

Research on the Paths and Strategies for Reforming the Project Financing Curriculum System through Industry-Education Integration

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Abstract: Against the backdrop of emerging liberal arts development, the Project Financing course combines theoretical rigor, practical orientation, and interdisciplinary characteristics, serving as an important vehicle for promoting the coordinated development of education, science and technology, and talent cultivation. This paper first elucidates the intrinsic value of industry-education integration in empowering the reform of emerging liberal arts curricula and systematically reviews the current research landscape through CiteSpace-based bibliometric analysis. Addressing the shortcomings of the current Project Financing curriculum system, the study develops implementation pathways and optimization strategies from four dimensions: teaching content, curriculum structure, teaching methods, and educational philosophy. The research aims to cultivate interdisciplinary professionals with global vision, engineering ethics, and a strong sense of social responsibility who are capable of project financing decision-making, and to provide references for the connotative development of economics and management curricula in the context of emerging liberal arts.

Keywords: Industry-Education Integration; Project Financing; Unity of Knowledge and Practice; Pathways

1. Introduction

The “Dual Carbon” strategy is a key initiative for achieving sustainable and high-quality development. The 15th Five-Year Plan for the modern energy system explicitly proposes accelerating the green and low-carbon transformation of the energy sector. The report of the 20th National Congress of the Communist Party of China emphasized accelerating the green transformation of development modes and highlighted the need to “deeply implement the strategies of invigorating the country through science and education, strengthening the nation through talent development, and driving development through innovation, so as to open up new fields and new arenas for development and continuously cultivate new drivers and advantages for growth.” As an important measure for promoting the integrated development of education, science and technology, and talent cultivation, industry-education integration provides goals and directions for petroleum and chemical engineering-oriented universities to cultivate innovative high-level talents with strategic thinking.

To achieve the green and low-carbon energy transition, it is necessary to cultivate a large number of professionals in green investment and financing management and provide strong professional support and guarantees. Therefore, it is essential to closely align with the development needs of the green and low-carbon energy transition and, within the framework of emerging liberal arts education, promote innovation in the curriculum system of green and low-carbon energy transition investment and financing in response to the development demands of new quality productive forces. In addition, concepts such as just transition and sustainable development should be integrated into the curriculum from multiple dimensions, thereby advancing the construction of a Beautiful China and fostering an industry-education integration ecosystem featuring the unity of knowledge and practice.

Based on the background of emerging liberal arts development, this study adopts a multidimensional perspective encompassing technology, economy, society, and environment. Focusing on the current status of the Project Financing curriculum system, it closely aligns with the sustainable development goals of industries involved in the green and low-carbon energy transition and constructs a new model of university-enterprise collaborative talent cultivation. By optimizing the curriculum system from the perspective of the entire project investment and financing process and its various stages, the study promotes high-level industry-education integration, emphasizes innovation in teaching content, curriculum framework, teaching methods, and educational philosophy, and cultivates future-oriented interdisciplinary and innovative talents.

2. Significance of Industry-Education Integration in Empowering the Reform of Emerging Liberal Arts Curriculum Systems

Driven by a series of policies such as the Excellence Engineer Education and Training Program, the construction of the Project Financing curriculum system in the context of emerging liberal arts education carries important functions of value

guidance and talent cultivation. It should not only take into account the practical nature of engineering projects but also consider the hierarchical characteristics of curriculum teaching and the professional features of interdisciplinary disciplines.

2.1 Strategic Level: Addressing the Lag in Knowledge Structures and Facilitating the Flow of Production Factors

Industry-education integration serves as an important pathway for reshaping the knowledge structure and competency framework of investment and financing management professionals. It transforms the latest practices in emerging industries such as artificial intelligence, biomedicine, and aerospace, as well as developments in data factor markets and financial markets, into curriculum modules. This promotes the precise alignment of the education chain, talent chain, industrial chain, and innovation chain, accelerates the optimization, reorganization, and efficient flow of production factors, and injects momentum into the development of new quality productive forces.

