), who emphasize that high-quality vocational education development must transition from patchwork policy measures to systematic institutional construction.

Challenges and Innovations in University-Enterprise Collaboration Mechanisms: A Critical Examination Amidst Divergent Logics and Technological Disruption

As the core operational vehicle for industry-education integration, the school-enterprise collaboration mechanism has long been regarded as the key factor determining the depth and quality of integration. However, existing research shows significant divergence in explaining the causes of collaboration failure. Based on multiple case studies, Xiong (2025) points out that vocational colleges commonly suffer from a structural imbalance characterized by enthusiastic schools and lukewarm enterprises, attributing the root cause to enterprises' lack of motivation to participate. This explanation, however, places responsibility unilaterally on enterprises while overlooking inherent flaws in institutional design.

In contrast, Wu (2024) employs field theory to argue that enterprises do not inherently reject educational collaboration but struggle to obtain commensurate returns for their investments under current institutional arrangements. Liu &Jiang (2024) further supplement this by arguing that current school-enterprise collaborations often remain superficial—limited to internship placements and equipment donations—failing to penetrate core value chain segments like joint curriculum development, technological R&D, and standard-setting. This prevents sustainable partnerships, posing a substantive challenge to the superficial explanation of insufficient corporate enthusiasm.

At the governance level, Hao (2023) explicitly states that while government-led industry-education integration models can rapidly establish partnerships in the initial stages, enterprises occupy a peripheral position in decision-making systems. This results in coordination mechanisms lacking flexibility and responsiveness, making it difficult to adapt to the rapid iteration of industrial technologies. Sun (2025) further reveals through research on cost-sharing mechanisms in modern apprenticeship programs that without clear rules for benefit distribution and risk-sharing, enterprises rationally opt for low-level participation as an almost inevitable choice.

A more forward-looking critique comes from Tang (2026). Their research indicates that the deep-seated cause of the school-enterprise collaboration mechanism's predicament lies in the lack of a truly established identity for vocational education. Under the dominance of general education logic, higher vocational institutions are compelled to mimic the operational models of academic universities, reducing school-enterprise cooperation to a tool for meeting employment metrics or policy mandates. This assessment aligns closely with Yao&Wu (2026) assertion that a modern vocational education system must be structured around collaborative governance. Consequently, the dysfunction of school-enterprise collaboration mechanisms is not merely an operational issue but a concentrated manifestation of misaligned institutional logic and governance philosophy.

The Structural Mismatch Between Teaching Resources and Industry Needs: A Critique of the Deep-seated Mismatch Under the Digital Transformation Gap

Regarding the relationship between educational resources and industrial demands, early research primarily focused on resource scarcity or uneven distribution. Cheng (2024) pointed out that some vocational colleges' program offerings are out of sync with regional industrial structures, resulting in talent cultivation that fails to meet actual needs. However, this explanation has become inadequate in the current context. As policies continue to increase investment, resource shortages are gradually being replaced by inefficient resource utilization and structural lag.

Wang (2025) analyzed job competency models and found that curriculum content updates lag significantly behind industrial technological advancements, particularly in smart manufacturing and the digital economy. This finding resonates with Feng (2024) research on the insufficient quantity and quality of dual-qualified teachers. However, neither fully explains why these issues persist despite ongoing reforms. In response, Chen (2024) offers a more critical perspective, arguing that the core issue lies not in whether teachers possess industry experience, but in an evaluation system that remains centered on academic achievements and teaching hours, thereby suppressing their motivation for sustained engagement in industrial practice.

From a curriculum reform perspective, the project-based, modular curriculum model advocated by Yang &Yang(2025) is widely regarded as a potential solution. However, a critical challenge lies in the fact that such reforms are prone to becoming superficial innovations without a sustained influx of authentic industry projects. Yan (2026), drawing on endogenous development theory, points out that current vocational education digitization faces a “superficial embedding” dilemma. Technology is introduced into classrooms without altering teaching organization logic or governance structures, hindering the conversion of digital resources into learning outcomes.

