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Domestic and International Models of Industry-Education Integration and Cooperative Education Model: A Comparative and Applied Study Based on Literature Review and Student Experience Survey

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Abstract: Against the backdrop of deepening industry–education integration and the transformation of applied talent cultivation, this study investigates collaborative education models in business administration programs. By comparing representative international models—including Germany's dual system, the U.S. cooperative education model, and Singapore's teaching factory—with domestic practices, and analyzing questionnaire data from 300 students involved in school–enterprise cooperation projects, the study develops a framework covering cooperative foundation, value co-creation behavior, learning outcomes, and continuous participation intention. Results show that resource complementarity and support, collaborative design and participation depth, and interactional fairness and trust significantly enhance learning outcomes, while value co-creation behavior partially mediates these relationships. Learning outcomes further strengthen students' intention to continue participating. Although students generally hold positive perceptions of collaborative education, collaborative design and participation depth remain relatively weak. Comparative analysis indicates that international models demonstrate advantages in enterprise involvement, process-oriented evaluation, and institutionalized collaboration. Accordingly, this study suggests strengthening project-chain integration, process-oriented evaluation, and institutionalized collaboration mechanisms to improve the quality and effectiveness of industry–education integration in business administration education.

Keywords: Industry-Education Integration; The Collaborative Education Model; Literature Comparison; Student Experience; Value Co-Creation; Business Administration

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1. Introduction

As higher education shifts from scale expansion to quality improvement and from knowledge transmission to competence development, the integration of industry and academia has evolved from a policy-advocated "key direction" to a "critical mechanism" in the cultivation of application-oriented talents (Khan et al. , 2025; Ferns et al. , 2025). For business administration majors in particular, the instructional objective extends beyond helping students master the conceptual frameworks of management, marketing, human resource management, and operations management; it also aims to enable

them, within real and complex organizational contexts, to develop comprehensive abilities to analyze problems, coordinate resources, communicate and negotiate, design solutions, and pursue continuous improvement. Such competencies are critical to students' employability, job adaptation, and career transition (Jackson, 2025; van der Baan et al. , 2024). These abilities are highly dependent on situational triggers and practical verification. Simply relying on classroom lectures, case discussions, and final exams often fails to fully cultivate them, as more authentic task design, evaluation centered on students' meaningful participation, and project-based or simulation-based learning proximal to real-world work scenarios are more effective in promoting students' skill demonstration, engagement experience, and job readiness (Quinlan et al. , 2025; Pickering et al., 2024; Naseer et al. , 2025). Therefore, effectively integrating industrial resources, job tasks, and course learning through school–enterprise cooperation to enable students to "learn by doing," "learn through collaboration," and "learn through reflection" has become a key issue in the educational reform of business administration programs (Ferns et al. , 2025; Khan et al. , 2025; van der Baan et al. , 2024).

Compared with earlier cooperation models that focused primarily on base construction, agreement signing, and internship placement, current industry-education integration places greater emphasis on cooperation depth, process quality, and outcome transformation (Vuoriainen et al. , 2025; Khan et al. , 2025; Ferns et al. , 2025). In practice, although some universities have adopted various forms of collaboration—such as industry colleges, order-based classes, co-developed courses, enterprise mentors in the classroom, and project-based teaching—the actual effectiveness of the collaborative education model does not always match the scale of cooperation. Some projects have invested a lot of resources, but the results often stay at the level of field visits and task execution. Although some enterprises actively participate in it, they mainly focus on lectures, recruitment and short-term guidance, and do not really integrate into curriculum design, project evaluation and learning feedback (Ferns et al. , 2025; Luk & Chan, 2024). Although some projects formally achieve multi-party participation, students lack sufficient subjectivity in goal setting, process negotiation, result correction, resulting in coexistence of cooperation but limited learning gains (Omland et al. , 2025; Nieminen et al. , 2025; Quinlan et al. , 2025). This shows that whether industry-education integration can truly be transformed into the advantage of talent cultivation depends not only on whether there is cooperation, but also on how cooperation is organized, how students participate, and how the cooperation conditions are transformed into learning outcomes (Vuoriainen et al. , 2025; Luk & Chan, 2024; Khan et al. , 2025).

