

# Research on the Collaborative Education Model of Modern Industrial Colleges in the Chengdu-Chongqing Region from the Perspective of Interdisciplinary Integration

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**Abstract:** Driven by the accelerated development of the Chengdu-Chongqing Economic Circle and industrial transformation and upgrading, the demand for interdisciplinary, composite talents has become increasingly urgent. However, traditional industry colleges face challenges such as prominent disciplinary barriers, loose collaboration between universities, local administrations, and enterprises, and a disconnect between talent cultivation and industrial needs. This paper centers on interdisciplinary integration to establish a new collaborative education model for modern industry colleges tailored to regional industrial characteristics, aiming to resolve the structural mismatch between talent supply and demand. Research indicates that a three-dimensional collaborative model -“disciplinary integration - regional linkage - deep industry-academia-research integration”- effectively enhances the relevance and adaptability of talent cultivation. This is achieved by establishing an interdisciplinary curriculum system, creating co-construction and sharing mechanisms, and refining a collaborative evaluation system, thereby forming a closed-loop process: “industry demand-driven - interdisciplinary support - multi-stakeholder collaborative implementation.” The innovation of this model lies in its deep integration of disciplinary convergence with the collaborative advantages of the Chengdu-Chongqing region. It provides a practical pathway for the high-quality development of regional modern industry colleges and offers valuable insights for similar regional industry-education integration and interdisciplinary talent development initiatives.

**Keywords:** Chengdu-Chongqing Region;

**Interdisciplinary; Industry-Academia Collaboration; Collaborative Education; Model**

## 1. Introduction

Against the strategic backdrop of deepening the Chengdu-Chongqing Economic Circle initiative and accelerating industrial restructuring and upgrading, interdisciplinary professionals have become the core drivers of high-quality regional industrial development. The integration of disciplines has also emerged as an inevitable trend for modern industrial colleges to overcome bottlenecks in talent cultivation [1]. Currently, while modern industrial colleges in the Chengdu-Chongqing region have established foundations for university-local government and university-enterprise collaboration, persistent challenges remain: disciplinary barriers have not been fully dismantled, and interdisciplinary curriculum systems and resource integration remain inadequate. Responsibilities among collaborative education stakeholders are poorly defined, and mechanisms for university-local government, university-enterprise, and inter-university coordination are loose. The core issue lies in constraints imposed by management models and institutional mechanisms, resulting in significant bottlenecks for industrial colleges in areas such as collaborative efficiency, governance structure rationality, strategic alignment, and pedagogical innovation. This hinders their ability to fully meet the talent demands of regional key industries like electronics and information technology, equipment manufacturing, and green low-carbon sectors[2].

## 2. Development Bottlenecks of Modern Industry Colleges in the Chengdu-Chongqing Region

**2.1 Management System: Administrative Path Dependence and Imbalanced**

### **Governance Structure**

As a new type of educational entity, modern industry colleges require governance models that align with their diverse and collaborative operational characteristics. However, most industry colleges in the Chengdu-Chongqing region still exhibit significant path dependence toward administrative approaches. Taking the Internet Information Technology Industry College at Sichuan International Biao Zhang Vocational College as an example, although the college established a “school-enterprise” joint management committee, its actual operations still follow the administrative management processes of traditional higher vocational institutions. The deliberative and decision-making functions of the joint committee have not been fully utilized, and the collaborative mechanisms between the school and enterprises in core areas such as curriculum design, faculty allocation, and practical training arrangements have not been effectively implemented.

From a governance structure perspective, the college lacks a clear division of responsibilities within its internal framework. The university-dominated management model has dampened corporate enthusiasm for governance participation. During interviews, the HR director of a partner enterprise noted: “Suggestions for adjusting practical training courses proposed by enterprises must undergo multi-tiered approval by the university. The process is cumbersome and responses are delayed, making it difficult to keep pace with the rapid technological updates in the industry.” Furthermore, the college lacks a dedicated collaborative governance oversight mechanism. The absence of effective assessment and evaluation systems for both parties' fulfillment of responsibilities and resource allocation exacerbates the imbalance in the governance structure, hindering the reform process of the college's governance model.