Yao & Qiang (2026) further emphasize that high-quality vocational education development must prioritize dynamic resource adaptation capacity as a core metric, rather than static allocation levels. Li &Tao (2022) propose that while establishing an industrial technology monitoring platform is insightful, its effectiveness will be severely limited without concurrent reforms to teacher mobility mechanisms and resource evaluation systems. Thus, the root cause of teaching resource mismatch lies not in the deficiency of any single factor, but in the supply system's lack of capacity for co-evolution with the industrial system.

Theoretical Framework: A Three-Dimensional Analysis Model of Policy-Mechanism-Resources
This study constructs a three-dimensional analysis framework ofpolicy-mechanism-resources (as shown in Figure 1) to systematically reveal the operational logic and optimization path of industry-education integration. This framework integrates policy implementation theory, collaborative governance theory, and resource dependence theory, emphasizing the interaction and overall effectiveness among the three.

First, at the policy level, this study incorporates policy implementation theory. Pressman &Wildavsky (1973) were the first to point out that significant attenuation risks exist between the formulation and implementation of public policies; Mazmanian &Sabatier (1983) further emphasized that the clarity of implementation rules and incentive structures are key variables determining policy effectiveness. This theory provides a crucial explanatory perspective for analyzing the “implementation gap” of industry-education integration policies at the Chongqing higher vocational college level.

Second, at the mechanism level, this study adopts collaborative governance theory. Ansell&Gash (2008) proposed that the effectiveness of multi-stakeholder governance in public affairs depends on power parity among participants, a foundation of trust, and consensus on rules. Hao (2023) applied this theory to vocational education research, arguing that the core failure of industry-education integration stems not from resource scarcity but from the absence of collaborative mechanisms. Accordingly, this study treats the school-enterprise collaboration mechanism as the “central variable” linking policy to practice.

Finally, regarding the resource dimension, this study draws upon resource dependence theory. Pfeffer and Salancik (1978) noted that organizations reduce environmental uncertainty by acquiring critical external resources. In the context of vocational education research, Yao &Wu (2026) argued that higher vocational colleges exhibit high dependence on enterprise technology, projects, and real production scenarios, with resource acquisition capabilities directly influencing industry-education integration performance.

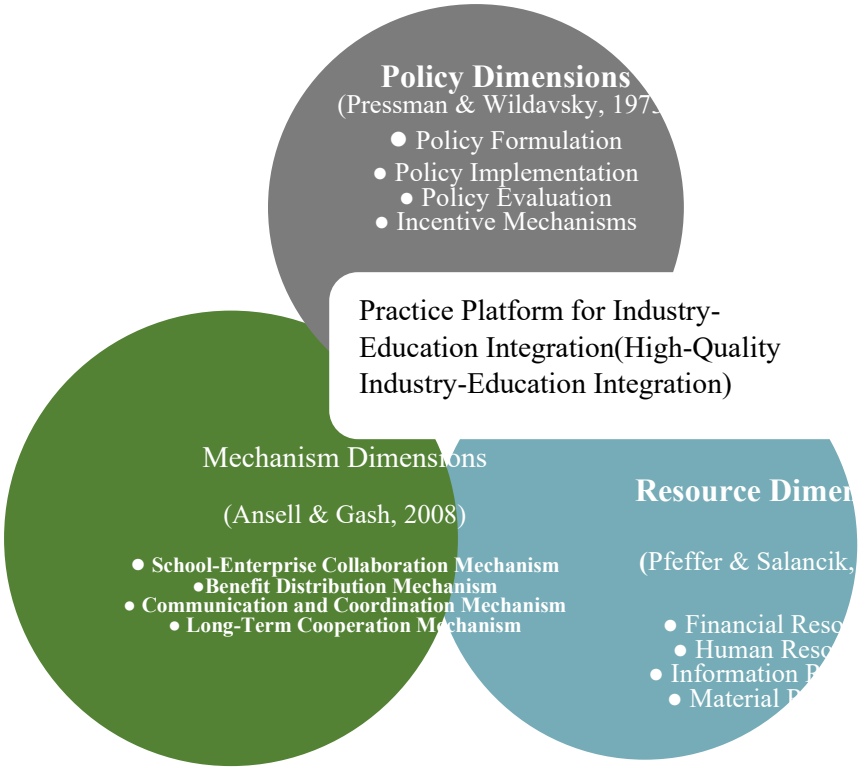

Figure 1: Three-Dimensional Analysis Framework of Industry-Education Integration: Policy-Mechanism-Resources

