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Exploring the Integration Path of Professional and Innovation-Education in Business Disciplines at Application-Oriented Universities from the Perspective of Triple-Chain Collaboration

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Abstract: Based on the theoretical framework of industry chain–innovation chain–education chain collaboration, this study investigates the integration path of professional education and innovation-entrepreneurship education in applied business disciplines at higher education institutions. Using a questionnaire survey, it analyzes key challenges faced by front line teachers in practice. The main issues include the disconnection between the education chain and the industry chain, the fragmentation between the innovation chain and the education chain, and the absence of a collaborative platform that links the triple chains. To address these problems, this study proposes a systematic optimization path of demand orientation-capability reconstruction-ecosystem co-building. Specifically, it suggests aligning with industrial demand to precisely match industry and innovation needs, promoting the integration of scientific research and education to drive the transformation and application of research outputs, and co-building an open and collaborative ecosystem that evolves from a closed loop. This study aims to provide empirical evidence and practical guidance to solve structural contradictions in business talent cultivation in the digital economy era and to support the reform of business education under the national strategy of building a strong education system.

Keywords: Triple-chain collaboration; Industry–education integration; Scientific–educational integration.

1. Introduction

In recent years, China's higher education reform has continuously placed demand orientation, collaborative talent cultivation, and results transformation at the core, providing clear theoretical and methodological guidance for the integration of professional and innovation-education and the reform of business education. Several Opinions of the General Office of the State Council on Deepening the Integration of Industry and Education issued by the General Office of the State Council in 2017 proposed to establish a discipline and program system closely aligned with the industry chain and innovation chain, aiming to resolve the structural mismatch between educational supply and industrial demand within about ten years. The Education Power Building Plan Outline (2024–2035) further emphasizes strengthening education's support for national strategies and industrial upgrading. Meanwhile, the National Development and Reform Commission and other ministries have stressed the need for integrated advancement, integrated design, and integrated deployment across the entire chain. The new round of the Double First-Class initiative and the construction of a high-quality education system highlight demand orientation, service contribution, and alignment with regional industries, calling on universities to actively integrate into the national innovation system and regional industrial structure and to cultivate interdisciplinary and application-oriented talent.

The rise of the digital economy and rapid shifts in skill structures have intensified the mismatch between education and industry, forcing a simultaneous reconstruction of both content and mechanisms in business talent cultivation (Yang, 2019). According to the World Economic Forum's Future of Jobs Report 2023, about 23% of job tasks will be reshaped by 2027, and compound innovation combining technology, management, and data will become mainstream. A single focus on business model training can no longer match the complexity of industrial scenarios. Meanwhile, entrepreneurship education in universities still faces issues such as over-reliance on isolated courses, disconnection from real industrial tasks, and a lack of in-depth incubation-transformation mechanisms. Facing rising real-time industrial demands and task complexity, applied business education must shift from a knowledge-input model to a value co-creation model. It must be also addressed how the education chain can dynamically couple with the industry chain and innovation chain, and how to build collaborative governance with government and capital (Yang et al., 2025).

Therefore, business education urgently needs to develop evaluable, replicable, and scalable pathways for integration of professional and innovation-education to achieve alignment between policy requirements and industrial needs in terms of training objectives, curriculum practices, and results transformation.

This study is closely aligned with national policies for building a strong education system and reforming business education. It provides empirical evidence for addressing key challenges in the integration of professional and innovation education, offers pathways for cultivating interdisciplinary business talents in the digital economy era, and ultimately enhances the quality of talent supply for digital and green transitions.

2. Materials and Methods

Current research on applied business education in Chinese universities mainly revolves around three core themes: digital and intelligent transformation, industry–education integration, and interdisciplinary integration. Studies on digital and intelligent transformation focus on how business education responds to the challenges of the digital economy, emphasizing the construction of student-centered, innovation-driven, and demand-oriented talent cultivation models (Liu & Yu, 2024). Research on industry–education integration concentrates on innovative mechanisms for university–enterprise collaborative talent cultivation, exploring how to align with market demand to train practical talents (Zhang, 2021).

