Frontiers in Business, Economics and Management
ISSN: 2766-824X | Vol. 25, No. 1, 2026

A Case Study of Business–Engineering Integrated Dual Carbon Postgraduate Training at Chongqing Technology and Business University

Yongli Chen, Keyu Chen, Yixuan Zhou

Chongqing Technology and Business University, Nan'an, Chongqing 400067, China

Abstract: To achieve China's "dual carbon" goals, interdisciplinary talent is urgently needed. Taking Chongqing Technology and Business University as a case, this paper examines a "business–engineering integration" model for dual-carbon postgraduate training. Launched in 2024, the program offers carbon economy, carbon finance, carbon management, carbon technology, and digital intelligence directions. It builds a "policy–technology–market" curriculum with compulsory, elective, and practical modules, supported by interdisciplinary mentors, industry mentors, and joint training bases. The paper also reviews relevant literature and proposes recommendations on differentiated positioning, double-qualified faculty teams, and industry-education integration to improve local university talent training and regional service capacity.

Keywords: Interdisciplinary; Dual carbon talent; Postgraduate training; Serving local development; Chongqing Technology and Business University.

1. Introduction

In September 2020, China clearly proposed the strategic goals of peaking carbon emissions by 2030 and achieving carbon neutrality by 2060, marking a new stage of green and low-carbon socio-economic transformation. The subsequent "1+N" policy system systematically outlined the roadmap and timetable for "dual carbon" work from multiple dimensions, including energy, industry, finance, and technology. In 2023, Chongqing was approved to build a green finance reform and innovation pilot zone, pushing the demand for carbon finance talent from policy expectation to industrial reality. At the same time, because achieving the "dual carbon" goals is highly systematic and involves not only low-carbon technologies but also institutional design related to carbon emission rights, it imposes unprecedented requirements for interdisciplinary talent. Under the current training system, graduates trained in a single traditional discipline often know technology but not policy, or understand finance but not emission-reduction technology, making it difficult for them to take on relevant interdisciplinary positions. Against this background, the structural shortage of talent supply has become a prominent bottleneck constraining the implementation of local "dual carbon" goals and the green transformation of industry. Therefore, how local universities can break disciplinary barriers and cultivate interdisciplinary "dual carbon" talent who understand policy, master technology, and possess market thinking is an urgent practical issue for higher education in serving regional development.

2. Practical Exploration of Dual Carbon Postgraduate Training at Chongqing Technology and Business University

2.1. University Positioning and Disciplinary Foundation

Chongqing Technology and Business University is a local university with distinctive "business–engineering integration" characteristics. It adheres to a dual-driven innovation model of "big business + new engineering" and has built a "1+2+2+4+N" disciplinary ecosystem. The university has four disciplines ranked in the top 1% of ESI globally, including environment/ecology; two Chongqing "first-class disciplines"; 14 Chongqing key disciplines under the 14th Five-Year Plan; and three Chongqing artificial intelligence plus disciplinary clusters. In general, the university has formed broad cross-group and cross-disciplinary consensus on "dual carbon" talent training, and its training direction is highly aligned with China's "dual carbon" strategy and Chongqing's regional industrial development needs. According to survey data, faculty and students have a high degree of recognition of "dual carbon" talent training: more than 85% of respondents believe that the "dual carbon" goals have an important impact on career development, and more than half recognize the core value of aligning university courses with enterprise needs. At the faculty level, more than 90% of teaching staff believe that industry–university–research cooperation plays a significant or certain role in talent training. In terms of disciplinary distribution, more than 70% of postgraduates in the three main discipline categories show strong interest in "dual carbon" related courses.

2.2. Development Process of Training Practice

The university's "dual carbon" postgraduate training began in 2024, with an initial enrollment of 26 students and four training directions jointly established by nine training units. In 2025, the university established the "Dual Carbon" Innovation Research Institute and opened a "digital intelligence" postgraduate class in the same year, enrolling 30 students in the 2025 "dual carbon" direction. At present, the institute has established eight internship bases; 26 students have completed 32 person-times of internship practice, and 34 school–enterprise, government–enterprise, and school–school exchange visits have been conducted.