This framework integrates policy implementation theory (emphasizing the transmission and adaptation process of policies from formulation to grassroots implementation), collaborative governance theory (focusing on the interest coordination and action logic among multiple stakeholders such as government, industry, enterprises, and schools), and resource dependence theory (focusing on how organizations can reduce environmental uncertainty by acquiring external resources). The interaction among the three: a sound policy system (policy dimension) provides institutional incentives and guarantees for school-enterprise collaboration (mechanism dimension). an effective collaboration mechanism can promote the optimal allocation and integration of human, material, financial, and informational resources (resource dimension). and the sufficiency and suitability of resources, in turn, affect the achievement of policy objectives and the sustainable operation of the collaboration mechanism. This framework aims to go beyond single-factor analysis, revealing the underlying logic of the dilemma of industry-education integration from the perspective of system interaction and exploring integrated optimization paths.

Methodology

This study employs a quantitative research design, aiming to systematically examine the three-dimensional analytical framework of policy-mechanism-resources through standardized measurement tools and standardized statistical analysis methods, and to quantify the impact paths and strengths of each dimension on the effectiveness of industry-education integration. The study strictly adheres to the quantitative research paradigm of social sciences to ensure the reliability of the process.

Research Population and Sampling

The theoretical population of the study consists of core stakeholders in Chongqing involved in industry-education integration, including administrators, full-time teachers, and representatives of partner enterprises from higher vocational colleges. To ensure the representativeness and feasibility of the sample, a two-stage stratified random sampling strategy was adopted.

Stage 1 (College Sampling): Based on Chongqing's One District, Two Clusters development strategy and the layout of higher vocational education, Shapingba District (University Town) and Yongchuan District were selected as the core research fields. These two districts respectively represent two typical development models: Science, Education, and Cultural Innovation Agglomeration and Industry-Education-City Integration Practice. A simple random sampling method was used to select 5 higher vocational colleges from a total of 46 colleges in the two districts as primary sampling units (see Table 3.1). Phase Two (Individual Sampling): Within each sampled institution, stratified random sampling was conducted based on the institution's personnel roster and official partner company list, using a ratio of approximately 1:3:1 for managers: full-time teachers: company representatives to ensure that the views of key groups were fully represented. The sampling framework was constructed based on official data from the Chongqing Municipal Education Commission (2025) and publicly available information from the official websites of each institution, with a verifiable total population (N) of approximately 73,502 people.

Table 3.1
Sample Institutions and Overall Research Composition

District	**College**	**Total number of students (people)**	**Total number of teachers (people)**	**Population used in N**
Shapingba	Chongqing Business Vocational College	14,552	740	14,552
Shapingba	Chongqing City Management Vocational College	15,000	1000	16,000
Yongchuan	Chongqing College of Finance and Economics	12,700	750	13,450
Yongchuan	Chongqing Water Resources & Electric Engineering VC	13,200	760	13,960
Yongchuan	Chongqing City Vocational College	14,000	800	14,800
Total				73,502

A stratified random sampling method was used. Based on Krejcie and Morgan's (1970) sample size scale, a sample size of 382 was recommended at a 95% confidence level and approximately 5% margin of error. Considering both research resources and the expected effective response rate, 450 questionnaires were distributed through an online questionnaire platform, and 350 valid questionnaires were ultimately collected, resulting in an effective response rate of 77.8%. The composition of the effective sample is shown in Table 3.2. This sample size is considered to have sufficient statistical power in quantitative research in the social sciences (Babbie, 2016).

Table 3.2
Distribution of Effective Samples (N=350)

Group Categories	Sample Size	Persentage
Full-time Faculty at Higher Vocational Colleges	210	60.0%
Administrative and Academic Managers at Higher Vocational Colleges	70	20.0%
Technical or Human Resources Supervisors from Partner Enterprises	70	20.0%
Total	**350**	**100.0%**

Measurement Tools and Variable Operationalization

The study employed a self-report structured questionnaire. All scales were based on established theories and literature, and underwent pre-testing (n=50) and expert review to ensure sound metrological properties. The operationalized definitions, dimensions, items, and reliability of each core construct are detailed in Table 3.3.