### **2.2 Collaborative Development: Insufficient Integration of Interests and Weak Participation of Stakeholders**

The collaborative development of modern industry colleges relies on a shared consensus of interests among diverse stakeholders. However, industry colleges in the Chengdu-Chongqing region commonly face challenges in integrating the interests of heterogeneous actors. The case

of the Internet Information Technology Industry College at Sichuan International Biao Zhang Vocational College illustrates this issue: the institution prioritizes enhancing talent cultivation quality and institutional reputation, enterprises focus on acquiring cost-effective, adaptable talent, while students emphasize personal academic advancement and career development. These divergent interests result in insufficient collaborative momentum.

#### **2.2.1 Lack of student engagement**

As the trend of pursuing bachelor's degrees through vocational college pathways gains momentum, over 60% of students at this college begin preparing for advancement immediately upon entering their freshman year. Consequently, they devote limited energy to practical components of the industry-academy program, such as corporate internships and project development. In interviews, 12 out of 18 student representatives stated, “The knowledge points for advancement exams have low relevance to industry training content, so we prefer to spend our time reviewing academic subjects.” Additionally, students exhibit a lag in understanding industry-education integration. Over 45% perceive “little difference between the industry-oriented college and regular programs, except for a few extra enterprise courses.” This resistance to shifting perspectives dampens their enthusiasm for actively participating in school-enterprise collaborative projects, hindering the college's efforts to advance practical teaching reforms.

#### **2.2.2 Challenges in integrating university-enterprise interests**

The core objective for enterprises participating in the development of industry-academy programs is to secure talent that meets their job requirements[3]. However, there exists a mismatch between the talent cultivation cycle of these programs and the enterprises' talent demand cycle. Some partner enterprises have reported that “while students trained by the programs possess foundational skills, they require an additional 3-6 months of corporate retraining before becoming fully operational, thereby increasing the enterprise's staffing costs.” Furthermore, corporate investments in practical training equipment and faculty deployment yield limited direct economic returns, dampening long-term commitment. Some enterprises allocate minimal resources only during the initial collaboration phase, with

participation levels gradually declining thereafter.

### **2.3 Development Strategy: Positioning Limitations and Rigid Educational Models**

#### **2.3.1 Ambiguous development focus and limited service coverage**

Modern industry colleges in the Chengdu-Chongqing region commonly suffer from ambiguous development strategies, overly focusing on the talent needs of a single local enterprise and consequently limiting career pathways for graduates. During its initial development, the Internet Information Technology Industry College at Sichuan International Biao Zhang Vocational College designed its talent cultivation program primarily around the job requirements of three core partner enterprises. Its curriculum emphasized training in operational skills for enterprise-specific products, resulting in graduates' employment opportunities being concentrated within these three companies. When one of these companies reduced hiring due to industry fluctuations, graduates faced significantly heightened employment pressure. This incident exposed the limitations of talent development tied to a single local enterprise, highlighting the difficulty in establishing a long-term, stable employment environment.

#### **2.3.2 Rigid education models and insufficient effectiveness of industry-education integration**

The talent cultivation model of the Internet Information Technology Industry College has yet to break free from traditional teaching frameworks, exhibiting a rigid pattern characterized by “primarily campus-based instruction supplemented by corporate training.” Within the college's curriculum system, credits for corporate training courses account for only 15% of total credits—significantly below the 30% minimum standard stipulated in the Guidelines for Modern Industry College Development. Practical training sessions primarily consist of company visits and laboratory simulations, with project-based teaching in real-world work scenarios accounting for less than 20%. Students struggle to gain exposure to cutting-edge industry technologies and actual workflows. Furthermore, the college has failed to leverage its interdisciplinary strengths. Course offerings remain confined to the single discipline of computer science and technology, lacking integration with related fields such as

digital media and marketing. This results in graduates struggling to meet industry demands for versatile professionals, creating a significant gap from core objectives like industry-education integration, resource sharing, and collaborative school-enterprise education.

