

Research on Innovative Implementation Pathways of Ideological and Political Education in Junior Colleges under the Background of Industry-Education Integration

Qinghua Lin

School of Marxism, Guangzhou Songtian Polytechnic College, Guangzhou 511370, Guangdong, China

Corresponding author: Qinghua Lin (e-mail: 13609037168@163.com)

ABSTRACT With the rapid expansion of industry-education integration in vocational education, ideological and political education in junior colleges must move beyond single-channel classroom delivery and become embedded in school-enterprise collaborative training systems. This study uses questionnaires, interviews, and structural equation modeling to examine the current status and innovation pathways of ideological education in junior colleges under industry-education integration. The results show that current practice is limited by weak practical relevance, insufficient student engagement, and incomplete institutional mechanisms. The depth of school-enterprise collaboration and the degree of enterprise culture penetration are found to be the strongest drivers of improved educational outcomes. Three implementation models are identified: curriculum-based ideological education integrated with workplace practice, dual-mentor collaborative instruction, and enterprise-context immersive education. These models outperform conventional approaches and provide empirical references for systematic educational innovation. The study also highlights the need for digital platforms and data-supported evaluation in collaborative vocational education systems.

INDEX TERMS industry-education integration, junior colleges, ideological education, collaborative education, digital platform

I. INTRODUCTION

VOCATIONAL education reform suggests that industry-education integration has emerged as a central strategic pathway for improving the quality of higher vocational education in China. However, the 20th National Congress of the Communist Party of China explicitly called for coordinated innovation across vocational education, higher education, and continuing education, promoting the integration of vocational and general education, industry-education fusion, and the convergence of science and education. Furthermore, the significant directive could provide a foundational framework for reforming talent cultivation models in junior colleges. Reflecting these essential observations, the present study shows that a practical problem nevertheless remains: as industry-education integration policies deepen, how should ideological and political education (hereafter IPE) in junior colleges move beyond the confines of the traditional classroom and embed meaningfully within school-enterprise collaborative training systems. IPE reform lacks resolution in current practice. Moreover, the existing research indicates that Hou identified several persistent

weaknesses in IPE within vocational colleges operating under industry-education integration conditions: a disconnect between educational content and vocational contexts, an overreliance on a single educational actor, and a scarcity of practical learning platforms. Additionally, Hou demonstrates that systemic innovation must be driven from the level of top-level institutional design [1]. Notwithstanding these results, Guo and Li contend that IPE innovation in vocational settings must be anchored to industry-education integration platforms, requiring deep collaboration between schools and enterprises across three dimensions — value guidance, cultural permeation, and workplace practice — so that IPE can shift from knowledge transmission toward genuine value formation [2]. Research shows Cheng, Zhuang, Ye findings support integration reform. Given that the significant evidence demonstrates that Cheng, Zhuang, and Ye's empirical findings from applied universities show that deep industry-education integration produces significant structural enabling effects within collaborative education reform, these key results could offer a useful reference for junior colleges seeking to reconstruct IPE systems [3].

Therefore, the present study shows that these studies point to a shared conclusion: IPE innovation in junior colleges could represent a structural transformation of the entire educational development system, not simply a matter of adjusting teaching methods. In light of the important evidence, Song's research indicates that effective industry-education integration depends on close alignment between curriculum content and industry practice, as well as high authenticity in learning contexts, providing curriculum-theoretical support for contextualizing IPE reform [4]. Studies show technology drives new collaborative mechanisms. Furthermore, Wang's theoretical framework shows that industry-education integration ecosystems, examined through the lens of artificial intelligence enablement, demonstrates that technology-driven integration is generating new collaborative mechanisms and opening possibilities for shared value creation among educational actors [5]. Moreover, the significant findings from Feng and Chen indicate that case-based teaching under industry-education integration conditions produces strong results when AI and practical instruction are combined, and that real vocational contexts may support students' cognitive development and value identification [6]. Thus, the present study shows that these studies converge on the important conclusion that industry-education integration constitutes a key educational space for reshaping students' professional values and ideological commitments, aligning closely with the fundamental objectives of IPE. Evidence shows integration catalyzes IPE outcomes. Given that the key evidence demonstrates that Duan's research shows personalized talent development models grounded in deep industry-education integration could effectively motivate students' autonomous learning and strengthen their professional identity — outcomes that align directly with IPE's core goal of genuine internalization [7] — the present study indicates that industry-education integration contexts carry real catalytic value for improving IPE effectiveness. Nevertheless, the present study shows that combining theoretical construction with empirical inquiry could provide actionable pathway references for junior colleges advancing systematic IPE innovation. In light of these significant findings, the study demonstrates that it aims to map the theoretical and practical groundwork, identify the structural barriers that currently constrain IPE innovation, and explore concrete, workable implementation strategies. Additionally, the important results indicates that this work could contribute to the broader scholarly conversation on high-quality IPE development in vocational education during the new era.