2.2 University Level: Promoting Educational Transformation and the Commercialization of Scientific and Technological Achievements

Industry-education integration contributes to the optimization of academic program structures in universities by reversing the previous disconnect between discipline development and practical needs, thereby facilitating continuous adjustment and improvement of disciplines. It also helps universities activate the spillover effects generated by basic research, test the innovativeness of research outcomes in enterprise engineering scenarios, improve the efficiency of transforming scientific and technological achievements into new quality productive forces, and promote the practice of “research in laboratories and transformation on production lines.”

2.3 Enterprise Level: Addressing Talent Shortages and Supporting Technological Upgrading

The core bottleneck in enterprise transformation, upgrading, and technological iteration lies in the shortage of high-end technical professionals and application-oriented skilled personnel, which directly constrains industrial upgrading and the enhancement of core competitiveness. Addressing the mismatch between talent supply and demand requires strengthening enterprises’ deep participation throughout the entire talent cultivation process. This involves integrating enterprise practices into key educational links such as program design, curriculum systems, practical training, internships, and employment, thereby cultivating interdisciplinary and application-oriented talents that meet industrial and technological demands.

2.4 Student Level: Transforming Students from “Knowledge Recipients” to “Value Creators”

Industry-education integration is a crucial link in promoting students’ transformation from “knowledge recipients” to “value creators.” The two mutually support and empower each other, enabling the precise alignment between talent cultivation and industrial needs. By breaking down barriers between universities and enterprises through the joint establishment of industrial colleges, practical training bases, and collaborative education mechanisms, industry-education integration incorporates industrial demands, technical standards, and real-world challenges into the educational process. This enables students to actively apply knowledge, explore solutions, and refine their capabilities while addressing practical problems, thereby transforming knowledge into actual productive forces.

3. Research Status of Industry-Education Integration Empowering Emerging Liberal Arts Curriculum Systems

Using “emerging liberal arts,” “industry-education integration,” and “curriculum system” as subject keywords, this study conducted a literature search in the Wanfang Database and retrieved 423 journal articles published between January 1, 2020 and April 30, 2026. The literature records were exported in RefWorks format and analyzed using the CiteSpace bibliometric tool to generate a knowledge map.

The research hotspots concerning curriculum systems in the context of emerging liberal arts mainly include keywords such as “industry-education integration,” “talent cultivation,” “teaching reform,” and “digital-intelligence empowerment.” In terms of teaching models, approaches such as “interdisciplinary integration” and “digital-intelligence empowerment” have attracted extensive attention, emphasizing curriculum design and implementation pathways centered on “problem-driven learning” and “interdisciplinary collaboration.” Meanwhile, the application of technologies and mechanisms such as “experimental teaching,” “artificial intelligence,” and the “dual-mentor system” in teaching activities has gradually become an important support for promoting the digital and intelligent transformation of curricula. In addition, talent cultivation philosophies and objectives, including “value guidance” and “collaborative education,” are integrated throughout the moral education dimension of curriculum development. It can be observed that existing studies focus on the contemporary

implications of serving major national strategic needs and have further shifted toward innovation and deepening in teaching content, curriculum systems, teaching methods, and educational philosophies. This trend is particularly reflected in the emergence of keywords such as “collaborative education,” “innovation and entrepreneurship,” “digital-intelligence empowerment,” “value guidance,” and “interdisciplinary integration.”

4. Problems Existing in the Project Financing Curriculum System under the Context of Emerging Liberal Arts

4.1 Misalignment Between Teaching Content and Industry Frontiers

The demand in the project financing market is evolving rapidly. With the transformation of PPP (Public-Private Partnership) projects, the emergence of EOD (Ecology-Oriented Development) models, and the normalized issuance of REITs (Real Estate Investment Trusts), current curriculum materials have become increasingly disconnected from industry frontiers. Existing teaching content pays limited attention to financing instruments such as green finance and REITs under the “Dual Carbon” goals. In addition, the cases used in teaching rarely reflect the latest development trends of financial technology innovation in project financing.