At the research level, existing literature has extensively demonstrated the necessity, institutional foundation, and organizational forms of industry-education integration. However, there remains a lack of in-depth explanation regarding the micro-level mechanisms of the collaborative education model and talent cultivation (Khan et al. , 2025; Ferns et al. , 2025; Oliveira et al. , 2024). In business administration programs in particular, students' learning outcomes often manifest as multifaceted competencies—such as project comprehension, communication and collaboration, problem-solving, business judgment, and career adaptability. These outcomes do not arise automatically from resource investment; rather, they are gradually shaped through continuous interaction, collaborative practice, and relationship building (Jackson, 2025; D'Souza et al. , 2025; Omland et al. , 2025). The theory of value co-creation offers a powerful lens for explaining this process: it posits that value is not unilaterally predetermined by either schools or enterprises, but is instead cocreated through the integration of multiple actors' resources and the coordination of their actions (Vargo & Lusch, 2008; Payne et al. , 2008; Grönroos & Voima, 2013; Cruz et al. , 2024). Based on this, this paper identifies resource complementarity and support, collaborative design and depth of participation, and interactional fairness and trust as key antecedents of the collaborative education model, conceptualizes value co-creation behavior as the mediating mechanism that connects the cooperative foundation with learning outcomes, and further examines the influence of learning outcomes on the intention to continuously participate (Petrescu et al. , 2026; Zarandi et al. , 2024; Omland et al. , 2025). The study adopts a dual-path approach combining literature comparison and student experience surveys. On one hand, it conducts a structured comparison of typical industry-education integration models of the collaborative education model, both domestically and internationally, to identify key differences in their underlying mechanisms. On the other hand, based on questionnaire data from university students involved in school–enterprise cooperation projects, it empirically examines the causal relationships among cooperative foundation, value co-creation behavior, learning outcomes, and the intention to continuously participate. This paper seeks to answer

three questions: First, what are the similarities and differences in the structures and operational mechanisms of typical the collaborative education model models at home and abroad? Second, how do the key structural elements of the collaborative education model influence students' learning outcomes through value co-creation behavior? Third, what insights can the comparative findings offer for optimizing the localized application of business administration programs? The significance of this paper lies in integrating "model comparison—mechanism testing—application transformation" into a unified analytical framework, thereby providing a more robust theoretical and practical foundation for optimizing industry-education integration mechanisms within business administration programs.

2. Literature Review and Theoretical Foundation

2.1 Evolution of Research Perspectives and Existing Limitations

In terms of the research trajectory both domestically and internationally, studies on industry-education integration and the collaborative education model have generally evolved from policy argumentation and model analysis to research on process mechanisms (Khan et al. , 2025; Oliveira et al. , 2024; Vuoriainen et al. , 2025). Early research focused on demonstrating the necessity of school–enterprise cooperation for optimizing the structure of talent cultivation, alleviating the mismatch between supply and demand, and improving educational quality (Khan et al. , 2025). Subsequently, scholarly attention turned to comparing different institutional forms—such as industry colleges, the dual system, cooperative education, modern apprenticeship systems, and teaching factories (Ferns et al. , 2025; Vuoriainen et al. , 2025). In recent years, the focus has gradually shifted toward project processes, learning experiences, and competency outcomes (Luk & Chan, 2024; Ferns et al. , 2025). Overall, existing studies have sufficiently addressed the questions of "why promote industry-education integration" and "what forms of cooperation can be adopted. " However, there remains insufficient explanation regarding the mechanistic question of "how cooperation conditions translate into student gains during the project process" (Oliveira et al. , 2024; Luk & Chan, 2024; Vuoriainen et al. , 2025).

This deficiency is reflected in three main aspects. First, research has predominantly focused on system design and platform construction, with insufficient attention paid to the micro-level interactions occurring during project implementation. As a result, the collaborative education model tends to be interpreted as a static outcome—such as the signing of agreements, the establishment of bases, or the joint development of courses (Björck & Willermark, 2025; Oliveira et al. , 2024). Second, a considerable portion of the research remains centered on schools or enterprises, rarely analyzing students' depth of participation, judgment logic, or behavioral responses from the perspective of their actual experiences. This makes it difficult to explain why there are significant variations in student gains across similar projects (Smith et al. , 2025; Jackson, 2025). Third, comparisons between domestic and international models often remain at the level of experience description, with insufficient effort devoted to extracting the effective mechanisms underlying different models. Consequently, a comparative framework capable of supporting the application and adaptation of these models to local contexts has yet to be developed (Jackson, 2025; Smith et al. , 2025).

2.2 The Contextual Characteristics and Theoretical Imperatives of Business Administration Programs

The educational goal of business administration programs is not simply skill training, but rather the shaping of multifaceted competencies to address real-world managerial problems (Jackson, 2025; Petrescu et al. , 2026). Whether in marketing—where students engage in customer insight, operations management—where they focus on process optimization, or human resource management—where they conduct job analysis and facilitate team collaboration, students need to develop the capacity for judgment and action within environments characterized by multiple interacting parties, incomplete information, and diverse goals (Jackson, 2025; Pickering et al. , 2024). Therefore, the integration of industry and academia in this discipline should not be understood merely as "increasing practice hours" or "introducing enterprise mentors"; rather, it should be understood as reconstructing the learning process itself through engagement with real tasks, real constraints, and real feedback (Quinlan et al. , 2025; Nieminen et al. , 2025). Only when students are embedded in project sequences that allow them to participate, express themselves, experiment, and revise can course knowledge be transformed into contextualized competencies and practical experience be consolidated into relatively stable professional capabilities (Pickering et al. , 2024; Petrescu et al. , 2026; Nieminen et al. , 2025). This also implies that the effectiveness of the collaborative