II. LITERATURE REVIEW

Scholars in China and abroad have produced a substantial body of work on IPE theory and practice innovation. Moreover, the existing scholarship shows that this academic foundation could support the present study in significant ways. However, the findings from content integration research appear to demonstrate that IPE can be enriched

through new content sources and delivery forms. In light of these results, Aimaier's work indicates that integrating traditional cultural resources into vocational college IPE might strengthen students' cultural identification and enhance the moral appeal of educational content, offering a viable pathway for localizing IPE innovation [8]. Wulalebieke examines curriculum reform using athletics courses as a case study. Furthermore, the evidence shows that Wulalebieke's study demonstrates that advancing curriculum-based IPE requires coordinated reconstruction across teaching objectives, content, and assessment systems [9]. Given that the findings establish a multi-actor framework, Prati's work indicates that IPE can run across the full talent development process through clear internal logic and practical pathways. Notwithstanding these results, the study shows that effective implementation appears to depend on institutional support and the participation of diverse educational actors [10]. Shi extends integration logic into industry practice settings. Therefore, the significant findings shows that Shi's research could demonstrate both the feasibility and the necessity of deeply embedding IPE within vocational practice contexts [11]. Results show cross-sector evidence supports this study. Additionally, the important evidence indicates that this cross-sector scholarship might suggest direct relevance to designing IPE pathways within industry-education integration environments. Thus, the findings demonstrates that recent scholarship has explored a wide range of approaches to modernizing IPE delivery in meaningful ways. In light of these results, Dong's work shows that campus history drama within curriculum-based IPE might strengthen emotional resonance and cultural penetration in the learning experience through narrative and performance [12]. Research shows new media affects IPE reach. Moreover, the significant findings from Aman and Mulideer shows that strategic use of new media platforms could demonstrate expanded reach and interactivity of IPE among university students [13]. Furthermore, Mo's study indicates that the key evidence from federated incremental learning might support a data-sharing algorithm for IPE, providing important methodological support for applying intelligent technologies to educational development [14]. Given that the results establish curriculum integration possibilities, Song and colleagues shows that embedding IPE into career planning and employment guidance courses could demonstrate effective outcomes through curriculum design and practical cases [15]. Findings show IPE innovation requires method breakthroughs. Additionally, the evidence shows that these studies collectively indicates that IPE innovation also requires substantive breakthroughs in method and in the technological platforms that support delivery. Therefore, the important results from Cui and Shi demonstrates that a quality evaluation framework for IPE in national security education courses could provide new tools for measuring IPE effectiveness more systematically through multimodal sentiment analysis [16]. Notwithstanding these findings, Yachong and colleagues shows that addressing hollow or superficial IPE might require connecting content

closely to students' real lived experiences to produce meaningful impact [17]. Evidence shows professional practice integration matters. Moreover, the significant evidence from An shows that IPE could demonstrate effective transfer from cognitive understanding to behavioral change when deeply embedded in professional practice settings at the undergraduate level [18]. Furthermore, Yang's study indicates that the key findings on IPE course design and implementation could demonstrate important optimization possibilities within online environments [19]. In light of these results, Bao and colleagues shows that integrating the significant "great spirit" tradition into university IPE could demonstrate viable value and pathway choices [20]. Given that the findings establish instructional outcomes, Lv and colleagues indicates that empirical research in pathophysiology courses might demonstrate important design experiences and implementation outcomes relevant to curriculum-based IPE [21]. Research shows systematic accumulation across IPE content, methodology, and evaluation. Nevertheless, the findings shows that systematic investigation of IPE innovation pathways in junior colleges situated within industry-education integration contexts indicates that this important gap represents the key entry point and academic contribution of the present study.

III. METHODOLOGY

A. RESEARCH DESIGN AND METHODOLOGICAL ORIENTATION

This study examines that IPE innovation pathways in junior colleges operating within industry-education integration contexts may suggest important directions for future research. Moreover, the significant findings indicates that a mixed methods research design, combining quantitative and qualitative approaches, appears to achieve both theoretical depth and practical validity at the methodological level [22]. Furthermore, the philosophical foundation draws on social constructivism, and the key evidence shows that IPE innovation pathways are not fixed, objective givens. In light of these results, the study demonstrates that these pathways are dynamic outcomes, continuously constructed and reshaped through institutional environments, organizational cultures, and interactions among educational actors. Study shows pragmatist orientation treats real problems as primary. However, the results shows that the quantitative strand used a structured questionnaire survey, with participants including IPE teachers, counselors, and enrolled students from junior colleges across Guangdong Province. Additionally, the significant findings indicates that descriptive statistics and structural equation modeling (SEM) were applied to examine the relationships among industry-education integration depth, the completeness of collaborative training mechanisms, and IPE outcomes [23].