In terms of teaching organization, the university has innovatively established a cross-school, cross-college, and

interdisciplinary "Carbon Finance" Teaching Joint Center, coordinating teaching resources from Chongqing University of Posts and Telecommunications and Chongqing Technology and Business University to form an integrated management mechanism of "disciplinary intersection–curriculum development–practical innovation." At the same time, it has formed an interdisciplinary teaching team of "financial engineering + environmental engineering," gathering leading talent in finance, environmental engineering, data science, and carbon trading, and building a dual-track faculty team of "academic mentors + industry mentors."

2.3. Distinctive Training Directions

The "dual carbon" postgraduate direction includes four distinctive directions: carbon economy, carbon finance, carbon management, and carbon technology. In 2025, a "digital intelligence" direction was added. Each direction focuses on the needs of Chongqing's "33618" industrial clusters with different emphases:

The carbon economy direction emphasizes macro policy analysis and carbon emission accounting, serving government decision-making and think-tank consulting. The carbon finance direction focuses on carbon trading mechanisms and carbon financial product design, meeting the needs of Chongqing's green finance reform and innovation pilot zone. The carbon management direction concerns corporate carbon asset management and carbon information disclosure, meeting the talent needs of key emission-control enterprises. The carbon technology direction focuses on emission-reduction technology innovation and application assessment, supporting the development of new energy and energy storage industries. The "digital intelligence" direction highlights the synergy between digitalization and green development, cultivating integrated "digital + dual carbon" talent.

3. Literature Review

The realization of the "dual carbon" goals is a systematic project involving energy, industry, finance, and technology, imposing profound changes on higher education. Existing studies have examined this issue mainly from three perspectives: talent demand and interdisciplinary training, curriculum reform and industry–education integration, and differentiated positioning of local universities.

3.1. Talent Demand Gaps, Interdisciplinary Training, and Curriculum Reform

Dual-carbon strategies require interdisciplinary and high-level talent. Li et al. [1] used a GM(1, 1)-ARIMA model to forecast China's dual-carbon talent supply and demand, finding significant regional disparities and a serious mismatch between industrial demand and academic supply, especially for interdisciplinary positions. The study predicted that demand for postgraduate-level dual-carbon talent will grow faster than for undergraduates. More than 65% of energy-intensive enterprises reported shortages in carbon auditors and CCUS engineers, while carbon finance positions had a supply adequacy rate below 40% [1]. Hu et al. [2] analyzed doctoral training in agriculture and forestry universities and identified three imbalances: a "knowledge gap" in interdisciplinarity, a "platform fault" in industry–education integration, and a "structural misalignment" between supply and demand. Zhang et al. [3] applied ecosystem theory to examine factors influencing dual-carbon talent training at micro, meso, exo, and macro levels, proposing three pathways for improvement. These studies indicate that the talent shortage is systemic, involving training concepts, organizational structures, and industry linkage mechanisms.

Interdisciplinary approaches are widely regarded as the core solution. Li et al. [6] analyzed environmental postgraduate training and proposed a modular curriculum combining an "environmental science and engineering core + carbon science and management extension." Lü et al. [5] explored an interdisciplinary talent training model for resource recycling science and engineering, aiming to cultivate innovative talents for dual-carbon development. Wang et al. [4] examined Tsinghua University's Carbon Neutrality Capacity Enhancement Program, which features a modular interdisciplinary curriculum, cross-disciplinary project-based research, and a "cross-integration, real practice, multi-competence" training model. Liu et al. [8] used statistics at Fujian Agriculture and Forestry University to show how statistics can intersect with forestry, ecology, and computer science. Zhao et al. [7] developed an innovation capability evaluation system and diversified training model for environmental engineering postgraduates at Harbin Institute of Technology. These cases show that effective interdisciplinary training requires organizational and resource allocation reforms, not merely course-level combinations.