education model cannot be judged solely by the quantity of resources allocated or the diversity of cooperation forms. Instead, we need to examine three further questions: whether the resources provided by schools and enterprises are truly accessible, usable, and convertible for students (Smørvik & Vespestad, 2020; Petrescu et al. , 2026); whether students are involved in the entire process of goal setting, process negotiation, task execution, and outcome evaluation (Zarandi et al. , 2022; Omland et al. , 2025); and whether cooperative interactions are grounded in fair, transparent, and predictable relationships (To, 2025; Zarandi et al. , 2022). If the aforementioned conditions are absent, even if a cooperation project is formally established, students may remain merely performers and observers, making it difficult for them to achieve genuinely high-quality learning (Omland et al. , 2025; To, 2025). Therefore, research in the field of business administration requires an analytical framework capable of explaining the continuous transmission logic of "resources—participation—relationship—behavior—outcomes" (Smørvik & Vespestad, 2020; Petrescu et al. , 2026; Omland et al. , 2025).

2.3 Comparative Dimensions of Typical Collaborative Education Model Models: Domestic and International

From a comparative perspective, the lasting influence of typical international models—such as Germany's dual system, America's cooperative education, and Singapore's teaching factory—stems not merely from the maturity of their cooperative forms, but more importantly, from the relatively stable collaborative mechanisms they have established throughout the entire process of talent cultivation (Mordhorst & Jenert, 2023; Lamancusa et al. , 2008; Quirós-Alpera et al. , 2025). Synthesizing relevant studies reveals that the differences between typical domestic and international models are primarily manifested in four dimensions. First, the structure of cooperation entities—specifically, whether enterprises function as peripheral supporters or as full-process collaborative partners (Ferns et al. , 2025; Vuoriainen et al. , 2025). Second, the depth of student participation—that is, whether students are genuinely involved in key stages such as goal setting, process negotiation, scheme revision, and outcome review (Lamancusa et al. , 2008; Quirós-Alpera et al. , 2025; Boud et al. , 2026). Third, the evaluation and feedback mechanism—namely, whether evaluation remains at the level of outcome acceptance or evolves into process-oriented feedback and learning correction (Luk & Chan, 2024; Boud et al. , 2026; Quirós-Alpera et al. , 2025). Fourth, the mode of institutionalized operation—whether the project relies on short-term cooperation and individual initiatives, or has established a relatively stable system encompassing curriculum, mentorship, projects, and evaluation (Mordhorst & Jenert, 2023; Ferns et al. , 2025; Vuoriainen et al. , 2025).

The aforementioned comparative dimensions hold particular significance for business administration programs (Jackson, 2025; Brodsky et al. , 2024). This major emphasizes cross-departmental collaboration, problem diagnosis, resource integration, and continuous improvement. Therefore, the effectiveness of the collaborative education model depends not on whether the forms of cooperation "appear diverse," but on whether students can receive ongoing feedback within real tasks and participate in value generation (Billett, 2025; Timperley & Schick, 2025; Petrescu et al. , 2026). Building on the comparative analysis above, it is evident that the differences between domestic and international models lie not primarily in the presence or absence of cooperation forms, but rather in the depth of cooperation, the position of student participation, the evaluation loop, and the degree of institutionalization (Billett, 2025; Brodsky et al. , 2024; Timperley & Schick, 2025). Accordingly, this paper further introduces value co-creation theory to explain how conditions for the collaborative education model translate into students' learning outcomes during the project process (Petrescu et al. , 2026).

2.4 Explanatory Power of Value Co-creation Theory and Research Hypotheses

Value co-creation theory offers a meso-level explanatory framework for this issue. The theory posits that value is not pre-produced by a single actor and passively accepted by others; rather, it is continuously generated through the integration of multiple actors' resources, information exchange, collaborative practice, and relational embedding (Vargo & Lusch, 2008; Payne et al. , 2008). Introducing this theory into research on industry-education integration implies that universities, enterprises, and students should no longer be understood as a unidirectional chain of "universities teach—enterprises apply—students learn," but rather as a collaborative system jointly engaged in the process of talent cultivation (Matthews & Dollinger, 2023; Muelder et al. , 2025; Stensaker & Matear, 2025). Within this system, resource complementarity and support are manifested through the effective provision of key elements such as curricula, mentorship, tasks, data, learning

spaces, and feedback (Payne et al. , 2008; To, 2025). Collaborative design and depth of participation are reflected in whether students shift from passive execution to joint design, joint decision-making, and joint improvement (Matthews & Dollinger, 2023; Nieminen et al. , 2025; Muelder et al. , 2025). Interactional fairness and trust are demonstrated by the transparency of rules, fairness of evaluation, clarity of responsibilities, and stability of relationships during project implementation (To, 2025; Stensaker & Matear, 2025; Muelder et al. , 2025). Together, these three elements constitute the cooperative foundation for the collaborative education model (Vargo & Lusch, 2008; Payne et al. , 2008; To, 2025).