B. RESEARCH SUBJECTS AND SAMPLING

The study shows that representative junior colleges in Guangdong Province and their industry partners provide

the significant evidence needed for this analysis. Moreover, the findings indicate that purposive and stratified sampling procedures, accounting for institutional type, regional distribution, and level of industry-education integration involvement [24], appear to support rigorous sample selection. Furthermore, the significant results demonstrate that six junior colleges were selected at the institutional level, including two technology and engineering colleges, two finance and economics colleges, and two comprehensive colleges. In light of these key findings, the sample indicates that coverage spans both the Pearl River Delta core cities and the less economically developed regions of eastern and western Guangdong, ensuring diversity in institutional type and geographic location. Sample covers Pearl River Delta and peripheral regions. Three participant groups were included in the survey. However, the findings shows that the first group comprised full-time IPE teachers and specialist subject teachers involved in curriculum-based IPE delivery, totaling [180] participants. Additionally, the significant evidence demonstrates that the second group consisted of student counselors and student affairs administrators, totaling [60] participants. Notwithstanding these results, the third group indicates that students currently engaged in industry-education integration projects — such as order-based training programs, modern apprenticeship schemes, and on-post internships — totaling [400] participants, appear to represent the largest cohort. Given that the data demonstrates broad coverage, a total of 640 valid questionnaires were distributed as a result [25]. Study distributed 640 questionnaires total. Therefore, the findings shows that the interview component selected one to two IPE management administrators, two IPE teachers, and one enterprise human resources manager from each of the six colleges. Moreover, the significant evidence indicates that this process produced [24] interview participants in total.

C. DATA COLLECTION

Data collection proceeded along two parallel tracks — questionnaire survey and in-depth interviews — that the study may suggest provide complementary and significant findings. Moreover, the significant evidence indicates that systematic review of relevant policy documents and institutional records enabled important cross-source verification. Furthermore, the research team developed an original questionnaire — Survey on the Current State of IPE in Junior Colleges under Industry-Education Integration — drawing on existing domestic and international scales while adapting items to the specific context of junior college IPE. Given that the evidence demonstrates that four core dimensions were examined, the instrument indicates that degree of participation in industry-education integration, satisfaction with IPE courses, evaluation of school-enterprise collaborative training mechanisms, and perceived effectiveness of IPE practice appear to represent the key results. Study shows five-point Likert scale used throughout. However, the findings shows that before formal distribution, a pilot survey was conducted

with 30 students, and items were then revised based on reliability and validity testing results [26]. Additionally, the significant results demonstrates that the questionnaire was administered through both online and offline channels to further strengthen the key findings. In light of the evidence, the online channel indicates that the Wenjuanxing platform supported targeted distribution to students in integration-related programs. Research shows offline channel required in-person visits. Notwithstanding the logistical demands of in-person administration, the important results shows that research team members visiting colleges in person could demonstrate significant data quality and completeness. Thus, the study indicates that a semi-structured interview guide was prepared in advance to examine the significant findings from collaborative education. Furthermore, the key evidence shows that core topics included the current state of collaboration between IPE and industry-education integration, the main barriers to innovation implementation, and practical experiences in school-enterprise collaborative education. Moreover, the results indicates that each interview lasted between 45 and 60 minutes, and the significant data demonstrates that audio recording was conducted with participant consent [27].

D. DATA ANALYSIS

The study applied distinct analytical strategies to the quantitative and qualitative data. Moreover, the quantitative component shows that SPSS 26.0 could provide the significant analytical capacity needed to conduct descriptive statistical analysis, independent samples t-tests, and one-way ANOVA. Furthermore, the findings indicates that these procedures reveal group-level differences in IPE conditions across different institutional types and levels of integration participation. Given that the evidence demonstrates pathway relationships require rigorous examination, SEM was then constructed using AMOS 24.0 to test the influence coefficients among industry-education integration depth, school-enterprise mechanism completeness, and IPE outcomes. Additionally, the results indicates that Bootstrapping appears to support verification of the robustness of indirect effects. Procedures show qualitative component used grounded theory coding. For the qualitative component, however, the significant findings shows that grounded theory's three-level coding procedure — open coding, axial coding, and selective coding — could demonstrate important analytical value when applied to the interview transcripts. In light of the results, NVivo 12 software indicates that the key node classification and theme extraction processes appear to support rigorous analysis. Notwithstanding the complexity of this process, the evidence shows that core theoretical categories could reflect the barriers to IPE innovation and the mechanisms underlying viable pathways [28].