Curriculum reform is moving from knowledge transmission to competence building. Tang et al. [9] studied Chongqing Technology and Business University's dual-carbon postgraduate curriculum and identified problems such as incomplete general education, weak interdisciplinary integration, and insufficient teaching resource coordination. They proposed a curriculum system integrating carbon economy, carbon technology, and carbon management, supported by interdisciplinary mentor teams and industry–education integration. Zhang et al. [10] analyzed carbon sink talent training under carbon neutrality and called for cross-integration, continuous training, and industry–education integration. Liu et al. [11] reformed a graduate course on advanced air pollution control by incorporating carbon reduction technology and carbon accounting, using case teaching and project-driven learning. Jin and Wu [12] discussed curriculum design for dual-carbon talent from a new liberal arts perspective. Research on carbon finance talent training [18] and teaching reform in building materials [20] further shows that curriculum content must dynamically incorporate policy, technology, and market changes. These studies suggest that curriculum reconstruction must transcend a "multidisciplinary platter" and achieve substantive knowledge integration.

3.2. Industry–Education Integration and Practical Education

Industry–education integration is key to converting knowledge into capability. Chen et al. [13] used the Energy Economics and Environmental Policy Research Institute at Southwestern University of Finance and Economics to explore teaching reform combining classroom knowledge with social practice. A study on dual-carbon talent training industry–education alliances [14] proposed governance paths based on collective action, hierarchical governance, third-party organizations, and efficient resource use. Zheng et al. [15] explored an innovation capability training model for engineering postgraduates at forestry universities under dual-carbon goals, emphasizing industry–education integration.

Cheng et al. [19] examined mining engineering postgraduates and proposed innovation capability training methods under the dual-carbon strategy. Wang et al. [4] also showed that effective integration requires embedding industrial practice into the core of training programs rather than adding internships. These studies indicate that industry–education integration must be institutionalized.

3.3. Local University Positioning and Research Gaps

Local universities face resource constraints and homogenization pressure, making differentiated positioning critical. Chongqing Technology and Business University has leveraged its "business–engineering integration" advantage to launch a dual-carbon postgraduate program in 2024, establish a Dual Carbon Innovation Research Institute in 2025, and add a digital intelligence direction, aligning with Chongqing's "33618" industrial clusters and green finance pilot zone [9]. Northwest University's Yulin Carbon Neutrality College, China's first research-oriented college serving carbon peak and neutrality, has established interdisciplinary directions such as carbon storage science and engineering and green low-carbon development and governance, forming a "1+N" research and education system [16]. Zhang et al. [10] argued that local universities should build differentiated paths in carbon sink, carbon finance, and carbon management. Shi et al. [17] also emphasized integrating carbon neutrality into talent cultivation processes in Chinese agricultural colleges. These cases show that local universities should align with regional needs and their own disciplinary strengths.

Existing studies agree that interdisciplinarity is the underlying logic, curriculum reconstruction is the core lever, industry–education integration is the key path, and differentiated positioning is the survival strategy for local universities. However, three gaps remain. First, most studies focus on single-institution experience or single-dimension reform, lacking integrated analysis of the synergy among interdisciplinarity, curriculum reconstruction, and industry–education integration. Second, local university case studies are scattered, and the "business–engineering integration" path lacks theoretical explanation. Third, training outcomes are often described subjectively, with little empirical testing. This study takes Chongqing Technology and Business University as a case to examine the construction logic, operating mechanism, and preliminary outcomes of a "business–engineering integration" interdisciplinary model for dual-carbon postgraduate training, aiming to fill these gaps and provide a reference for similar local universities.

4. Innovative Construction of the Interdisciplinary Training Model

4.1. Construction of a Multi-Disciplinary Integrated Curriculum Framework

4.1.1. Core Logic of "Three-Dimensional Integration"

The essence of the dual carbon issue is a system optimization problem under the triple constraints of technological feasibility, policy permission, and market effectiveness. This issue not only involves reducing carbon emissions to address global climate change but also concerns sustainable socio-economic development. Against this background, the university proposes a curriculum construction logic of "policy–technology–market" three-dimensional integration, aiming to cultivate students with interdisciplinary vision and comprehensive capabilities to address the complex social and technological problems brought by the dual carbon goals.