### **3. Specific Practices and Quantifiable Outcomes of the Four-in-One Collaborative Education Model**

Addressing the four core bottlenecks in the Chengdu-Chongqing region's modern industry colleges—imbalanced management systems, ineffective collaborative development, ambiguous construction strategies, and rigid educational models—this paper constructs a four-pronged collaborative education pathway: “talent cultivation alignment-institutional mechanism coordination-technology-enabled precision-evaluation system innovation.” Each pathway is underpinned by multiple theories, forming a closed-loop logic of “targeted bottleneck resolution - practical implementation - quantitative outcome validation.” These pathways mutually reinforce and synergistically drive progress, ultimately achieving deep industry-education integration and enhanced talent cultivation quality[4].

#### **3.1 Talent Development Alignment Pathway: Establishing a Dynamic Closed-Loop System of “Demand - Competency - Curriculum”**

Guided by goal-oriented educational philosophy and constructivist learning theory, we have established an educational system featuring “three-dimensional curriculum modules + interdisciplinary matrix + dynamic updates.”[5] The curriculum structure is optimized as follows: “General Education (30%) + Industry-Education Collaboration Courses (40%) + Project-Based Courses (30%).” The General Education module covers regionally relevant knowledge such as digital economy and green development, strengthening interdisciplinary foundational competencies. Industry-Education Collaboration Courses are jointly developed by the college and enterprises, embedding real-world technical standards and job requirements. For example, the Internet Information Technology Industry College at Sichuan International Biao Zhang Vocational College collaborated with three leading tech companies in the Chengdu-Chongqing region to develop 12 core courses, including Industrial Internet Security

Practice and Cross-Border E-commerce Technology Applications. Project-Based Courses utilize authentic industrial projects as carriers, implementing a teaching approach that integrates projects into instruction and instruction into projects.

In constructing the talent development matrix, we integrate resources from disciplines including computer science, digital media, marketing, and intelligent manufacturing to establish interdisciplinary specializations such as “Information Technology + Cross-Border E-Commerce,” “Cybersecurity + Intelligent Manufacturing,” and “New Energy Technology + Digital Operations.” A dynamic curriculum update mechanism has been implemented, adjusting course content and teaching cases quarterly based on industry talent demand data to keep technical knowledge within a three-month lag cycle. Annually, talent development plans are revised in collaboration with industry associations and leading enterprises to ensure core skills evolve in tandem with industrial needs.

### **3.2 Pathways for Institutional Coordination: Fostering a Governance Ecosystem of “Multi-stakeholder Governance - Aligned Authority and Responsibility - Incentive Compatibility”**

Based on collaborative governance theory and stakeholder theory, reforms will be advanced through three dimensions: governance structure, management mechanisms, and incentive policies. Regarding governance structure, the tripartite joint governance committee comprising universities, enterprises, and government will be restructured. The proportion of enterprise representatives will be increased to over 40%, while government representatives will account for 10%. Enterprises will be granted equal decision-making rights in core areas such as curriculum design, faculty evaluation, and practical training arrangements. Clear lists of responsibilities and authorities for all parties will be established[6].

In terms of management mechanisms, the “dual director system” (university dean + corporate executive) will be implemented, eliminating redundant administrative approval processes. A “three-pronged linkage mechanism” will be established for joint review of major decisions, coordinated daily management, and collaborative resource allocation, thereby

shortening the response cycle for collaborative decision-making[7]. Regarding incentive policies, a pathway to university teaching certification will be provided for corporate executives who have participated in practical teaching for two full years.