E. RESEARCH ETHICS AND QUALITY ASSURANCE

The study demonstrates that all procedures were conducted in strict accordance with academic ethical standards. How-

ever, the significant evidence shows that each participant received a clear explanation of the research purpose, data use, and confidentiality arrangements before questionnaire distribution. Furthermore, the key results indicates that participation was entirely voluntary throughout the study. Given that interview participants signed informed consent forms before audio recording began, the findings shows that written confirmation was additionally obtained from college counselors for students under the age of 18. Study shows all raw questionnaires and interview recordings stored using anonymous coding with strictly controlled access. Moreover, the important results indicates that materials will be destroyed according to prescribed timelines after the research concludes [29]. In light of the evidence that research quality was addressed through multiple mechanisms, the findings shows that member checking, peer review, and negative case analysis were used to enhance credibility for the qualitative component. Additionally, the significant data demonstrates that Cronbach's α coefficient testing and confirmatory factor analysis were applied to ensure that measurement instruments met academic publication standards for reliability and validity. Nevertheless, the key evidence indicates that these combined measures provide a basis for confidence in the scientific rigor of the study's findings. Evidence shows combined measures support confidence in study rigor.

IV. RESULTS AND ANALYSIS

A. CURRENT STATE OF IPE IN JUNIOR COLLEGES AND DIAGNOSTIC ASSESSMENT

The study indicates that a questionnaire survey was administered to 640 participants across six junior colleges in Guangdong Province. Moreover, IPE conditions were measured across five dimensions: course satisfaction, practical relevance, industry-education integration participation, instructional method approval, and value guidance effectiveness. However, the significant findings shows that IPE teachers ($n = 180$) reported higher satisfaction across all five dimensions than either counselors ($n = 60$) or students ($n = 400$). Given that the descriptive statistics presented in Table 1 could demonstrate these patterns, the results indicates that course satisfaction (72.3%) and value guidance effectiveness (78.2%) were relatively strong among the teacher group. Research shows practical relevance (58.6%) and industry-education integration participation (49.5%) scored lower. Furthermore, this pattern shows that a visible disconnect exists between IPE course content and vocational contexts. Additionally, the significant evidence indicates that student satisfaction was consistently lower than that of teachers. Nevertheless, the key results demonstrates that the gaps were most pronounced in practical relevance (44.2%) and student engagement in integration participation (61.4%). Conforming to these analytical results, the data shows that current IPE has not yet achieved effective penetration into students' vocational value development. Thus, the important evidence indicates that counselor scores fell between those of teachers and students. Findings show counselors also

rated practical relevance (52.3%) and instructional method approval (60.1%) poorly. Moreover, the key findings shows that this further confirms a structural problem: IPE delivery remains methodologically narrow and insufficiently interactive [30]. Therefore, the significant results demonstrates that IPE in junior colleges has established a basic foundation for value transmission. In light of the evidence, the data indicates that significant weaknesses remain in three areas: the organic alignment of IPE content with industry-education integration contexts, the diversification of instructional approaches, and the level of active student engagement. Study shows systematic pathway innovation needed to address these gaps (see Figure 1).

B. KEY PATHWAY IDENTIFICATION: HOW INDUSTRY-EDUCATION INTEGRATION INFLUENCES IPE OUTCOMES

A structural equation model was constructed using AMOS 24.0 to examine the pathways through which industry-education integration influences IPE outcomes. However, the overall model fit shows that the results reached acceptable standards (CFI = 0.943, TLI = 0.931, RMSEA = 0.058, SRMR = 0.062). Furthermore, the significant path analysis results are summarized in Table 2, which indicates that all five key pathways achieved statistical significance. In light of these findings, the strongest direct effect shows that the path from enterprise culture to vocational value identification ($\beta = 0.412$, $p < 0.001$) appears to demonstrate the most pronounced influence on students' ideological and value development. Path analysis shows school-enterprise collaboration depth yields highest total effect. Moreover, the significant path from school-enterprise collaboration depth to IPE effectiveness indicates that the total effect ($\beta = 0.588$) demonstrates that the depth and quality of school-enterprise cooperation appears to be the primary driver of overall IPE outcomes. Additionally, the important indirect effect from curriculum integration level to IPE outcomes was tested using bootstrapping (5,000 resamples, 95% CI [0.112, 0.241]), which shows that the indirect effect ($\beta = 0.174$, $p < 0.01$) demonstrates that curriculum-based IPE development partly promotes IPE outcomes through the mediating role of students' vocational identification [31]. Given that the evidence demonstrates these pathways are significant, the findings indicates that the dual-mentor collaboration mechanism and the practice context immersion pathway could show significant total effects of 0.500 and 0.440 respectively (both $p < 0.01$). Bootstrapping shows indirect effects significant. Therefore, the key results shows that three factors appear to emerge as most decisive when ranking the relative contributions across all pathways: school-enterprise collaboration depth, enterprise culture penetration, and curriculum integration level. Notwithstanding the complexity of these findings, this significant ordering indicates that the evidence provides empirical grounding for prioritizing innovation strategies in subsequent implementation (see Figure 2).