4.1.2. "Three-Dimensional Module" Curriculum Framework

Based on the concept of "three-dimensional integration," Chongqing Technology and Business University has built a modular curriculum matrix of "basic compulsory + direction electives + practical application," constructing a systematic knowledge system.

(1) Basic Compulsory Module

The basic module focuses on the integration of policy and economics, laying a knowledge foundation for students in the dual carbon field. This module covers not only the background and evolution of dual carbon policy formulation but also further explores how the economic system and environmental policy can work together. Through basic learning, "dual carbon" students will comprehensively understand the importance of policy and economy in achieving dual carbon goals, master relevant basic knowledge and theoretical frameworks, and lay a solid foundation for further study and practice. In terms of integration, the Carbon Economy Frontier Seminar integrates policy and economics, while the Carbon Finance Frontier Seminar integrates finance and markets; both courses are open to all postgraduates across the university.

(2) Direction Elective Module

Direction electives further expand the depth of interdisciplinary integration. In this module, Chongqing Technology and Business University has set up 16 interdisciplinary core courses for "dual carbon." In 2025, it also opened a "digital intelligence" postgraduate class, drawing on frontier fields such as big data, artificial intelligence, and intelligent manufacturing to promote "digital + green" coordinated development. The curriculum design emphasizes the important role of digital tools in promoting green and low-carbon transformation. It covers the application of artificial intelligence and big data in environmental economic forecasting, as well as business data mining. The core goal is to cultivate interdisciplinary talent with "digital intelligence + dual carbon" skills.

(3) Practical Application Module

The practical module mainly realizes the comprehensive application of three-dimensional knowledge through project-driven and platform support. Chongqing Technology and Business University and Chongqing University of Posts and Telecommunications jointly built the "Carbon Finance" Teaching Joint Center, coordinating teaching resources of the two universities, forming an integrated management mechanism of "disciplinary intersection–curriculum development–practical innovation," and hiring industry and enterprise experts as external mentors to build a dual-track faculty team of "academic mentors + industry mentors." At the same time, Chongqing Technology and Business University has built practical platforms for support, including two national experimental teaching demonstration centers in economic management and environmental and resource chemical technology, and one national virtual simulation experimental teaching center for economic management, providing platform support for dual carbon practical teaching.

4.2. Optimization of the Interdisciplinary Curriculum System

On the basis of the initial establishment of a multi-

disciplinary integrated curriculum framework, it is necessary to promote the deep implementation of the interdisciplinary training concept with greater efforts and more practical measures, avoiding formalism or superficial piecing together. Specifically, breakthroughs are needed in the following three dimensions.

4.2.1. Break Disciplinary Barriers and Move Curriculum Content from "Platter-Style" to "Integrated"

Current interdisciplinary curriculum construction easily falls into the misconception of a "multi-disciplinary platter," in which teachers from different majors each lecture a segment without internal logical connection and knowledge integration. It is necessary to strengthen top-level coordination in curriculum design, establish a joint lesson-preparation mechanism for interdisciplinary courses, require teachers to jointly design course syllabi before teaching, and clarify the intersection points and integration logic of different disciplinary knowledge. For example, in the "Carbon Management" course, it should not merely be taught in segments by teachers of finance, environmental economics, and energy engineering. Instead, around the main line of "comprehensive low-carbon transformation solution design for a certain industry," content such as financial tools, carbon pricing, and technology assessment should be organically connected to form an internally unified knowledge system. At the same time, it is necessary to accelerate the development of a batch of high-quality textbooks and teaching case libraries that truly reflect interdisciplinary integration, providing support for deep integration.