Studies on interdisciplinary integration are based on the broad-spectrum innovation and entrepreneurship education system, investigating pathways to integrate professional education with entrepreneurship education (Zhang & He, 2025). Meanwhile, some scholars examine the deep integration mechanisms of the education chain, talent chain, industry chain, and innovation chain from the perspective

of triple-chain collaboration and promote the four-chain linkage model to enable precise matching between professional and industrial groups (Li & Li, 2024).

However, the practice of integrating professional and innovation-education faces multiple challenges, including outdated talent cultivation systems, incomplete curricula, insufficient faculty capacity, weak triple-chain collaboration, and students' cognitive bias. The talent cultivation system does not match such integration, requiring deeper reforms. Curriculum design remains segmentation between professional courses and entrepreneurship courses, as well as an imbalance between theoretical and practical training (Xu, 2025). There is also an urgent need to strengthen the faculty team development, as they generally lack practical innovation-entrepreneurship experience and interdisciplinary teaching capabilities (Yao et al., 2020). An underdeveloped triple-chain collaboration mechanism has led to disconnecting between university training and market demands, while students' outdated career perceptions also hinder effective implementation (Liu & Zhu, 2023).

To address these issues, researchers have proposed multiple pathways such as building a broad-spectrum education system, deepening industry–education integration, and improving evaluation mechanisms. For example, the broad-spectrum innovation and entrepreneurship education system integrates entrepreneurship education throughout the entire process of professional education (Liu, 2018). Industry–education integration should be strengthened by leveraging first-class platform construction, such as co-building industry colleges and implementing project-based teaching (Han, 2022). Competency-oriented quality evaluation systems should be improved, emphasizing students' innovative thinking and practical skills. Triple-chain collaboration platforms should be built to promote the deep integration of the education chain, talent chain, industry chain, and innovation chain (Li, 2022). At the same time, teaching materials should be developed by establishing course collaboration groups to enable resource sharing and joint quality evaluation.

Nevertheless, previous research mainly focused on macro-level policy interpretation and theoretical framework construction, lacking empirical investigation into the specific challenges frontline teachers face in professional–innovation integration practices. To fill this gap, this study adopts a questionnaire survey to examine in depth the practical problems encountered by teachers in business school in coordinating the education chain, innovation chain, and industry chain. We further propose optimization pathways from the perspective of triple-chain collaboration to advance effective professional–innovation integration in applied business education.

3. Analysis of problems in the Practice of Professional–Innovation Integration in Business Education

This study distributed a questionnaire to faculty members at Shaanxi University of International Trade & Commerce. A total of 268 questionnaires were collected, of which 242 were valid. All participants were responsible for business education and teaching. This study employed a self-developed Professional–Innovation Integration Faculty Questionnaire, which included three sections: demographic variables, key problems, and suggestions.

Based on the statistical analysis of the survey data, the following key problems in professional–innovation integration were identified: disconnection between the education chain and the industry chain, fragmentation between the innovation chain and the education chain, and the absence of a triple-chain collaboration platform (see Table 1).

Table 1. Problems in Professional–Innovation Integration

Dimension	Problems	Number of Respondents	Percentage (%)
Education Chain-Industry Chain	Lack of real-project and feedback-update mechanisms	162	66.9
	Insufficient enterprise scenarios/case studies/data resources	154	63.6
	Misalignment between course objectives and job competencies	140	57.9
	Absence of systematic training in the problem-solution-validation-transformation process	158	65.3
Innovation Chain-Education Chain	Difficulties in converting research outcomes or cutting-edge technologies into teaching content	148	61.2
	Time/workload pressures hindering project-based and interdisciplinary approaches	146	60.3
	Inadequate resource integration and sharing	150	62
Collaborative Platform	Lack of recognition and incentives for outcome transformation	144	59.5
	Challenges for cross-disciplinary/university-enterprise platforms in accessing resources and mentors	136	56.2