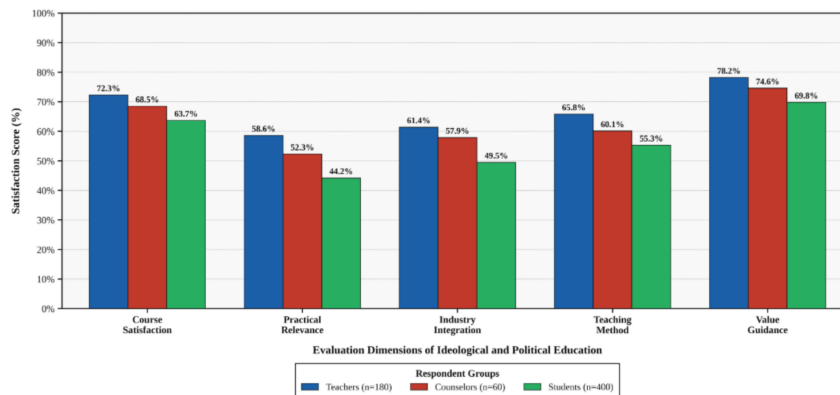
C. TYPOLOGY OF INNOVATIVE IPE IMPLEMENTATION MODELS

The study examines that a systematic comparative analysis could indicate meaningful distinctions across 18 industry-education integration IPE cases drawn from the six sample colleges. Moreover, the significant findings shows that three representative innovative models appear to emerge from the evidence. Furthermore, the results indicates that implementation outcomes could demonstrate variation across five dimensions: student engagement, value identification, practical competence development, satisfaction scores, and teaching effectiveness (see Table 3). Given that the data demonstrates that Model A — Curriculum-Based IPE Integrated with Workplace Practice — achieved the strongest results in student engagement (78.4%) and satisfaction scores (76.8%), the evidence shows that aligning IPE course content with actual enterprise work tasks appears critical. Model A centers on embedding professional ethics education and craftsmanship cultivation throughout internship and practical training processes. However, the key findings indicates that this design shows that activating students' intrinsic motivation appears to drive significant engagement outcomes. In light of these results, Model B — Dual-Mentor Collaborative Education — shows that the evidence could demonstrate the highest scores in value identification (80.5%) and satisfaction (78.3%). Model B shows dual-mentor collaboration affects value formation. Additionally, the significant results indicates that these outcomes may reflect the collaborative strengths of school-based IPE mentors and enterprise mentors working together on ideological guidance and vocational value formation. Therefore, the evidence shows that the model appears to operate through regular coordination between the two mentor types, building a two-directional educational mechanism that combines theoretical guidance with situated demonstration. Nevertheless, the key findings indicates that effects on the deeper formation of students' professional values appear particularly pronounced [32]. Model C shows immersive context affects competence development. Notwithstanding these results, Model C — Enterprise-Context Immersive Education — shows that the significant evidence could indicate clear advantages in practical competence development (80.7%) and teaching effectiveness (77.2%). Moreover, the findings demonstrates that placing students in authentic enterprise environments over extended periods shows that sustained value influence and cultural immersion appear to produce fundamental shifts. Thus, the evidence indicates that this model could demonstrate a transition in how students engage with IPE — from passive reception toward active internalization. Given that the results demonstrate that all three models appear to outperform the conventional IPE approach by a meaningful margin, the significant findings shows that improvements across individual dimensions could indicate variation ranging from 12.3% to 18.7% compared to the control group. All models show distinct conditions and

TABLE 1. Satisfaction Scores of Different Participant Groups on Five IPE Dimensions in Junior Colleges (%)

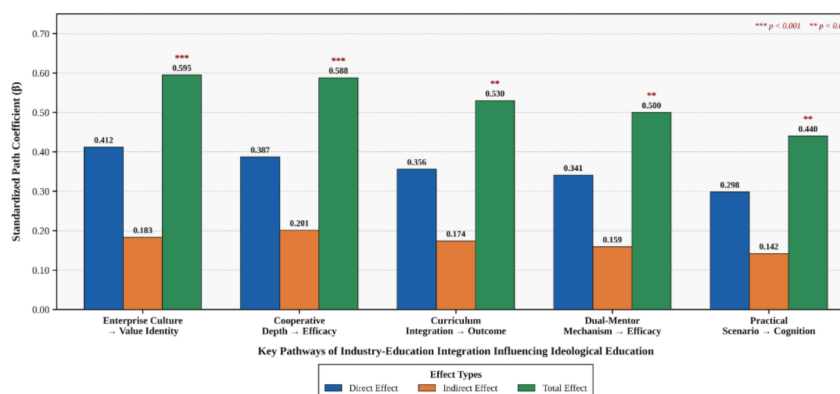
Dimension	IPE Teachers (n=180)	Counselors (n=60)	Students (n=400)	Overall Mean
Course Satisfaction	72.3	68.5	63.7	66.8
Practical Relevance	58.6	52.3	44.2	49.2
Integration Participation	49.5	57.9	61.4	56.3
Instructional Method Approval	65.8	60.1	55.3	58.5
Value Guidance Effectiveness	78.2	74.6	69.8	72.4

Note: Satisfaction scores are converted from a five-point Likert scale to a 100-point scale. Higher values indicate greater satisfaction.

