Adult and Higher Education (2026)
Clausius Scientific Press, Canada

DOI: 10.23977/aduhe.2026.080214
ISSN 2523-5826 Vol. 8 Num. 2

Research on Optimization Paths of Talent Cultivation with "Four-Chain Integration" for Logistics Engineering Technology Specialty Group in Vocational Undergraduate Education

Ming Yang

Chongqing Polytechnic University of Electronic Technology, Chongqing, 401331, China

Keywords: Vocational Undergraduate Education; Logistics Engineering Technology Specialty Group; Four-Chain Integration; Cross-Domain Collaboration; Talent Cultivation

Abstract: Against the background of in-depth integration of industrial transformation and upgrading and digital economy, the logistics engineering technology specialty group in vocational undergraduate education is faced with the deep-seated contradiction of structural mismatch between the supply side of talent cultivation and the demand side of industry. The in-depth integration of education chain, industry chain, innovation chain and talent chain has become a key proposition to solve this contradiction. Based on the perspective of cross-domain collaboration, this study systematically analyzes the practical dilemmas faced by the logistics engineering technology specialty group in vocational undergraduate education in the process of four-chain integration, such as virtualized collaboration mechanism, insufficient motivation of multiple subjects, and rigid and solidified cultivation system. Furthermore, it proposes a systematic optimization path scheme from the dimensions of governance mechanism reconstruction, dynamic adjustment mechanism construction, curriculum teaching system innovation, practical teaching platform upgrading, faculty capacity iteration, and digital empowerment. The study aims to provide theoretical support and practical guidance for the logistics engineering technology specialty group in vocational undergraduate education to achieve high-quality talent cultivation, and promote the precise docking and synchronous resonance between education supply and industrial demand.

1. Introduction of the Problem

At present, the restructuring of the global industrial chain is accelerating, and the logistics industry is undergoing a profound transformation from a traditional labor-intensive industry to a technology-intensive and knowledge-intensive one. New business forms such as cross-border e-commerce logistics, smart warehouse and distribution operation, supply chain finance, and low-carbon green logistics are emerging constantly, and the logistics industry presents significant development characteristics of cross-domain, digitalization and intelligence. This trend puts forward new requirements for talent cultivation in the field of logistics engineering technology — not only solid professional skills, but also compound high-level technical and skilled talents with cross-domain collaboration ability, innovative thinking and complex problem-solving ability are required.

As a high-level component of China's modern vocational education system, vocational undergraduate education undertakes the important mission of cultivating high-level technical and skilled talents[1]. As a core professional cluster in vocational undergraduate education connecting with the modern logistics industry, the quality of talent cultivation of the logistics engineering technology specialty group is directly related to the intellectual support level for the high-quality development of the logistics industry. However, in practice, the talent cultivation of the logistics engineering technology specialty group in vocational undergraduate education still faces many structural dilemmas: there is a time lag and dislocation in the docking between the education chain and the industry chain, the achievements of the innovation chain are difficult to be effectively transformed into teaching content, and there is an obvious gap between the supply specification of the talent chain and the actual demand of the industry.

The proposal of the "four-chain integration" concept provides a systematic analytical framework and practical direction for solving the above dilemmas. The education chain, industry chain, innovation chain and talent chain are not isolated linear systems, but complex ecosystems that are nested, driven and dynamically evolved with each other. How the education chain actively adapts to the cross-domain layout trend of the industry chain and the cross-domain diffusion law of the innovation chain to realize the dynamic adjustment of talent supply; how the talent chain, as the core hub, effectively links and reversely drives the optimization and upgrading of the other three chains constitute the core proposition of four-chain integration. Against this background, this study focuses on the logistics engineering technology specialty group in vocational undergraduate education, deeply discusses the optimization path of talent cultivation with four-chain integration, so as to provide referable schemes for specialty construction and talent cultivation reform in relevant colleges and universities.