However, the cooperative foundation does not automatically translate into learning outcomes. Whether this effect can be achieved depends on whether students engage in substantive value co-creation behaviors during the project—such as active communication, knowledge sharing, task collaboration, solution optimization, joint problem-solving, and outcome co-creation (Omland et al. , 2025; Petrescu et al. , 2026; Babalola, 2024). Value co-creation behavior acts as a critical bridge through which external institutional arrangements are internalized into students' learning processes. When students are able to participate deeply and receive consistent feedback, the resource and relational advantages inherent in cooperation are more likely to translate into knowledge acquisition, competence development, and career adaptability (To, 2025; Bao et al., 2023; D'Souza et al. , 2025). Conversely, even when resources are abundant, insufficient participation or weak trust may hinder the attainment of high-quality gains (Pinna et al. , 2023; Omland et al. , 2025). Based on this, the paper posits the following research propositions: resource complementarity and support, collaborative design and depth of participation, and interactional fairness and trust all positively influence multi-dimensional learning outcomes; these effects are partially mediated through value co-creation behavior; and multi-dimensional learning outcomes further enhance students' intention to continuously participate. Accordingly, this study formulates an overarching analytical framework—"cooperative foundation—value co-creation behavior—multi-dimensional learning outcomes—continuous participation intention"—and proceeds with subsequent empirical testing and model comparison (Petrescu et al. , 2026; Bao et al. , 2023; Pinna et al. , 2023).

3. Research Design

3.1 Research Approach and Methodology Path

This paper adopts a research design combining literature comparison and questionnaire survey. First, by reviewing representative models of industry-education integration and the collaborative education model in both domestic and international contexts—such as Germany's dual system, America's cooperative education, Singapore's teaching factory, as well as domestic industry colleges, co-developed courses, and project-based practices—a comparative analysis is conducted across four dimensions: the structure of cooperation entities, depth of student participation, evaluation and feedback mechanisms, and modes of institutionalized operation. This analysis aims to identify institutionally embedded experiences that can inform local adaptation (Hermann & Fauskanger, 2025; Fisher et al. , 2025).

Second, this study focuses on university students participating in school–enterprise cooperation projects, with particular attention to their authentic experiences and subjective perceptions throughout the the collaborative education model process. Selecting students as the primary observational subjects is based on two considerations. On one hand, students are the direct participants in industry-education integration projects and the ultimate bearers of whether cooperation conditions translate into learning outcomes; their perceptions most accurately reflect the actual quality of project implementation (Brodsky et al. , 2024; Stensaker & Matear, 2025). On the other hand, competence development in business administration programs is inherently process-oriented and context-dependent. Examining the process solely from the perspectives of university administrators or enterprise mentors makes it difficult to fully capture variations in students' goal understanding, task commitment, interaction and collaboration, and achievement acquisition (Lin, 2024; Brodsky et al. , 2024). From December 2025 to February 2026, the questionnaire was distributed through a combination of online and offline channels, and a total of 300 valid questionnaires were collected. In order to ensure data quality, the screening project is designed around the real project participation experience. Then clean up the data according to the response integrity, completion time and response mode to minimize the interference of invalid responses to the analysis results.

3.2 Variable Measurement and Analysis Approach

The questionnaire consists of 25 items, using the Likter 5-point scale, of which 1 means "very disagree" and 5 means "very agree". The scale includes six dimensions: resource complementarity and support, collaborative design and depth of participation, interactional fairness and trust, value co-creation behavior, multi-dimensional learning outcomes, and continuous participation intention. Among them, the first three dimensions correspond to the cooperative foundation for the collaborative education model. Value co-creation behavior reflects students' active communication, knowledge sharing, task collaboration, and outcome co-creation during the project. Multi-dimensional learning outcomes capture students' overall experiences in terms of knowledge acquisition, competence development, problem-solving, and career-related gains. Continuous participation intention examines students' willingness to continue participating in similar projects in the future. The dimensions and corresponding items are presented in Table 1.

Table 1 Variable Dimensions and Item Settings

Dimension	Item Scope	Number of Items
Resource complementarity and support	Q1—Q4	4
Collaborative design and depth of participation	Q5—Q8	4
Interactional fairness and trust	Q9—Q12	4
Value co-creation behavior	Q13—Q17	5
Multidimensional learning outcomes	Q18—Q21	4
Continuous participation intention	Q22—Q25	4

3.3 Reliability, Validity, and Common Method Bias Testing

To ensure the stability and applicability of the measurement instruments, this paper conducts reliability and validity tests on the scale. The results show that Cronbach's α coefficients for each dimension range from 0.884 to 0.927, all significantly above the 0.80 threshold, indicating high internal consistency of the scale (Cronbach, 1951). Furthermore, the KMO value is 0.919, and Bartlett's test of sphericity is significant ($p < 0.001$), suggesting that the sample data are suitable for factor analysis (Kaiser, 1974). Additionally, the number of factors with eigenvalues greater than 1 is six, aligning with the hypothesized six-dimensional structure, which indicates that the scale possesses good construct validity. The relevant results are presented in Table 2 Furthermore, this study conducted Harman's single-factor test to assess the potential risk of common method bias. The results show that the first factor accounts for 39.10% of the total variance, which did not exceed the generally accepted threshold of 40-50%. This did not exceed the generally recommended threshold, indicating that the common method deviation is unlikely to become a serious problem in this study (Podsakoff et al. , 2003).