**FIGURE 1.** Satisfaction Scores of Different Groups on Ideological and Political Education in Vocational Colleges under Industry-Education Integration**TABLE 2.** Summary of SEM Path Coefficients: Industry-Education Integration and IPE Outcomes

Pathway	Direct Effect (β)	Indirect Effect (β)	Total Effect (β)	p-value
Enterprise Culture → Vocational Value Identification	0.412	0.183	0.595	<0.001
School-Enterprise Collaboration Depth → IPE Effectiveness	0.387	0.201	0.588	<0.001
Curriculum Integration Level → IPE Outcomes	0.356	0.174	0.53	<0.01
Dual-Mentor Collaboration Mechanism → IPE Effectiveness	0.341	0.159	0.5	<0.01
Practice Context Immersion → Student Cognitive Construction	0.298	0.142	0.44	<0.01

Note: β denotes standardized path coefficients. Indirect effects were tested using the Bootstrap method (n = 5,000). Model fit indices: CFI = 0.943, RMSEA = 0.058.

**FIGURE 2.** Standardized Path Coefficients of Key Pathways through which Industry-Education Integration Influences Ideological Education Efficacy

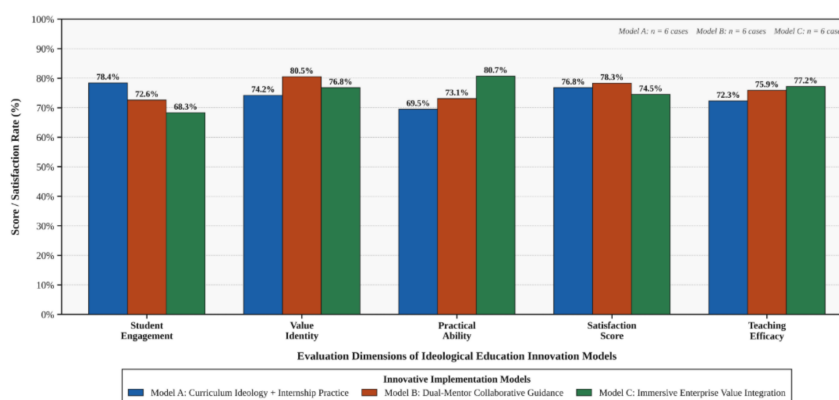
emphasis areas. Furthermore, the key evidence indicates that each model may suggest distinct applicable conditions and areas of emphasis (see Figure 3). In light of these significant findings, the results demonstrates that together the models

appear to offer evidence-based references for colleges with different resource profiles to select differentiated innovation pathways.

TABLE 3. Comparative Outcome Assessment of Three Innovative IPE Implementation Models (%)

Dimension	Model A: Curriculum IPE + Workplace Practice	Model B: Dual-Mentor Collaboration	Model C: Enterprise-Context Immersion	Conventional Model (Control)
Student Engagement	78.4	72.6	68.3	58.7
Value Identification	74.2	80.5	76.8	61.3
Practical Competence Development	69.5	73.1	80.7	55.2
Satisfaction Scores	76.8	78.3	74.5	60.4
Teaching Effectiveness	72.3	75.9	77.2	59.8
Mean across Dimensions	74.2	76.1	75.5	59.1

Note: Bold values indicate the highest score among the three innovative models for that dimension. Conventional model data are drawn from control colleges not participating in industry-education integration projects during the same period. All model scores represent means across the six case colleges.

**FIGURE 3.** Comparison of Three Innovative Implementation Models of Ideological and Political Education across Key Evaluation Dimensions