Table 3.3
Core Variable Measurement Scale Information

Variables	operational definitions and dimensions,	number of items,	example items,	Cronbach's α	main references and basis.
Policy awareness and implementation	The evaluation of the clarity of industry-education integration policies, supporting measures, incentive levels, and cross-departmental collaborative implementation.	12	Local tax incentives for industry-education integration are clear and easy to implement.	0.89	Petko et al. (2018).Wu (2024)
Industry-university collaboration mechanism	Measurement of the depth of school-enterprise cooperation, the rationality of benefit sharing, corporate governance participation, and	16	Enterprises have substantial decision-making power in the curriculum design of	0.92	Collaborative Governance Theory.Hao (2023)

Variables	operational definitions and dimensions,	number of items,	example items,	Cronbach's α	main references and basis.
	communication effectiveness.		collaborative projects.		
Adaptability of teaching resources to industry	Assessment of the matching degree between curriculum content, faculty practical skills, training facilities, and digital resources and industry technology needs.	14	The technical standards of our school's practical training equipment are updated in sync with those of leading local enterprises.	0.87	Cattaneo et al. (2025)'s ICAP Integrated Quality Perspective.Cheng (2024)
Comprehensive effectiveness of industry-education integration	Comprehensive subjective evaluation of talent cultivation, technology transfer, and industry service outcomes.	6	Through collaboration, students' ability to solve real-world industry problems has significantly improved.	0.85	Yao & Wu (2026)

All scales used a five-point Likert scale (1 = Strongly Disagree/Strongly Poor, 5 = Strongly Agree/Excellent). According to DeVellis's (2016) reliability criteria, a Cronbach's alpha coefficient above 0.70 is acceptable, above 0.80 is good, and above 0.90 is excellent. The alpha coefficients of the scales used in this study ranged from 0.85 to 0.92, indicating that all measurement tools had good to excellent internal consistency reliability. Demographic variables such as gender, age, occupational role, and years of work experience were also collected as control variables.

Data Analysis Methods Basic statistical analysis was performed using SPSS 26.0, and advanced modeling analysis was performed using Mplus 8.3. The steps are as follows: Common method bias test and reliability and validity analysis: Harman's one-way factorial test was used to preliminarily assess common method bias (Podsakoff et al., 2003). Confirmatory factor analysis was used to test the construct validity of the scale, and the combined reliability and mean variance sampling size were reported.

Descriptive statistics and difference analysis: The mean and standard deviation of each variable were calculated. An independent samples t-test was used to compare the perceived differences between university personnel and enterprise representatives on each core variable, and Cohen's d effect size was reported. One-way ANOVA was used to test differences between different universities.

Correlation and regression analysis: Pearson product-moment correlation analysis was used to explore the relationships between variables. Hierarchical regression analysis was used, controlling for demographic variables, and then including policy, mechanism, and resource

variables in sequence to test their incremental explanatory power for the overall effectiveness.

Structural equation model testing: To directly test the path and mediation effects in the theoretical framework, a structural equation model was constructed. Maximum likelihood estimation was used, and the goodness of fit of the model was assessed according to the standard combination proposed by Hu and Bentler (1999).

Hypotheses

Based on the research objectives and theoretical framework, this study proposes the following hypotheses:

H1: Perception of industry-education integration policies and implementation capabilities exert a significant positive influence on the overall effectiveness of industry-education integration.

H2: The school-enterprise collaboration mechanism plays a significant positive mediating role between industry-education integration policies and overall effectiveness.

H3: The degree of alignment between teaching resources and industrial demands exerts a significant positive influence on the overall effectiveness of industry-education integration.

Results

Demography

Confirmatory factor analysis showed that the four-factor model (policy, mechanism, resources, and effectiveness) fit well ($\chi^2/df = 2.87$, CFI = 0.94, TLI = 0.93, RMSEA = 0.07, SRMR = 0.05), with factor loadings for each item greater than 0.60, indicating good construct validity. The combined reliability of all variables ranged from 0.85 to 0.92, and the mean variance extracted was greater than 0.50, indicating satisfactory reliability and convergent validity. Harman's one-factor test showed that the first factor explained 38.7% of the variance (<40% critical value), indicating minimal common method bias.