Table 2 Reliability and Validity Test Results

Dimension / Indicator	Result	Evaluation
Resource complementarity and support	0. 891	Reliability acceptable
Collaborative design and depth of participation	0. 887	Reliability acceptable
Interactional fairness and trust	0. 889	Reliability acceptable
Value co-creation behavior	0. 927	Reliability acceptable
Multidimensional learning outcomes	0. 901	Reliability acceptable
Continuous participation intention	0. 884	Reliability acceptable
KMO	0. 919	Suitable for factor analysis
Bartlett's test of sphericity (p)	0. 000	Correlation matrix not an identity matrix
Number of factors with eigenvalue > 1	6. 000	Consistent with six-dimensional structure
Sample size	300. 000	Meets analytical requirements

Overall, this paper follows the research logic of "literature comparison - theoretical construction - variable measurement - statistical inspection - application transformation": First, find out the key differences between typical models at domestic and abroad through comparative research. Second, an analysis framework based on the theory of value co-creation is built. Third,

test the relationship between variables through descriptive statistics, correlation analysis and intermediary effect test. Finally, based on the comparison results, the mechanism optimization path suitable for business administration programs is proposed. This design not only enhances the explanatory power of the research conclusions, but also provides an empirical basis for subsequent application suggestions.

4. Empirical Results

4.1 Descriptive Statistical Analysis

From the overall distribution, the mean scores of all six core dimensions exceed the scale midpoint of 3, indicating that have a positive overall evaluation of the current school-enterprise cooperation project.

Resource complementarity and support received the highest score (M=3.980, SD=1.034), indicating that most projects have established a foundational level of mentor allocation, practical opportunities, and task resources. The mean score for continuous participation intention is also relatively high (M=3.958, SD=0.990), suggesting that students are generally willing to continue participating in similar projects. However, collaborative design and depth of participation received the lowest scores (M=3.892, SD=1.039), indicating that there remains room for improvement in engaging students deeply in goal setting, process negotiation, and outcome revision within current projects. Descriptive statistics for each dimension are presented in Table 3.

Table 3 Descriptive Statistics for Each Dimension

Dimension	Mean	SD
Resource complementarity and support	3. 980	1. 034
Collaborative design and depth of participation	3. 892	1. 039
Interactional fairness and trust	3. 929	1. 039
Value co-creation behavior	3. 921	1. 055
Multi-dimensional learning outcomes	3. 928	1. 059
Continuous participation intention	3. 958	0. 990

4.2 Correlation Analysis

The correlation analysis results indicate significant positive correlations among all six dimensions. Resource complementarity and support is significantly positively correlated with multi-dimensional learning outcomes ($r=0.459$, $p<0.01$), and collaborative design and depth of participation exhibit a higher correlation coefficient with multi-dimensional learning outcomes ($r =0.476$, $p <0.01$).

This shows that students' participation in the key project stage is closely related to their learning gains. In addition, interaction fairness and trust are significantly related to value co-creation behavior ($r = 0.451$, $p <0. 01$), showing that transparent rules and stable relationships are important prerequisites for stimulating co-creation. In addition, multi-dimensional learning outcomes are significantly correlated with the willingness to continue to participate ($r = 0.452$, $p <0. 01$), which shows that tangible income provides an important basis for the willingness to continue to participate in the future. The results of the correlation analysis for each dimension are presented in Table 4.

Table 4 Correlation Matrix for Each Dimension

Variable	1	2	3	4	5	6
Resource complementarity and support	1					
Collaborative design and depth of participation	0. 434**	1				
Interactional fairness and trust	0. 347**	0. 425**	1			
Value co-creation behavior	0. 293**	0. 419**	0. 451**	1		
Multi-dimensional learning outcomes	0. 459**	0. 476**	0. 427**	0. 410**	1	
Continuous participation intention	0. 400**	0. 477**	0. 466**	0. 352**	0. 452**	1

Note: ** indicates $p < . 01$.

4.3 Further Analysis of Main Effects

The results indicate that resource complementarity and support, collaborative design and depth of participation, and interactional fairness and trust each exhibit a significant positive relationship with multi-dimensional learning outcomes. Furthermore, value co-creation behavior is not only significantly associated with multi-dimensional learning outcomes but also plays a significant mediating role in the process through which the cooperative foundation influences learning outcomes. This suggests that the effectiveness of the collaborative education model does not arise solely from the amount of resource investment, but is gradually shaped through the dynamic interaction of resource support, depth of participation, quality of relationships, and students' co-creation behaviors. The results of the main relationship tests are presented in Table 5.