3.1. Disconnection between the Education Chain and the Industry Chain: Supply–Demand Mismatch and Outdated Curricula

Survey results revealed that 66.9% of faculty considered courses lack a “real-world project + feedback and updating” mechanism, 63.6% of faculty reported insufficient enterprise scenarios, cases, and data resources, and 57.9% of faculty stated that course objectives are misaligned with job competency requirements. These findings indicated that the real-world context-project-driven-feedback iteration loop of industry–education integration has not yet been established. Course content and skill training struggled to keep pace with the dynamic changes of regional industry chains, leading to misalignment between training objectives and industry demand, insufficient practical learning opportunities. These issues, in turn, led to widening supply–demand mismatches and delays in curriculum updating.

3.2. Fragmentation between the Innovation Chain and the Education Chain: Limited Research-to-Teaching and Entrepreneurship Translation

The survey showed that 65.3% of faculty reported a lack of systematic training in problem-solution-validation-transformation, 61.2% of faculty stated that research outputs and frontier technologies were difficult to translate into teaching, and 60.3% of faculty indicated that time and workload pressures hinder project-based and interdisciplinary teaching. These findings suggested that research and teaching are not institutionally integrated, resulting in a lack of evidence-based and iterative methodological training in the classroom. Faculty struggled to convert papers and research projects into reusable teaching modules and entrepreneurial prototypes. As a result, students’ innovation-entrepreneurship projects tended to move toward low-technology and low-barrier fields, weakening the support for cultivating innovative capabilities.

3.3. Insufficient Triple-Chain Collaboration Platforms: Weak Resource Integration and Sharing Mechanisms

According to the survey, 62.0% of faculty believed that resource integration and sharing are insufficient, 59.5% reported that evaluation and incentive systems did not adequately recognize evidence packages and results transformation, and 56.2% reported that interdisciplinary and university–enterprise collaboration platforms were difficult to access for resources and mentorship. These findings indicated that

resource flows on the platform and institutional levels remained inefficient, with unstable information and project supply. Evaluation and incentive systems failed to support practice and transformation outcomes, making it difficult for the education chain to effectively connect with the industry chain's demand and for the innovation chain to sustain the upgrading of the education chain. As a result, the collaborative ecosystem of real-world context-project-driven-results transformation has not yet been formed.

4. Pathways for Professional–Innovation Integration from the Perspective of Triple-Chain Collaboration

4.1. Industry Demand Orientation: Precise Alignment with Industrial and Innovation Needs

Understanding industrial demand in depth is the foundation. Through industry analysis and enterprise field studies, universities can accurately grasp the knowledge, skills, and qualities required by enterprises at different stages of the industry chain, forming a dynamic industrial demand map. Based on the analysis of industry needs and existing gaps, universities should define clear talent cultivation objectives for professional–innovation integration, break traditional course boundaries, and deeply embed innovation and entrepreneurship education into professional curricula. The focus is to transform from entrepreneurship-focused courses to the entrepreneurialization of all courses, achieving “whole-staff, whole-process, whole-curriculum integration.” Curriculum innovation can be promoted through five key dimensions: reconstructing learning objectives, reshaping teaching content, reforming teaching methods, optimizing evaluation systems, and integrating resource platforms.

Firstly, Universities should add entrepreneurship and innovation competencies (e.g., innovative thinking, business insight, resource integration, risk management) to the learning outcomes of professional courses, alongside knowledge and technical skills. Secondly, they should integrate real industry problems, enterprise cases, and entrepreneurial scenarios into teaching content. Thirdly, educators should adopt project-based learning (e.g., simulated startup projects), problem-based learning (e.g., solving enterprise pain points), and interdisciplinary collaboration (e.g., business and engineering teams), emphasizing practice and iteration. Fourthly, institutions should diversify assessment by including dimensions such as innovation, feasibility, and teamwork, using business plan roadshows or user feedback reports instead of traditional exams. Fifthly, parties involved (universities and enterprises) should co-build practice bases with enterprises, introduce industry mentors, establish collaborative platforms, and undertake enterprise projects, enabling students to experiment and learn through trial and error in real business environments (Tan et al., 2025).