H1 Test Results: Impact of Policy Dimensions on the Effectiveness of Industry-Education Integration

The descriptive statistical results for each core variable are shown in Table 4.1. Overall, the Comprehensive Effectiveness of Industry-Education Integration was at a moderate level (M=3.12). Of the three predictor variables, Industry Adaptability of Teaching Resources scored the highest (M=3.28), while Policy Perception and Implementation scored the lowest (M=2.78), with the Incentive Intensity sub-dimension scoring the lowest (M=2.45).

Independent samples t-tests showed that enterprise representatives scored significantly lower than university personnel (managers and teachers combined) on Policy Perception and Implementation ($t = -4.32$, $p < .001$, Cohen's $d = 0.62$), University-Enterprise Collaboration Mechanism ($t = -5.01$, $p < .001$, Cohen's $d = 0.74$), and Overall Effectiveness ($t = -3.87$, $p < .001$, Cohen's $d = 0.56$). One-way ANOVA showed that there were significant differences among different institutions in the adaptability of teaching resources to industry ($F(4, 377) = 3.56$, $p = .007$), with a manufacturing-focused institution in Yongchuan District scoring significantly higher in this dimension.

Table 4.1
Descriptive Statistics and Correlation Matrix for Core Variables (N=350)

Variables	M	SD	1	2	3	4
Policy Awareness and Implementation Capacity	2.78	0.81	1			
University-Industry Collaboration Mechanisms	3.05	0.76	.67***	1		
Industry-Relevant Teaching Resources	3.28	0.69	.58***	.71***	1	
Overall Outcomes of Industry-Education Integration	3.12	0.73	.61***	.74***	.69***	1

Note: M = mean, SD = standard deviation. Pearson's correlation coefficients (r) between variables are reported above the diagonal.p < .05, ** p < .01, *** p < .001.

Regression analysis results indicate that policy awareness and implementation capacity exert a significant positive influence on the overall effectiveness of industry-education integration (β = .25, p < .001), supporting Hypothesis H1. This suggests that policies are not merely institutional background variables but serve as critical prerequisites directly impacting integration performance.

H2 Test Results: Examination of the Mediating Effect of the School-Enterprise Collaboration Mechanism

The stratified regression analysis results (see Table 4.2) indicate that after controlling for gender, age, role, and years of service, Model 1 (containing only control variables) explains limited variance in overall effectiveness (R^2 = .05). The explanatory power of the model significantly increased after sequentially adding policy perception and implementation capacity (Model 2, ΔR^2 = .33), school-enterprise collaboration mechanisms (Model 3, ΔR^2 = .18), and alignment of teaching resources with industry needs (Model 4, ΔR^2 = .04). The final model (Model 4) achieved a total variance explained of R^2 = .60. Within this model, school-enterprise collaboration mechanisms exhibited the largest standardized regression coefficient (β = .44, p < .001), followed by policy perception and implementation capacity (β = .25, p < .001) and alignment of teaching resources with industry needs (β = .19, p < .01). Among the control variables, only Role (Enterprise = 1) exhibited a significant negative predictive effect (β = -.11, p < .05).

Table 4.2
Stratified Regression Analysis Results for Comprehensive Outcomes of Industry-Education Integration

Predictor Variables	Model 1	Model 2	Model 3	Model 4
Step 1: Control Variables				
Role (Enterprise = 1)	-.18*	-.15*	-.12*	-.11*
Years of Service	.08	.05	.03	.02
Step 2: Policy Dimension				
Policy Perception and Implementation Capacity		.61***	.29***	.25***
Step 3: Mechanism Dimension				
University-Enterprise Collaboration Mechanism			.52***	.44***
Step 4: Resource Dimension				
Industrial Alignment of Teaching Resources				.19**
Model Summary				
R^2	.05	.38	.56	.60
ΔR^2	.05***	.33***	.18***	.04**
AdjustedR^2	.04	.37	.55	.59
F-value	8.67***	71.22***	88.93***	85.66***

Note: The values in the table are standardized regression coefficients (β). roles are dummy variables (company representative = 1, school staff = 0). *p < .05, **p < .01, ***p < .001. ΔR^2 represents the increase in explanatory power compared to the previous model.