4.2 Weak Knowledge Integration within the Curriculum System

The essence of emerging liberal arts lies in interdisciplinarity and integration. However, existing curriculum systems often merely combine engineering technology, financial management, contract law, and related subjects without adequately considering the impact of engineering technologies, such as Building Information Modeling (BIM) and smart construction, on financing models. Moreover, there is an insufficient supply of simulation software for project investment and financing decision-making, making it difficult to effectively utilize digital technologies to construct financing chains covering the entire project life cycle. As a result, when confronted with interdisciplinary practical problems, students often struggle to develop systematic analytical frameworks.

4.3 Lagging University–Enterprise Collaboration in Teaching Methods

Project Financing is a highly practice-oriented course, yet a practical teaching ecosystem characterized by “co-construction, co-cultivation, and resource sharing” has not been fully established. First, university–enterprise collaborative mechanisms have not been effectively implemented at the operational level. Most off-campus internship bases remain limited to visits and observations, with low levels of participation, making it difficult for students to engage in full-process training involving multi-party strategic interactions. Second, the development of “dual-qualified” teaching teams composed of university instructors and industry practitioners remains inadequate. Enterprise experts with substantial industry experience are unable to participate in classroom teaching on a regular basis, limiting the transformation of complex and dynamic market rules into concrete teaching scenarios.

4.4 Insufficient Value Guidance in Educational Philosophy

The field of project financing often involves balancing public interests and commercial profits, while major engineering projects bear multiple responsibilities related to economic development, public welfare, ecological protection, and social progress. At present, course teaching seldom incorporates China's achievements in large-scale infrastructure development and tends to focus primarily on professional knowledge such as financing models, capital operations, and return analysis, while neglecting students' value formation and professional ethics cultivation. Therefore, it is imperative to integrate engineering ethics, green finance, and sustainable development concepts throughout the teaching process and strengthen value-oriented guidance within the curriculum.

5. Paths and Strategies for Reforming the Project Financing Curriculum System through Industry-Education Integration in the Context of Emerging Liberal Arts

Under the background of emerging liberal arts development, the construction of the Project Financing course should not only emphasize practical applicability but also take into account the hierarchical nature of teaching and the distinctive characteristics of the discipline. The focus lies in promoting innovation in teaching content, curriculum systems, teaching methods, and educational philosophies through industry-education integration. The educational objective should shift from merely providing “financing skills training” to cultivating interdisciplinary talents with engineering literacy, financial thinking, and a strong sense of social responsibility and national commitment from a holistic perspective.

5.1 Transforming Teaching Content toward Scenario-Based Practical Training

Relying on university–enterprise cooperation platforms and focusing on engineering project investment and financing, practical training platforms integrating industry and education should be established in combination with new urbanization initiatives, the digital economy and new infrastructure development, as well as green buildings and smart city construction. Digital simulation technologies should be employed to create immersive training environments. Taking the design and implementation of financing schemes as the main line, students are guided to understand the four major knowledge modules of project investment and financing—investment structure, financing structure, capital structure, and credit enhancement structure—as well as the entire financing process. Students are expected to become familiar with the characteristics and operation mechanisms of various equity financing and debt financing approaches and master the methods for designing and optimizing project financing schemes. Particular emphasis should be placed on cultivating students’ professional competencies in handling investment and financing activities for complex engineering projects.

A dual-mentor system should be implemented, under which university instructors and enterprise mentors jointly supervise practical training throughout the entire process, thereby achieving seamless alignment between talent cultivation and industrial needs. By establishing realistic project roadshow scenarios, students can be guided to master advanced project investment and financing decision-making tools. Through scenario-driven reconstruction of teaching content, learning can be transformed from knowledge acquisition to practical decision-making, while immersive training strengthens students’ capabilities in practical judgment and innovative thinking.