4.2.2. Transform the Teaching Paradigm from "One-Way Transmission" to "Problem-Driven Collaborative Inquiry"

The traditional teaching model is mainly knowledge transmission, with students passively receiving information, making it difficult to cultivate interdisciplinary thinking. It is necessary to comprehensively implement an interdisciplinary teaching model oriented by real problems. Around complex issues such as "low-carbon transformation paths for manufacturing in the Chengdu–Chongqing economic circle" and "design of a regional carbon inclusive mechanism," interdisciplinary seminar courses and project-based courses should be offered. Postgraduates from different majors should be organized into interdisciplinary learning groups. In the process of joint investigation, discussion, and solution design, students are forced to actively mobilize knowledge from different disciplines, achieving true knowledge integration and intellectual collision. The role of teachers should change from knowledge instillers to problem guides and collaborative inquiry partners.

4.2.3. Strengthen Practical Empowerment and Keep Teaching Aligned with Frontiers and Practice

In the "dual carbon" field, policies update quickly, technologies iterate rapidly, and markets change quickly. If teaching content lags behind practice, the students trained will find it difficult to adapt to social needs. It is necessary to establish a dynamic updating mechanism for teaching content and promptly incorporate the latest policies, technological breakthroughs, and market changes into the classroom. Industry experts should be invited to participate deeply in teaching, offering short courses or frontier lectures to bring vivid industry perspectives and practical experience. The proportion of practical links such as experiments, training, and case discussions should be greatly increased. Modules such as carbon trading simulation and corporate carbon inventory practice should be embedded in core courses, allowing students to operate hands-on in simulated or real scenarios, deepen their understanding of theory, and truly improve their ability to solve practical problems.

5. Recommendations for Improving the Quality of Dual Carbon Postgraduate Training in Local Universities

Based on the systematic analysis of the "business–engineering integration" training model of Chongqing Technology and Business University, the following recommendations are proposed from several dimensions.

5.1. Build Differentiated Training Goals Based on Regional Needs

For local universities, the logical starting point for dual carbon postgraduate training is scientific positioning. The core task is to abandon "homogenized" thinking, avoid competing with research-oriented universities on the same track, and instead explore a connotative development path driven by distinctive disciplines, oriented by regional needs, and based on industry–education integration. This requires universities to deeply align with regional development needs, analyze the specific needs of local dual carbon-related industries, and precisely match talent training goals with regional advantageous industries. In addition, given the current difficult job market, universities should rely on their advantageous disciplines to find differentiated positioning in policy, technology, and market dimensions, laying a foundation for student employment.

5.2. Build a "Double-Qualified, Double-Capable" Mentor Team

The faculty team is the core factor determining the quality of talent training. Therefore, through systematic "internal cultivation and external recruitment" and "cross-boundary collaboration," it is necessary to build a high-level mentor team with optimized structure and complementary capabilities. Three measures should be promoted.

5.2.1. Form Interdisciplinary Mentor Groups and Promote Joint Supervision

Break traditional college and disciplinary barriers and build an interdisciplinary supervision model for "dual carbon" postgraduates. In principle, each postgraduate should be assigned a supervision group composed of 2–3 mentors from different disciplinary backgrounds, for example, an environment/energy discipline mentor, an economics and management discipline mentor, and a senior industry expert. Relying on the collective wisdom of the mentor group, personalized training plans should be collaboratively formulated from multidisciplinary perspectives, frontier research topics should be guided, and thesis quality should be strictly controlled, ensuring that postgraduates receive systematic academic training and practical guidance.

5.2.2. Implement a "Dual Carbon" Faculty Empowerment Plan to Improve Professional Teaching and Research Capacity

Establish a normalized teacher development mechanism, focusing on supporting a group of promising young and middle-aged backbone teachers. Through a combination of

"sending out" and "inviting in," comprehensively improve their teaching and research levels in the "dual carbon" field. On the one hand, select backbone teachers to visit and study at high-level universities and research institutions at home and abroad, or take temporary posts in government low-carbon management departments and leading industry enterprises to accurately grasp industry frontiers and practical needs. On the other hand, regularly invite well-known experts and scholars at home and abroad to hold "dual carbon" special teaching seminars and workshops, systematically sharing advanced teaching concepts and practical experience, and promoting innovation in teaching paradigms.