The results show that Model 1, which only includes control variables, has limited explanatory power (R^2 = .05). Including policy perception and implementation significantly increased the model's explanatory power to 38% (ΔR^2 = .33). Further inclusion of school-enterprise collaboration mechanism brought the largest incremental explanatory power (ΔR^2 = .18), bringing the model's explanatory power to 56%. Finally, after including industry-relevance of teaching resources, the complete model (Model 4) explained 60% of the variance in the overall effectiveness of industry-education integration (R^2 = .60), indicating that the theoretical framework of this study has strong explanatory power.

Turning to the final model, school-enterprise collaboration mechanism had the strongest predictive effect (β = .44, *p* < .001), followed by policy perception and implementation (β = .25, *p* < .001) and industry-relevance of teaching resources (β = .19, *p* < .01). Among the control variables, only role had a stable and significant negative predictive effect (β = -.11, *p* < .05), meaning that enterprise representatives' evaluation of the integration effectiveness was significantly lower than that of university personnel, which is consistent with the previous difference analysis results.The results indicate that the school-enterprise collaboration mechanism exerts a significant mediating effect between policy and outcomes (indirect effect = .35, p < .001), with the mediating effect strength markedly higher than that of the resource pathway. Hypothesis H2 is strongly supported.

H3 Test Results: The Impact of Teaching Resource Industry Alignment
To directly verify the theoretical path and mediating effect of policy → (mechanism/resources) → effectiveness, this study constructed a structural equation model.

The model fit indices were good: $\chi^2/df = 2.95$, CFI = 0.93, TLI = 0.92, RMSEA = 0.072, SRMR = 0.056, indicating that the model and data fit were acceptable.
Path analysis results (see Figure 4.1) show that:

Policy perception and implementation capacity both have significant and strong direct positive impacts on the university-enterprise collaboration mechanism (β = .70, *p* < .001) and the industry fit of teaching resources (β = .33, *p* < .001).
The industry-university collaboration mechanism (β = .50, *p* < .001) and the industry-education resource matching degree (β = .28, *p* < .001) have a direct positive impact on the overall effectiveness of industry-education integration.

Mediation analysis further reveals that policy perception and implementation also have a significant indirect impact on effectiveness through two paths: first, through the industry-university collaboration mechanism (indirect effect = .35, *p* < .001), and second, through the industry-education resource matching degree (indirect effect = .09, *p* < .01).

This model not only empirically supports the three-dimensional analysis framework of policy-mechanism-resources, but also clearly points out that the industry-university collaboration mechanism is the most critical transmission path connecting the policy environment and integration effectiveness, with its indirect effect (.35) being far greater than that of the resource path (.09). The alignment between teaching resources and industry needs exerts a significant positive influence on the effectiveness of industry-education integration (β = .19, p < .01), though its effect strength is lower than that of the collaborative mechanism. Hypothesis H3 is supported.

Summary of Results
The empirical testing of the three research hypotheses (H1, H2, H3) yields a clear conclusion: the overall effectiveness of industry-education integration in Chongqing's higher vocational colleges remains at a moderate level. Significant variations exist in the intensity of influence among different factors, with the school-enterprise collaboration mechanism exerting the most prominent impact, followed by policy perception and implementation capacity. The adaptability of teaching resources to industry needs, however, remains relatively weak. This finding aligns closely with Wu (2024) observation that policy texts are continuously strengthened, yet operational mechanisms remain relatively weak. Zhang (2025) and Yin (2024), in their studies on industry-education integration practices in western China, similarly noted that current collaborations often remain at the level of signing agreements and implementing formal projects, failing to translate into stable, sustainable collaborative action mechanisms. This study quantitatively validates these phenomena and builds upon Peng et al.(2025) findings on the phased effectiveness of administrative promotion. It further demonstrates that without institutionalized pathways for policy implementation, the marginal effectiveness of policy promotion diminishes rapidly as practices advance. Consequently, this research not only corroborates core conclusions from existing literature but also deepens the mechanistic understanding of why industry-education integration often falls short.

