Academic Education Publishing House

Higher Education and Practice Vol. 3 No. 4, 2026

Research and Practice on the Construction of Interdisciplinary Courses for Entrepreneurship Talent Cultivation in Application-Oriented Undergraduate Universities from the Perspective of Industry-Education Integration

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Abstract:Under the national strategy of industry-education integration, application-oriented undergraduate universities face three challenges in entrepreneurship talent cultivation: disciplinary barriers, industry-education mismatch, and weak practical transformation. From this perspective, this paper constructs an interdisciplinary course framework based on "university-enterprise-industry" tripartite collaboration and four-dimensional integration (knowledge, ability, project, platform), along with evaluation and ability growth models. A comparative practice (experimental vs. control class, n=88 each) shows significant improvement in entrepreneurial competencies, with the comprehensive ability index rising from 55.0 to 86.8. Countermeasures are proposed regarding curriculum, collaboration, faculty, platform, and evaluation.

Keywords: Industry-Education Integration; Entrepreneurship Talent Cultivation; Application-Oriented Undergraduate Education; Interdisciplinary Courses; Course Construction

1. Introduction

As industry-education integration becomes a national strategy and application-oriented undergraduate universities accelerate their connotative transformation toward ability-oriented and outcome-based education, entrepreneurship talent cultivation faces three prominent problems: disciplinary barriers in curricula, mismatch between industry and education supply and demand, and insufficient practical transformation from ideas to realization. Interdisciplinary courses, which are problem-oriented and project-driven, break disciplinary boundaries and incorporate industrial factors, offering a promising path to address these challenges. From the perspective of industry-education integration, this paper follows the research logic of "situation analysis—model construction—practical verification—countermeasure suggestions" and systematically answers three questions: What is the mechanism of industry-education integration empowering interdisciplinary course construction? How can an operable construction model be built? What are its practical effects and implementation paths? The aim is to provide theoretical and practical references for entrepreneurship talent cultivation in application-oriented undergraduate universities.

2. Theoretical Basis and Practical Analysis

2.1 Connotations

Industry-education integration refers to deep collaboration between education and industrial systems in talent cultivation, technological innovation, and resource sharing, using industrial demand to guide educational supply. Interdisciplinary courses are designed around real, complex problems, integrating knowledge from two or more disciplines with industrial practice elements. They focus on knowledge integration, ability connection, and authentic context learning. Industry-education integration empowers interdisciplinary course construction not simply by "adding resources" but by reconstructing content, organization, and evaluation logic, transforming entrepreneurship talent cultivation from discipline-based instruction to integrated cultivation and from learning-application separation to integration.

2.2 Practical Difficulties in the Construction of Interdisciplinary Courses for Entrepreneurship Talent Cultivation in

Application-Oriented Undergraduate Universities

The difficulties in the construction of interdisciplinary courses can be summarized into the four dimensions shown in Table 1 based on the survey at the application-oriented undergraduate university. The difficulties are coupled to each other. It cannot solve the problems just by adding courses or doing short-term training. Systematic reconstruction at the level of construction framework is urgent.

Table 1. Analysis of Practical Difficulties in the Construction of Interdisciplinary Courses for Entrepreneurship Talent Cultivation in Application-Oriented Undergraduate Universities.

Dimension of Difficulty	pecific Manifestation	Limitations of Traditional Course Construction
Curriculum structure	Obvious disciplinary barriers and fragmented modules	Lack of interdisciplinary integration design
Industry–education alignment	Industrial projects are difficult to integrate in a timely manner	Incomplete university–enterprise collaboration mechanism
Practical transformation	Remaining at the level of simulation and competitions, with insufficient implementation	Lack of coherent project-based carriers
Evaluation method	Emphasis on knowledge assessment and insufficient focus on ability output	Difficult to support ability-oriented cultivation

2.3 Mechanism of Industry–Education Integration Empowering Interdisciplinary Course Construction

Industry-education integration acts through three mechanisms: (1) Integration mechanism–organically combining multidisciplinary and industrial knowledge to reconstruct course content, turning fragmented knowledge into integrated structure. (2) Collaborative mechanism–through multi-stakeholder collaboration (universities, enterprises, industries), introducing real projects and industry mentors to achieve precise alignment between educational supply and industrial demand. (3) Connection mechanism – through project-driven learning, establishing the ability cultivation chain of "idea generation—training—incubation," forming a closed loop from knowledge acquisition to practical transformation. Together, these mechanisms serve the ability-oriented and outcome-oriented entrepreneurship talent cultivation.

3. Construction of the Interdisciplinary Course Model

3.1 Design Concepts and Principles

The model follows four principles: (1) oriented to entrepreneurial abilities output; (2) multi-stakeholder collaboration (joint construction, joint evaluation, shared benefits); (3) project connection linking knowledge learning and ability development; (4) feasibility and scalability for staged implementation under existing conditions of application-oriented universities.