Table 5 Summary of Main Relationship Tests

Path	Correlation Result	Mediation Effect	Conclusion	Interpretation
Resource complementarity and support → Multi-dimensional learning outcomes	Significantly positive (r = . 459**)	Significant indirect effect via value co-creation behavior	Supported	Greater resource support is associated with more pronounced learning gains
Collaborative design and depth of participation → Multi-dimensional learning outcomes	Significantly positive (r = . 476**)	Significant indirect effect via value co-creation behavior	Supported	Deeper student involvement in key project stages leads to better learning outcomes
Interactional fairness and trust → Multi-dimensional learning outcomes	Significantly positive (r = . 427**)	Significant indirect effect via value co-creation behavior	Supported	Fair, transparent, and stable interactions facilitate the formation of learning outcomes
Value co-creation behavior → Multi-dimensional learning outcomes	Significantly positive (r = . 410**)	exerts a significant positive effect on learning outcomes	Supported	Active communication, knowledge sharing, and outcome co-creation enhance learning gains
Multi-dimensional learning outcomes → Continuous participation intention	Significantly positive (r = . 452**)	Shown as significantly positive in supplementary tests	Supported	Stronger learning gains lead to higher willingness to continue participating

4.4 Mediation Analysis

Based on the correlation analysis, this paper further employs Model 4 of the PROCESS macro (Hayes, 2022) to test the mediating role of value co-creation behavior. Specifically, resource complementarity and support, collaborative design and depth of participation, and interactional fairness and trust were entered as independent variables, value co-creation behavior as the mediator, and multi-dimensional learning outcomes as the dependent variable. The 95% confidence interval for the indirect effect was estimated using 5,000 bootstrap samples. The results show that resource complementarity and support significantly and positively predict value co-creation behavior ($a=0.299$, $p < 0.001$). When both resource complementarity and support and value co-creation behavior were included in the model, value co-creation behavior still exerted a significant positive effect on multi-dimensional learning outcomes ($b=0.302$, $p <0.001$), and the direct effect of resource complementarity and support remained significant ($c'=0. 380$, $p<0.001$). The indirect effect was 0.090, with a 95% bootstrap confidence interval of [0.045, 0.150], which did not include zero. This indicates that value co-creation behavior plays a partial mediating role in the relationship between resource complementarity and support and multi-dimensional learning outcomes.

Further analysis shows that collaborative design and depth of participation significantly and positively predicted value co-creation behavior ($a=0.426$, $p<0.001$), with an indirect effect of 0.109 and a 95% bootstrap confidence interval of [0.057,0.171]. Similarly, interactional fairness and trust demonstrated a significant positive effect on value co-creation behavior ($a=0.458$, $p <0.001$), with an indirect effect of 0.125 and a 95% bootstrap confidence interval of [0.067, 0.198]. The above results indicate that the cooperative foundation not only directly enhances students' multi-dimensional learning outcomes but also further strengthens these gains through value co-creation behaviors—such as promoting knowledge sharing, task collaboration, and outcome co-creation. Additional analyses reveal that value co-creation behavior, via multi-dimensional learning outcomes, further influences continuous participation intention, with an indirect effect of 0. 142 and a 95% bootstrap confidence interval

of [0.084,0.209], again excluding zero. Thus, students' willingness to continue participating in similar projects is largely grounded in the tangible growth and developmental gains they attain during the cooperative process.

5. Comparative Analysis and Applications of Domestic and International Models

5.1 A Structured Comparison of Domestic and International Models

Based on the literature comparison, this study makes a structured comparison of international models and domestic practices from the four dimensions: the structure of cooperation entities, depth of student participation, evaluation and feedback mechanisms, and modes of institutionalized operation. Overall, the common feature of German dualism, American cooperative school management, Singapore teaching factory and other models is that enterprises are not peripheral supporters, but partners, deeply embedded in the whole process of talent training. Although domestic universities have made a variety of explorations in industry colleges, order-based training, practice bases, cooperative development courses, project-based teaching, etc., there are still obvious gaps in the depth of cooperation, continuous operation, and evaluation cycles (Gong, 2024). The comparative findings are presented in Table 6.

Table 6 Comparative Framework of Typical the Collaborative Education Models: Domestic and International

Comparative Dimension	Typical International Models	Main Domestic Practices	Implications for Business Administration Programs
Structure of Cooperation Entities	Enterprises are deeply embedded in the entire process, including curriculum goal setting, task design, mentor guidance, and evaluation feedback, with clear delineation of responsibilities between universities and enterprises.	Diverse forms of cooperation exist, but in some projects, enterprises still focus primarily on resource provision or endoutcome acceptance, with insufficient process cogovernance.	Shift from a "universityled, enterprisecooperative" model to "university–enterprise–student cocreation" and enhance enterprises' fullprocess participation.
Depth of Student Participation	Students are routinely involved in key stages such as goal setting, process negotiation, periodic review, and outcome improvement, resulting in a complete participation chain.	Some projects remain at the level of task execution, with students having limited early involvement in goal setting and evaluation criteria.	Enhance students' agency in problem identification, solution optimization, and outcome revision; facilitate their transition from executors to cocreators.
Evaluation and Feedback Mechanism	Emphasis on processoriented evaluation, job competency mapping, and dualmentor feedback; evaluation serves both outcome judgment and learning correction.	Many projects still focus on summative assessment or outcome presentation, with insufficient recognition of communication, collaboration, problemsolving, and innovative contributions.	Establish project logs, stagebased feedback forms, and outcome review meetings to form a traceable and modifiable evaluation loop.
Mode of Institutionalized Operation	Stable articulation of curricula, projects, mentorship, and evaluation systems; cooperation is sustainable and replicable.	Some cooperation depends on project applications or individual initiatives, with insufficient mechanism consolidation and limited capacity for replication and diffusion.	Develop project libraries, case libraries, and mentor libraries, and improve incentive and benefitsharing arrangements to enhance mechanism stability.