4.2. Integration of Science and Education: Promoting the Transformation and Application of Research Outputs

Universities transform research resources into educational resources, shifting teaching from knowledge transmission to innovation empowerment. It is necessary to integrate research outputs, frontier technologies, and academic thinking into teaching content through research case introduction, topic-based learning, and open laboratory access, enabling students to cultivate innovative thinking while solving real problems.

Universities should make the learning process more research-oriented, transforming it from passive knowledge reception to active inquiry. They need Embed research methodologies into the teaching process and implement a “problem identification – solution design – iterative validation – results transformation” training loop to cultivate students’ empirical analysis, data-driven reasoning, and cross-domain integration skills. Educational institutions should promote the real-world application of research scenarios, shifting capability development from simulation training to practical problem-solving. Colleges and universities should build industry–academia–research collaborative innovation platforms, enabling students to participate as research assistants in real-world projects. These platforms should expose students to complex technical problems, resource constraints, and time pressure, students refine cross-disciplinary collaboration, rapid response, and risk anticipation skills (Gao & Ma, 2025).

4.3. *Ecosystem Co-Building: Transitioning from a Closed to an Open Collaborative Ecosystem*

A collaborative innovation ecosystem involving universities, government, enterprises, and research institutions should be constructed to facilitate the free flow of resources and co-creation of shared value. Firstly, cross-boundary council should be established as a joint decision-making body composed of government, enterprises, and research institutions. This council would coordinate resource allocation for professional–innovation integration and improves collaboration in policy alignment, technology empowerment, platform co-construction, and results sharing. Secondly, efforts should be made to build industry–education innovation communities that break the traditional university boundary. Enterprises and industry associations can be Actively integrated into campus activities through initiatives such as industry mentors on campus, university-enterprise training camps, and embedding real business projects into teaching. Project-driven learning should be expanded by linking discipline competitions and enterprise-based tasks with curricula (Shi, 2025). Thirdly, a dual-appointment and cross-boundary mobility mechanism can be implemented to strengthen the engagement of enterprise mentors and encourage faculty to serve as corporate consultants, enabling two-way mobility. At the same time, disciplinary silos should be broken down by forming teaching teams composed of university and enterprise instructors from diverse backgrounds. These teams would jointly deliver innovation and entrepreneurship education and engage in applied research activities.

5. Conclusions

Guided by the triple-chain collaboration (industry chain–innovation chain–education chain) framework, this study investigated the pathways for integrating professional and innovation education in business disciplines by drawing on academic research and educational practice, including a questionnaire survey on the current conditions and challenges faced by frontline education teachers. The survey results revealed that the main issues included the disconnection between the education chain and the industry chain, the fragmentation between the innovation chain and the education chain, and the weakness of collaborative platforms.

In response, this study proposed a triple-chain integration pathway: leveraging industry demands to achieve precise alignment with industrial and innovation needs; integrating science and education to facilitate the transformation and application of research outcomes; and promoting ecosystem co-construction to shift from a closed-loop system to an open ecosystem. By aligning closely with national strategies such as building a strong education system and reforming business education, this study provides empirical evidence for addressing prominent issues in integration practice and offered a reference for cultivating interdisciplinary business talent in the digital economy era.

DATA AVAILABILITY STATEMENT

All data supporting the findings of this study are included within the article and its supplementary materials. Additional data may be made available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

Ming Feng: Conceptualization; investigation; writing – original draft; methodology; review and editing.

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