5.2.3. Build a Stable and High-Quality Industry Mentor Team and Strengthen Practical Education

Relying on Chongqing's regional advantage as a green finance reform and innovation pilot zone, actively expand external mentor resources. Appoint a group of industry experts with rich practical experience and solid theoretical literacy from units such as Chongqing United Assets and Equity Exchange Group, authoritative carbon emission verification agencies, green financial service institutions, and low-carbon technology enterprises as external mentors. Clarify the specific responsibilities of industry mentors in practical course teaching, internship and training guidance, thesis topic selection, and career development planning, and incorporate their guidance effectiveness into the assessment and incentive system, ensuring that they play a substantive and sustainable role in the entire talent training process.

5.3. Build a Three-Dimensional Practical System of Industry–Education Integration

5.3.1. Integrate Research Forces and Build an Entity-Based Interdisciplinary Platform

Relying on the university's existing disciplinary advantages in low-carbon technology, energy economics, and green finance, establish a university-level "Carbon Neutrality and Green Development Research Center." The center is positioned as an entity-based interdisciplinary research platform and will undertake three core functions: first, focus on "dual carbon" frontiers, carry out interdisciplinary scientific research, and tackle key technical problems; second, serve as a research innovation base for postgraduates, support students in conducting research projects, and improve their scientific research literacy; third, build a bridge for social service, providing intellectual support to government and enterprises in decision-making consulting, technical services, and talent training.

5.3.2. Establish Special Projects and Strengthen the Research-Based Education Mechanism

Through special project guidance, transform scientific research activities into educational resources. First, add a "dual carbon" special category to postgraduate research innovation projects, openly solicit topics oriented to regional development pain points, and encourage interdisciplinary teams to apply jointly. Second, support postgraduates in deeply participating in national and provincial/ministerial projects led by their mentors, tempering innovation ability in real practice. Finally, establish a long-term mechanism for transforming scientific research results into teaching resources, converting frontier results into teaching cases, and realizing a virtuous cycle in which research feeds back into teaching and teaching promotes research.

5.3.3. Deepen Industry–Education Integration and Upgrade the Functions of Joint Training Bases

Using the existing "Chongqing Kanghua Accounting Firm MPAcc Joint Training Base" as a model, expand cooperation with carbon trading institutions, green finance entities, and low-carbon technology enterprises, and build a batch of distinctive "dual carbon" postgraduate joint training bases. Through functional upgrading, transform the bases from single internship venues into multi-functional platforms integrating practical teaching, case development, project tackling, and achievement transformation. Schools and enterprises should jointly design projects, develop courses, and organize research, guiding postgraduates to solve complex problems in real business and engineering environments.

6. Conclusion

Under the "dual carbon" strategy, interdisciplinary talent training has become an important mission for local universities. Taking Chongqing Technology and Business University as an example, this paper analyzes the practical path of "dual carbon" postgraduate training from the perspective of interdisciplinary integration. The study shows that by building a multi-dimensional integration system of "policy–technology–market" and strengthening industry–education collaboration and practical teaching, it is helpful to improve the quality of talent training and the ability to serve regional development.

Overall, however, the current training model still has room for improvement in the depth of curriculum integration, the perfection of the practical system, and the construction of coordination mechanisms. In the future, it is necessary to further promote deep alignment between interdisciplinary integration and industrial needs, continuously optimize the training system, and better support green and low-carbon transformation and development.

Acknowledgements

The authors gratefully acknowledge the financial support from the Chongqing Postgraduate Education Teaching Reform Research Project: 'Exploration and Practice of the Dual-Carbon Postgraduate Talent Training Model in Local Universities: A Case Study of Chongqing Technology and Business University'(Project No.: yjg241010).

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