In terms of the structure of cooperation entities, typical international models tend to integrate enterprises into key stages such as curriculum goal setting, task design, mentor guidance, and evaluation feedback (Ferns et al. , 2025). In contrast, many domestic projects still face challenges such as uneven depth of enterprise participation, insufficient stability of cooperative relationships, and collaborative mechanisms that require further improvement (Li et al. , 2024). For business administration programs, this implies that enterprises should not merely provide positions at the end of a project or conduct outcome validation; rather, they should assume the responsibilities of process co-governance and feedback correction throughout the entire project (Ferns et al. , 2025; Li et al. , 2024).

In terms of student participation and evaluation feedback, typical international models place greater emphasis on students'

full-process engagement and process-oriented evaluation (Ferns et al. , 2025; Luk & Chan, 2024). The empirical results of this study show that collaborative design and depth of participation received the lowest mean scores, yet they exhibit a significant positive relationship with learning outcomes and demonstrate stable effects within the mediation model. This finding suggests that the main weakness of domestic projects is not a severe shortage of resources, but rather that students have yet to fully transform from "executors" into "co-creators. "Concurrently, international models emphasize job competency mapping, workplace mentor/supervisor evaluations, self-reflection, and continuous feedback (Luk & Chan, 2024). Similarly, studies conducted in the Chinese context indicate that school–enterprise collaboration and quality culture significantly influence students' perceived employability and developmental outcomes (Li et al. , 2024). This suggests that for domestic universities seeking to enhance the quality of the collaborative education model, the key lies not simply in increasing the number of cooperation projects, but rather in deepening the level of cooperation, strengthening evaluation loops, and advancing the degree of institutionalization (Li et al. , 2024; Luk & Chan, 2024).

5.2 Institutional Implications for the Collaborative Education Model in Domestic Universities

The comparison results show that the direction of optimizing the collaborative education model of domestic colleges and universities in the future is not simply to increase the number of cooperation projects, but to deepen the level of cooperation and enhance the completeness of the underlying mechanism (Curto-Reverte et al. , 2025; Li et al. , 2024). First, the project design logic should gradually change from the model of "university-led, enterprise cooperation, student participation" to the model of "university-enterprise-student co-creation" to ensure that students participate in goal understanding and task negotiation from the initial stage of the project (Bovill & Woolmer, 2019; Cruz et al. , 2024). Second, enterprise participation should be promoted from "resource investment" to "process co-governance", so that enterprises can truly participate in key links such as curriculum design, task decomposition, stage feedback, and performance evaluation, not just provide positions. Third, the focus of evaluation in the collaborative education model should be shifted from outcomes to process tracking, thereby establishing a continuous learning correction mechanism through periodic feedback, problem review, and outcome iteration (Luk & Chan, 2024; Smith et al. , 2025).

More importantly, the empirical findings indicate that the effects of resource complementarity and support, collaborative design and depth of participation, and interactional fairness and trust on learning outcomes are not simply direct. Value co-creation behavior plays a significant partial mediating role in this process. This implies that when promoting industry-education integration, universities should not focus solely on the "coverage of cooperation" or the "number of cooperation agreements. " Instead, greater attention should be paid to whether students genuinely engage in active communication, knowledge sharing, joint problem-solving, and outcome co-creation during the projects (Cruz et al. , 2024; Li et al. , 2024). In other words, the core of the collaborative education model lies not in whether a project exists, but in whether it can stimulate high-quality co-creation behavior. Whether this kind of co-creation behavior occurs depends on the exchangeability of resource supply, the accessibility of participation mechanisms and the predictability of interaction relationships (Bovill & Woolmer, 2019; Cruz et al. , 2024). Therefore, domestic universities need to shift from "focusing on formal construction" to "focusing on mechanism generation" to ensure that institutional design is transformed into specific project operation, so that students can perceive, participate and get practical returns (Li et al. , 2024; Smith et al. , 2025).

5.3 Practical Implications for Business Administration Programs

Based on the comparative and empirical findings above, this paper proposes three application suggestions. The first suggestion is to restructure the project chain to enhance task authenticity and deepen student embeddedness. Business administration programs can establish a project closed-loop centered on authentic enterprise problems, encompassing "problem identification—solution justification—execution and implementation—data analysis—outcome presentation. " In this way, it integrates course teaching, enterprise tasks, competition training and practical assessment, so as to avoid the project staying at the level of field investigation or fragmented task participation (Naseer et al. , 2025; Ferns et al. , 2025). During the project initiation phase, it is essential to clearly define the decision-making and negotiation points in which students can participate, enabling them to understand the project goals, performance standards, and organizational constraints from the outset, thereby enhancing the quality of their participation (Ruskin & Bilous, 2020; Smith et al. , 2025).