5.2 Transforming the Curriculum System toward Project-Based and Problem-Driven Learning

The curriculum should actively promote the Outcomes-Based Education (OBE) model and enrich approaches for cultivating innovation and entrepreneurship capabilities. In practical training courses, a closed-loop continuous improvement system featuring “objectives–cultivation–evaluation–improvement” should be established, shifting the focus from process guidance to thinking-oriented leadership. This approach fully leverages the guiding role of instructors, helps students clarify individual and team objectives, and stimulates their professional potential through learning and reflection.

With interdisciplinary project-based teaching as the central framework and Problem-Based Learning (PBL) as the primary pedagogical approach, a teaching system integrating “classroom theory + practical training scenarios + industry cases” should be constructed. Throughout the entire process, students are encouraged to participate deeply in and simulate the core tasks of engineering project investment and financing. In this way, professional theoretical knowledge can be transformed into measurable innovative capabilities required for solving practical problems, including business planning, investment and financing decision-making, and project implementation. Meanwhile, a multidimensional outcomes-based evaluation system should be implemented. Project achievements, roadshow performance, business plans, practical training outcomes, and other tangible outputs should serve as the primary assessment criteria, thereby continuously improving the quality of talent cultivation.

5.3 Transforming Teaching Methods toward Immersive Case-Driven Learning

Practical knowledge transfer should be based on the integration of “practical training platforms + real-world scenarios,” with students taking the leading role in classroom learning through active and self-directed participation. In the teaching process, instructors act as facilitators and mentors, while students work in groups assuming the roles of government agencies, private sector participants (contractors/operators), banks, and legal advisors. Through role-based interactions and conflicts, students are encouraged to consider engineering ethics and compliance requirements, develop a prudent understanding of risk, cultivate rigorous engineering thinking, and seek a balance between commercial interests and public welfare. By effectively presenting Chinese development experiences and designing immersive classroom activities around engineering cases, instructors can progressively deepen students’ understanding of key concepts and guide them to integrate multidisciplinary knowledge in analyzing and solving management problems aligned with course objectives.

An immersive teaching approach combining “action learning + engineering cases” should be adopted. Practical training cases should closely follow the mainstream development trends of diversified financing models, enabling students to gain a deeper understanding of investment and financing management practices in engineering projects. Through a structured process consisting of case background information, identification of investment and financing issues, case instruction, simulation software application, and result interpretation, students can develop optimal solutions, master theories and methods of investment and financing decision-making, promote interdisciplinary knowledge integration, and enhance their comprehensive problem-solving abilities.

5.4 Transforming Educational Philosophy toward Sustainable Value-Oriented Development

Professional course teaching should be integrated with values education. Drawing on the investment and financing management practices of major projects such as the West-to-East Gas Pipeline Project, the Sichuan–Tibet Railway, the South-to-North Water Diversion Project, and the Hong Kong–Zhuhai–Macao Bridge, students should be guided to strengthen their sense of responsibility in serving major national strategies and contributing to national rejuvenation. Emphasis should be placed on cultivating project investment and financing management capabilities through interdisciplinary integration, as well as developing professional competencies that enable students to comprehensively apply knowledge from the natural sciences, social sciences, and investment and financing disciplines. At the same time, professional education should be deeply integrated with ideological and political education to establish a sustainable value system encompassing the balance between justice and interests, social responsibility, public welfare protection, and ecological responsibility. In doing so, an industry-education integration ecosystem featuring the integration of theory and practice as well as the unity of knowledge and action can be achieved.

The fundamental task of fostering virtue through education should be fully implemented by integrating value shaping, knowledge transmission, and capability development. Students should be encouraged to develop innovative and critical thinking, foster cultural identification with and commitment to the principle of technology for good, and understand the macroeconomic environment shaped by China’s major engineering culture. During investment and financing decision-making processes, students should be encouraged to challenge conventional approaches and propose innovative solutions. Furthermore, efforts should be made to strengthen students’ professional ethics and risk awareness, enabling them to establish sound values regarding investment and financing decision-making.

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