3.2 "Tripartite Collaboration–Four-Dimensional Integration" Framework for Interdisciplinary Course Construction

According to the above mechanisms and the principles, in this paper, based on the collaboration of the "university- enterprise-industry" and guided by the four-dimensional integration of "knowledge integration- ability connection- project-driven learning- platform support", a "tripartite collaboration- four dimensional integration" framework of interdisciplinary course construction is constructed. Its structure is as shown in Figure 1.

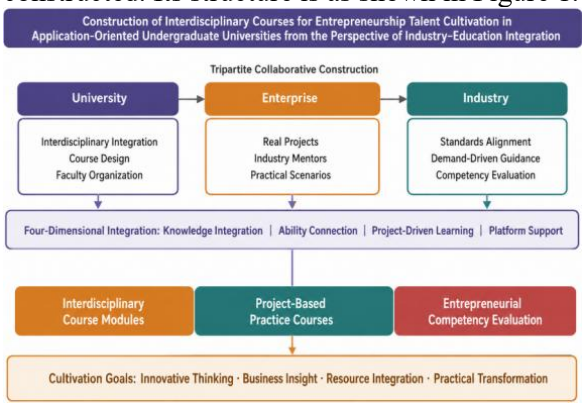

Figure 1. "Tripartite Collaboration–Four-Dimensional Integration" Framework for Interdisciplinary Course Construction

At the tripartite collaboration level: universities lead interdisciplinary integration and course design; enterprises provide real projects and industry mentors; industries are responsible for standards alignment and competency evaluation. At the four-dimensional integration level: knowledge integration reconstructs interdisciplinary content; ability connection

designs staged competency goals; project-driven learning runs real projects throughout teaching; platform support relies on industrial colleges and practical training platforms. Together, they support interdisciplinary course modules, project-based practice, and entrepreneurial competency evaluation, systematically improving entrepreneurship talent cultivation quality.

3.3 Key Support and Evaluation Model for Cultivation Effectiveness

To quantitatively measure cultivation effectiveness, a comprehensive evaluation model is constructed. The comprehensive effectiveness index T consists of knowledge integration degree (K), entrepreneurial ability (C), practical transformation (P), and innovation literacy (I) with weights:

$$T=w^1 \cdot K+w^2 \cdot C+w^3 \cdot P+w^4 \cdot I \quad (1)$$

where w_1~w_4 are weight coefficients satisfying $w^1+w^2+w^3+w^4=1$, In this study, based on expert consultation and the analytic hierarchy process, the weights are set as $w^1=0.20$、$w^2=0.35$、$w^3=0.30$、$w^4=0.15$, All sub-indicators are normalized to a range of 0~100。 Furthermore, the growth of students' entrepreneurial ability with the cultivation stage s can be characterized by a learning curve:

$$C(s)=C_max \cdot \left(1-e^{(-\mu s)}\right) \quad (2)$$

Where C_max represents the upper limit of entrepreneurial ability, and μ represents the ability growth rate coefficient. Industry–education integrated interdisciplinary courses increase the rate coefficient μ。 by enhancing project practice intensity and collaborative support. The cultivation value-added effect is measured by the difference between pre- and post-cultivation comprehensive effectiveness, expressed as $\Delta T=T_post-T_pre$, which serves as the core indicator for evaluating the effectiveness of interdisciplinary course construction.

4. Teaching Practice and Effectiveness Analysis

4.1 Practice Design and Sample

A three-academic-year, six-semester comparative practice was conducted in entrepreneurship-oriented economics and management programs at an application-oriented university. From natural classes of the same cohort with no significant difference in entrance quality, 88 students were selected for the experimental class (using the proposed "tripartite collaboration—four-dimensional integration" model) and 88 for the control class (traditional discipline-based curriculum). Faculty, total credits, and cultivation objectives were balanced; the only difference was the course construction model. Data collection included competency assessments, project outcomes, entrepreneurship practice records, and teacher-student interviews.

4.2 Analysis of Cultivation Effectiveness

After completion, the experimental class significantly outperformed the control class in six core entrepreneurial competency dimensions: innovative thinking, business insight, resource integration, teamwork, practical transformation, and risk decision-making (Figure 2). The overall competency structure expanded outward and became more balanced, indicating that interdisciplinary course construction effectively promotes systematic development of entrepreneurial competencies.