The Second suggestion is to establish a closed-loop process evaluation system that embeds learning outcomes into project operation. Schools and enterprises can jointly formulate an evaluation framework suitable for business administration majors, and include the quality of task completion, communication and collaboration, problem solving, solution optimization, reflection and improvement, innovation contribution, etc. into continuous evaluation. Through methods such as dual-mentor consultations, stage-based feedback forms, project logs, and outcome review meetings, evaluation can function as a genuine mechanism for learning correction (Luk & Chan, 2024; Smith et al. , 2025). For students, the most beneficial factor is not a one-time score, but ongoing and targeted feedback received throughout the project (Luk & Chan, 2024). For teachers and enterprise mentors, evaluation should also serve as a crucial means of identifying co-creation behaviors and adjusting the forms of project support (Ruskin & Bilous, 2020; Luk & Chan, 2024).

The Third suggestion is to institutionalize collaborative mechanisms to enhance the sustainability and replicability of cooperation. Universities should establish project libraries, case libraries and tutor libraries, constantly accumulate enterprise tasks, course results and student project suggestions, and form reusable resources of the collaborative education model. At the same time, a clearer incentive mechanism should be formulated to give institutional recognition to enterprise tutors who continue to invest, instructors who undertake project transformation tasks, and students with excellent performance in project participation, so as to reduce cooperation over-reliance on personal enthusiasm (Curto-Reverte et al. , 2025; Li et al. , 2024). For business administration programs, the key to institutionalization lies in maintaining a sustained alignment between authentic enterprise needs and course competency goals, thereby ensuring that projects function not merely as short-term practical activities, but as stable mechanisms integrated throughout the talent cultivation process (Ferns et al. , 2025; Curto-Reverte et al. , 2025). In addition, it is necessary to explore collaborative incentive mechanisms between universities and enterprises in areas such as project outcomes, mentorship input, resource support, and talent cultivation effectiveness, thereby transforming the collaborative education model from short-term cooperative arrangements into a stable operational mechanism (Li et al. , 2024; Ruskin & Bilous, 2020).

6. Conclusion and Future Directions

This paper adopts a research method that combines literature comparison and student experience survey. Through the comparative analysis of the typical industry-education integration and the cooperative education model at home and abroad, a six-dimensional analysis framework of resource complementarity and support, collaborative design and participation depth, interaction fairness and trust, value co-creation behavior, multi-dimensional learning results, and willingness to continue to participate is built. The empirical investigation was conducted with university students participating in school–enterprise cooperation projects as the research subjects. The research findings are as follows: First, the sampled students generally hold a relatively positive evaluation of industry-education integration and the collaborative education model; however, collaborative design and depth of participation remain relatively weak. This indicates that while most current projects have established a foundation in resource provision, they still exhibit notable shortcomings in stimulating student agency. Second, resource complementarity and support, collaborative design and depth of participation, interactional fairness and trust, and value co-creation behavior are all significantly positively correlated with multi-dimensional learning outcomes, and exhibit stable effects within the mediation model. This suggests that the effectiveness of the collaborative education model stems from the joint action of multiple mechanisms. Third, value co-creation behavior plays a partial mediating role in the process through which the cooperative foundation influences learning outcomes, and multi-dimensional learning outcomes further affect continuous participation intention. This indicates that whether students are willing to invest long-term in industry-education integration projects fundamentally depends on whether they achieve genuine growth through the cooperation.

This paper offers both theoretical and practical contributions. Theoretically, it integrates “cooperative foundation—value co-creation behavior—learning outcomes—continuous participation intention” into a unified explanatory chain. Through literature comparison, it also supplements the structured dimensions for analyzing domestic and international models, thereby enhancing the meso-level explanatory power of the collaborative education model mechanisms within business administration programs (Omland et al. , 2025; Curto-Reverte et al. , 2025). Practically, the findings reveal that in promoting industry-education integration, domestic universities should shift their focus from “emphasizing form and quantity” to

"prioritizing process, mechanism, and transformation" (Ferns et al. , 2025; Luk & Chan, 2024; Li et al. , 2024). Despite the contribution, this research still has some limitations. First, the data mainly comes from students' self-reports, and does not integrate the multi-source views of teachers and enterprise mentors. Second, it is difficult to capture the dynamic changes at different stages of the project using cross-sectional data. Third, the comparison of international models is mainly based on the synthesis of literature review and typical cases, and does not include the original transnational survey data. Future research can be combined with case interviews, vertical tracking and cross-regional comparisons to further explore the differences in collaborative education model mechanisms in the context of different types of institutions and projects. In the end, only by truly putting students at the center of co-creation can the integration of industry and education evolve from "cooperative arrangement" to "capacity generation mechanism" (Omland et al. , 2025; Li et al. , 2024).

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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