From a theoretical perspective, these findings provide robust empirical support for collaborative governance theory and resource dependence theory. Collaborative governance

theory posits that multi-stakeholder cooperation outcomes do not stem from the input of single power or resources, but rather depend on the formation of stable collaborative mechanisms and interactive rules (Ansell & Gash, 2008). This study finds that policy influences industry-education integration outcomes primarily through university-enterprise collaborative mechanisms. This indicates that policy functions more as a structural condition, with its effectiveness contingent upon being embedded within operationalizable collaborative institutions—a finding highly consistent with Hao (2023) policy-mechanism mediation pathway proposed in vocational education governance research. Simultaneously, Resource Dependency Theory (Pfeffer & Salancik, 1978) receives limited yet clear support in this study: while the industry alignment of teaching resources significantly positively influences integration outcomes, its explanatory power is markedly weaker than that of collaborative mechanisms. This indicates resources can only translate into actual performance within effective institutional arrangements and collaborative action frameworks. This finding further demonstrates that the core issue in industry-education integration is not the “existence” of resources, but rather “how resources are governed.”

At the hypothesis level, H1 (policy hypothesis), H2 (school-enterprise coordination mechanism hypothesis), and H3 (resource matching hypothesis) all received empirical support, though their effect strengths and causal pathways exhibited distinct hierarchical differences. Among these, the school-enterprise coordination mechanism corresponding to H2 not only possessed the strongest direct effect but also demonstrated the most significant mediating role in the structural equation model, indicating it is the key bottleneck variable in Chongqing's current industry-education integration practices. This finding corroborates Tang et al. (2026)'s research conclusion that lack of typological identification leads to unstable enterprise participation, and aligns closely with Yao & Wu (2026)'s systems theory perspective that building a modern vocational education system must center on stable collaborative structures. In contrast, while H1 and H3 are also valid, their effects are relatively limited. This further illustrates that relying solely on policy intensification or resource allocation cannot fundamentally enhance the quality of industry-education integration. This conclusion aligns with the research consensus from OECD (2020), Wu (2024), Zhang i (2025), and Peng et al. (2025) that mechanisms take precedence over policies and resources in industry-education integration. Consequently, it clarifies the priority sequence of these three factors in practical implementation at the hypothesis testing level.

Conclusion and Outlook

This study systematically analyzed the core influencing factors and their pathways of industry-education integration in Chongqing's higher vocational education using standardized quantitative research methods. The main conclusions are as follows: First, the effectiveness of industry-education integration is influenced by three dimensions: policy, mechanism, and resources, with the mediating effect of the school-enterprise collaboration mechanism being the most prominent. Second, enterprises' evaluation of the current integration status is significantly lower than that of colleges, revealing that the imbalance of interests and perceptions among stakeholders is a deep-seated obstacle. Third, weak policy implementation, particularly the ineffectiveness of incentive policies, is the root cause of hindering the deepening of integration.

The theoretical contribution of this study lies in empirically testing and deepening the three-dimensional analytical framework of policy-mechanism-resources, clarifying the core pivotal role of the mechanism. Practical implications are that improving the quality of industry-education integration cannot rely solely on resource investment or policy advocacy; it must focus on building a collaborative governance mechanism with clear responsibilities and shared benefits—the core contradiction.

The limitations of this study are the use of cross-sectional data, the need for caution in causal inference, and the concentration of the sample in two districts of Chongqing. Future research can delve deeper into three aspects: First, adopt a longitudinal tracking design to monitor the dynamic changes in various dimensions before and after the implementation of key policies (such as the certification of industry-education integration enterprises). Second, introduce more objective performance indicators (such as student employment quality and enterprise technical problem-solving rate) as dependent variables to compensate for the shortcomings of subjective evaluation. Third, we can draw on the research paradigm of Cattaneo et al. (2025) to encode specific teaching activities in industry-education integration using the ICAP framework, revealing how resources and mechanisms affect the final learning outcomes from the perspective of micro-level teaching process quality. Only through continuous research using multiple methods and at multiple levels can we provide a more solid scientific basis for improving the quality and efficiency of industry-education integration in China's vocational education.

Author Biography

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