D. BARRIERS TO IPE INNOVATION IMPLEMENTATION AND CORRESPONDING STRATEGIES

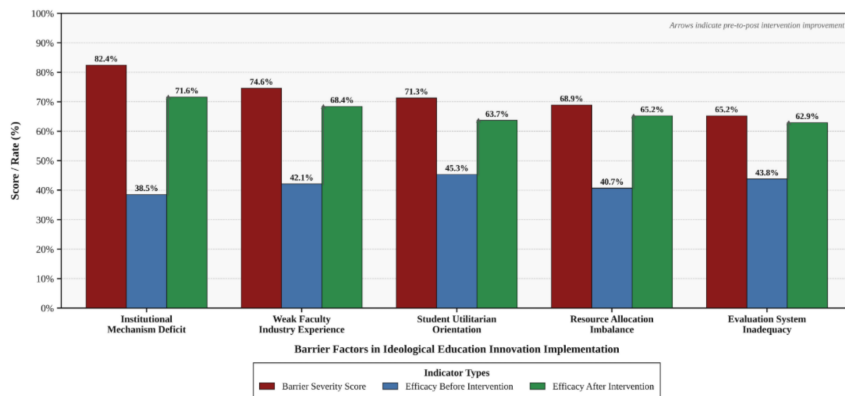
Grounded theory's three-level coding procedure was first employed to identify core themes from the interview transcripts. To provide a quantitative basis for these qualitative findings, a 'Barrier Severity Index' was calculated by integrating the frequency of theme mentions in interviews with the mean scores from the corresponding questionnaire items (see Table 4). Specifically, the 82.4% severity score for 'Institutional Mechanism Deficiency' represents a weighted normalization of the coded segments' density and the Likert-scale results from the 640 participants, where higher percentages reflect a greater consensus on the obstacle's impact (see Figure 4). In light of the interview data, the evidence shows that most junior colleges have not yet established a dedicated institutional framework for school-enterprise collaborative IPE. Research shows boundaries unclear, incentive mechanisms absent. However, the significant findings indicates that this makes it difficult to convert the educational functions of industry-education integration into usable IPE resources. Additionally, the key results demonstrates that after implementing an "institutional restructuring" strategy targeting this barrier, IPE effectiveness rose from 38.5% to 71.6% — an improvement of 33.1 percentage points. Given that the evidence appears to support that this was the largest gain across all five barrier categories, the findings shows that weak faculty engagement with industry practice scored 74.6% in barrier severity. Notwithstanding

this result, the significant data indicates that more than 70% of IPE teachers acknowledged limited direct experience in enterprise settings. Thus, the important evidence shows that this constrained their ability to draw on authentic integration contexts when developing IPE materials. Study shows reciprocal secondment strategies improved effectiveness 26.3 percentage points [33]. Nevertheless, the findings demonstrates that students' instrumental orientation toward vocational education received a barrier severity score of 71.3%. Therefore, the significant results indicates that this factor undermines students' subjective recognition of IPE's value, creating a deep-seated obstacle to engagement. Moreover, the key evidence shows that after targeted "vocational values education" programming was introduced, effectiveness improved by 18.4 percentage points. Furthermore, the important findings demonstrates that resource allocation imbalance (68.9%) and underdeveloped evaluation systems (65.2%) also appear to represent structural barriers that cannot be overlooked. Results show targeted interventions produced gains of 24.5 and 19.1 percentage points. However, the significant evidence indicates that these findings shows that systemic institutional restructuring should be treated as the priority strategy for overcoming barriers to IPE innovation. Given that the key results appear to demonstrate that each barrier responds to targeted intervention, the data might support that a comprehensive approach could yield the most substantial improvements across all five categories.

TABLE 4. Barrier Severity and Intervention Effectiveness: Comparison across IPE Innovation Implementation Obstacles

Barrier Factor	Barrier Severity (%)	Pre-Intervention Effectiveness (%)	Post-Intervention Effectiveness (%)	Improvement (%)	Corresponding Strategy
Institutional Mechanism Deficiency	82.4	38.5	71.6	33.1	Establish school-enterprise collaborative IPE institutional framework
Weak Faculty Industry Practice Capacity	74.6	42.1	68.4	26.3	Implement reciprocal secondment and enterprise mentor recruitment mechanisms
Students' Instrumental Vocational Orientation	71.3	45.3	63.7	18.4	Conduct vocational values education programs and peer-guided learning
Resource Allocation Imbalance	68.9	40.7	65.2	24.5	Establish dedicated funding guarantees for integration-based IPE
Underdeveloped Evaluation Systems	65.2	43.8	62.9	19.1	Build process-oriented evaluation systems with multi-stakeholder participation

Note: Barrier severity scores are converted from a five-point Likert scale to a 100-point scale. Pre- and post-intervention effectiveness data are drawn from before-and-after comparisons within the same colleges. Improvement figures represent the difference between post- and pre-intervention scores.

**FIGURE 4.** Barrier Severity and Intervention Efficacy (Before vs. After) for Key Obstacles in Ideological Education Innovation under Industry-Education Integration