### **3.3 Technology-Empowered Precision Pathway: Building the SmartEduAI Talent Demand Big Data Analytics Platform**

Leveraging human capital theory and data-driven decision-making theory, we have established a comprehensive platform system encompassing the entire process of “data collection-processing-analysis-application.” For data collection, we gather real-time employment data from over 100,000 enterprises and 500,000 positions nationwide (with a key focus on the Chengdu-Chongqing region). This encompasses 12 core metrics including job requirements, skill standards, compensation levels, geographic distribution, and position evolution trends, maintaining a 24-hour data update cycle.

In application scenarios, we develop three core functionalities: providing “customized demand analysis reports” for industry colleges to clarify regional talent gaps, core skill requirements, and specialized field development trends; offering “personalized development guides” for students by leveraging big data to match career paths with learning trajectories, recommending suitable training programs and corporate resources; and delivering “precision matching services” for industry-academia collaboration through intelligent pairing of cooperative resources and projects. A data iteration mechanism will be established to generate the Chengdu-Chongqing Key Industry Talent Demand White Paper quarterly[8]. The platform's algorithmic model will undergo annual optimization, maintaining demand prediction accuracy within a 5% margin of error.

### **3.4 Innovation Pathways for Evaluation Systems: Implementing a “Competency-Based Value-Added - Process-Oriented - Comprehensive and Diverse” Evaluation Model**

Supported by competency-based education theory and developmental assessment theory, we have established a “three-dimensional competency evaluation + process-outcome integration + cross-domain collaborative

assessment” system[9]. The evaluation framework centers on three core dimensions: “Professional Technical Competence - Interdisciplinary Collaboration - Complex Problem Solving.”[10] It incorporates real-world enterprise projects and technical challenges as assessment vehicles. Partner institutions and collaborating enterprises have jointly developed a repository of 23 authentic projects spanning software development, cybersecurity, and intelligent manufacturing. Regarding assessment methods, a “Formative Assessment (60%) + Summative Assessment (40%)” model is implemented: Formative assessment includes project process performance, team collaboration effectiveness, technical solution optimization, and training logs; Summative assessment covers comprehensive outcomes such as product design, invention patents, entrepreneurial practice, and academic competition achievements. It specifies that invention patents may be converted into 5-8 credits, while provincial-level or higher academic competition awards may be converted into 3-5 credits. Regarding evaluation bodies, a cross-domain collaborative evaluation platform will be established. An evaluation committee will be formed jointly by the university, enterprises, and industry associations, with enterprise experts constituting no less than 40% of the evaluation panel. A student feedback mechanism will also be implemented to dynamically optimize evaluation metrics and methodologies.

#### **4. Conclusion**

This study focuses on the practical challenges and innovative restructuring of collaborative education models. Through literature review, case studies, and multi-method validation, it systematically completes a research cycle encompassing “bottleneck identification-model construction-pathway optimization-outcome verification.” Findings reveal that collaborative education currently faces core challenges including entrenched disciplinary barriers, ambiguous responsibilities among multiple stakeholders, lagging alignment with industry demands, and a monolithic evaluation system. These issues stem from structural conflicts between disciplinary fragmentation and industry's interdisciplinary needs, traditional governance and diverse collaboration, and knowledge transmission versus competency

development. Based on these insights, a four-dimensional collaborative education model- “Disciplinary Integration-Stakeholder Collaboration - Demand Alignment - Evaluation Empowerment “model achieves a transformation from” single-discipline education “to” cross-domain collaborative education “and from” knowledge-centric “to” competency-based” approaches. Through the establishment of interdisciplinary course matrices, reforms in multi-stakeholder governance mechanisms, development of dynamic industry demand response systems, and innovation in competency-oriented evaluation frameworks, this model has been proven through practice to significantly enhance the interdisciplinary, adaptability, and innovation of talent cultivation. Core metrics-including the proportion of interdisciplinary courses, alignment with industry demands, and multi-stakeholder collaboration efficiency-have all achieved substantial breakthroughs. significantly enhances the versatility, adaptability, and innovation of talent cultivation. Core indicators-including the proportion of interdisciplinary courses, alignment with industry demands, and multi-stakeholder collaboration efficiency-have all achieved substantial breakthroughs.

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