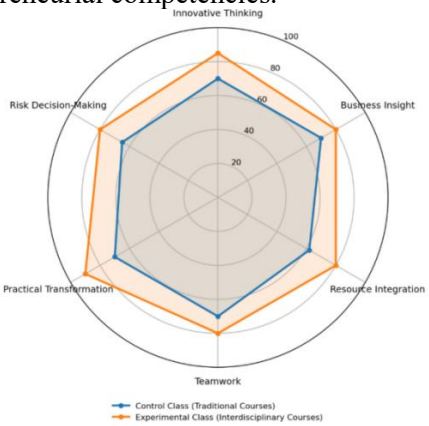

Figure 2. Comparison of Core Entrepreneurial Competency Dimensions Between the Experimental Class and the Control Class

Figure 3 shows the evolution of the comprehensive entrepreneurial ability index across cultivation stages. The experimental class increased steadily from 55.0 (semester 1) to 86.8 (semester 6), while the control class increased from 55.0 to only 66.7. The gap widened progressively, demonstrating that industry-education integrated interdisciplinary courses have a significant and lasting effect on ability improvement.

Table 2 compares key indicators. The experimental class is significantly better than the control class in comprehensive cultivation effectiveness, entrepreneurial ability, practical

transformation, entrepreneurship practice participation rate, and proportion of high-quality entrepreneurial projects. Independent-samples t-test shows $p < 0.01$ for all differences, confirming the model's effectiveness.

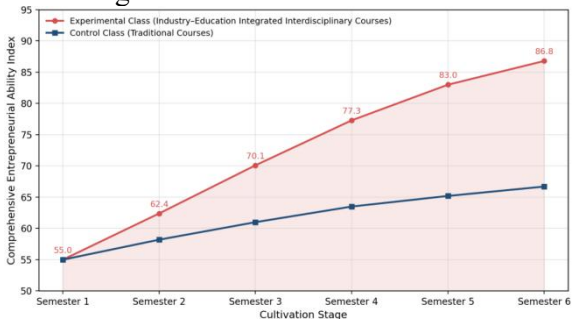

Figure 3. Evolution Curve of the Comprehensive Entrepreneurial Ability Index Across Cultivation Stages

4.3 Teacher–Student Feedback and Qualitative Analysis

Interviews and questionnaires indicate that students found interdisciplinary courses provided "real projects close to industry and useful learning," and that interdisciplinary training "broadened problem-solving perspectives." Teachers reported that university-enterprise collaboration "enriched teaching resources and enhanced practical orientation," and industry mentors significantly strengthened students' practical transformation ability. Feedback also revealed issues such as insufficient stability in university-enterprise collaboration and inadequate interdisciplinary competence among some teachers, suggesting the need for supporting mechanisms when promoting the model.

Table 2. Comparison of Key Indicators Between the Experimental Class and the Control Class

Evaluation Indicator	Control Class	Experimental Class	Improvement
Comprehensive Entrepreneurial Ability Index	66.7	86.8	+20.1
Comprehensive Cultivation Effectiveness T	64.2	85.3	+21.1
Practical Transformation Score	63.0	87.5	+24.5
Entrepreneurship Practice Participation Rate / %	41.2	78.4	+37.2
Proportion of High-Quality Entrepreneurial Projects/%	9.1	26.1	+17.0

5. Countermeasures for Promoting Interdisciplinary Course Construction

Based on the practice results and feedback, four countermeasures are proposed for application-oriented universities: (1) reconstruct the interdisciplinary curriculum system guided by an entrepreneurial competency map, breaking disciplinary barriers and establishing staged modules of "basic integration—project practice—incubation advancement"; (2) improve the university-enterprise-industry collaborative mechanism through long-term carriers such as industrial colleges and joint course development, clarifying responsibilities and benefit-sharing to ensure continuous integration of real projects; (3) strengthen dual-qualified teachers and platform support by implementing a "dual-mentor" system and enhancing teachers' interdisciplinary competence, while utilizing practical training platforms and incubation spaces; (4) improve an ability-oriented evaluation system by incorporating project outcomes, practical transformation, and innovation literacy, reducing single knowledge-based assessment and introducing industry standards and third-party evaluation. In addition, an implementation mechanism of "pilot first—iterative optimization—phased promotion" should be followed, along with dynamic monitoring and continuous improvement, to ensure scientific and controllable advancement.

6. Conclusion and Prospects

From the perspective of industry-education integration, this paper constructs a "tripartite collaboration—four-dimensional integration" interdisciplinary course framework for entrepreneurship talent cultivation in application-oriented undergraduate universities. The framework effectively addresses the core difficulties of disciplinary fragmentation, disconnection between learning and application, and insufficient practical transformation. Comparative practice shows that it significantly improves students' comprehensive entrepreneurial ability (from 55.0 to 86.8) and all competency dimensions, with stable and sustainable effects. Future research will expand sample and disciplinary coverage, conduct long-term tracking of graduates' entrepreneurial development, and integrate digital teaching with industrial data to shift evaluation from ability orientation toward literacy and value orientation.

Acknowledgements

This study was supported by the University-level Teaching Reform Projectt No. (2022XJJGYB33)

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