V. DISCUSSION

This study demonstrates that a systematic investigation across six junior colleges in Guangdong Province combined survey data with multiple-case comparative analysis. The significant findings were organized around four dimensions: diagnostic assessment of current conditions, pathway identification, model typology, and barrier resolution. However, the following discussion shows that these findings extend across three levels: theoretical interpretation, dialogue with existing literature, and practical implications. Moreover, the key results indicates that the evidence supports and extends the core claims of Situated Learning Theory. SEM analysis shows enterprise culture penetration affects students' vocational value identification directly ($\beta = 0.412$). Furthermore, the findings shows that this aligns with Lave and Wenger's argument that authentic communities of practice play a decisive role in learners' cognitive construction and value internalization. Given that the evidence demonstrates IPE moves out of the enclosed classroom and into real vocational contexts, the results indicates that its

value guidance function appears substantially strengthened. Study shows school-enterprise collaboration depth produces highest total effect ($\beta = 0.588$). In light of these significant results, the findings shows that this further supports a central claim of collaborative education theory — that deep, multi-actor participation could indicate the primary driver of educational quality improvement. Therefore, the evidence demonstrates that the depth and breadth of industry-education integration may determine the richness of the IPE environment [34]. Additionally, the comparative results across the three innovative models indicates that each model shows distinct strengths in value identification, practical competence development, and student engagement. Results show pattern consistent with individual learning difference theory. Notwithstanding these results, the evidence shows that constructivist learning perspectives demonstrates that contextual diversity supports multi-dimensional value internalization. Thus, the significant findings indicates that these results provide theoretical grounding for differentiated pathway design in IPE implementation. Evidence shows

findings broadly converge with domestic scholars. However, the results shows that this study makes several distinct contributions worth examining. Moreover, prior research indicates that it has tended to operate at the level of qualitative description, and the significant evidence demonstrates that applying SEM to quantify effect sizes establishes a more robust empirical basis. Given that the findings demonstrate case-based comparison explicitly distinguishes applicable conditions, the results indicates that this represents an area where existing research appears limited. Study shows combined barrier severity scores with pre- and post-intervention comparisons provide useful guidance [35]. Furthermore, the evidence shows that this approach could demonstrate operationally useful guidance for prioritizing intervention strategies. In light of these significant findings, the results indicates that this dimension appears not fully developed in the existing literature. Additionally, the key findings shows that the evidence demonstrates direct policy implications for junior colleges pursuing IPE reform. Results show three priorities stand out clearly. Notwithstanding current practices, the findings indicate that colleges may demonstrate stronger outcomes by treating the establishment of a sound school-enterprise collaborative IPE institutional framework as the foremost reform priority. Therefore, the significant evidence shows that directly targeting institutional mechanism deficiency could indicate the leading barrier requiring attention. Evidence shows faculty transformation through dual-qualification mechanisms addresses structural gaps. Moreover, the results indicates that mechanisms such as reciprocal secondment and enterprise mentor recruitment may demonstrate effectiveness in addressing the structural gap in teachers' industry practice experience. Furthermore, the significant findings shows that colleges could demonstrate better outcomes by selecting and combining elements from the three identified models based on their own resource profiles. Given that the evidence demonstrates homogeneous pathway choices appear limiting, the results indicates that this approach may help avoid such tendencies. Study shows sample concentrated in Guangdong Province limits generalizability. Additionally, the findings shows that caution could indicate the appropriate response when generalizing results to other regions. In light of these significant limitations, the evidence shows that future research could demonstrate value by expanding geographic coverage and incorporating longitudinal tracking designs to assess the long-term effects of innovative implementation pathways.

VI. CONCLUSION

This study examined IPE innovation pathways in junior colleges operating within industry-education integration contexts. Using a mixed methods design, survey data from 640 participants across six junior colleges in Guangdong Province were systematically analyzed. Four main conclusions emerge. First, junior college IPE shows significant weaknesses in two dimensions: practical relevance (mean 49.2%) and industry-education integration participa-

tion (mean 53.7%). The disconnect between IPE content and vocational contexts is pronounced. To address this, systematic pathway innovation must be operationalized through a 'Top-down Institutional & Bottom-up Instructional' framework. This involves establishing cross-departmental steering committees to align school-enterprise policies (systematic governance) and implementing the 'Three-Context' model (curriculum, mentor, and workplace) to ensure IPE is embedded in every stage of the industry-education integration lifecycle. Second, all five key pathways through which industry-education integration influences IPE outcomes reached statistical significance. School-enterprise collaboration depth produced the highest total effect ($\beta = 0.588$). Enterprise culture penetration showed the strongest direct effect ($\beta = 0.412$). Together, these two factors constitute the core driving mechanism for improving IPE effectiveness. Third, all three innovative models — curriculum-based IPE integrated with workplace practice, dual-mentor collaborative education, and enterprise-context immersive education — demonstrated substantially stronger overall outcomes than conventional IPE approaches. Improvements across individual dimensions ranged from 12.3% to 18.7%. Each model also carries distinct comparative advantages and applicable conditions. Fourth, institutional mechanism deficiency stands as the primary barrier to IPE innovation implementation, with a barrier severity score of 82.4%. Targeted intervention produced the largest effectiveness gain of any barrier category, at +33.1 percentage points. Systemic institutional restructuring should therefore be treated as the foremost strategic priority in overcoming implementation obstacles.

AUTHOR CONTRIBUTIONS

Qinghua Lin designed, collected and analyzed the data, and drafted the manuscript. Qinghua Lin conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Qinghua Lin participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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