2. Theoretical Connotation and Logical Framework of Four-Chain Integration

2.1 Concept Definition of Four-Chain Integration

Four-chain integration refers to a deep coupling state of element intercommunication, functional complementarity and value co-creation among education chain, industry chain, innovation chain and talent chain in a specific industrial field. In the context of the logistics engineering technology specialty group in vocational undergraduate education, the education chain covers the whole process of talent cultivation such as specialty setting, curriculum development, teaching implementation and quality evaluation; the industry chain refers to the complete value chain of the modern logistics industry from the upstream supply chain to the downstream terminal distribution and its cross-domain extension; the innovation chain includes the whole process from research and development to application transformation of logistics technology innovation, model innovation and management innovation; the talent chain refers to the complete chain of cultivation, allocation, use and development of talents at all levels and of all types in the logistics industry.

Four-chain integration is not a simple linear superposition or mechanical splicing, but an organic whole with dynamics, complexity and systematicness. In this system, the industry chain is the source of demand traction, the innovation chain is the engine of value improvement, the education chain is the main channel of talent supply, and the talent chain is the core hub connecting the other three chains and the ultimate foothold. The four form multi-directional causal relationships and feedback loops, and the lag or fracture of any chain will affect the operation efficiency of the whole system.

2.2 Particularity of Four-Chain Integration from the Perspective of Cross-Domain Collaboration

The perspective of cross-domain collaboration provides a richer analytical dimension for understanding four-chain integration. The so-called "cross-domain" contains three meanings: cross-region, that is, the global layout of the logistics industry requires talent cultivation to break through geographical restrictions; cross-industry, that is, the in-depth integration of logistics with manufacturing, commerce, finance and information technology requires talents to have cross-border knowledge reserves; cross-organization, that is, the integration of industry and education involves the collaboration of multiple subjects such as government, schools, enterprises, industry associations and scientific research institutions.

Under the background of cross-domain collaboration, four-chain integration presents several particularities. The cross-domain layout of the industry chain makes the demand for talents present diversified and differentiated characteristics, and the talent cultivation mode of a single region and a single type is difficult to meet the industrial needs. The cross-domain diffusion of the innovation chain requires that education content can quickly absorb cutting-edge technologies and practical experience from different regions and industries. The cross-domain flow of the talent chain requires the cultivation system to be highly open and adaptable. These particularities determine that the four-chain integration of the logistics engineering technology specialty group in vocational undergraduate education cannot copy the traditional mode, and a new integration mechanism with cross-domain collaboration characteristics must be constructed.

2.3 Logical Framework of Four-Chain Integration

Based on the above analysis, this study constructs a four-chain integration logical framework of "demand traction — supply response — innovation drive — talent connection". The industry chain sends demand traction signals to the education chain through post ability requirements, technology development trends, business format reform directions and other signals; the education chain makes supply responses by adjusting specialty settings, updating curriculum content, reforming teaching modes and other ways; the innovation chain injects innovation momentum into the education chain through the transformation of technical achievements, the introduction of innovation methods, cooperation in R&D projects and other approaches; the talent chain forms reverse drive and optimization suggestions for the other three chains through information such as graduates' industrial performance, ability feedback and career development. The four chains form closed-loop feedback to promote the continuous iteration and optimization of the system.

3. Practical Dilemmas of Four-Chain Integration for Logistics Engineering Technology Specialty Group in Vocational Undergraduate Education

3.1 Virtualized Collaboration Mechanism: Integration Stays at the Surface Level

At present, in the process of promoting four-chain integration, the logistics engineering technology specialty group in vocational undergraduate education generally faces the problem of virtualized collaboration mechanism. The specific manifestations are as follows: the integration of industry and education mostly stays at the formal level such as agreement signing and listing co-construction, lacking substantial resource input and in-depth cooperation; enterprises have insufficient participation depth in school-enterprise cooperation, often limited to providing internship positions or occasional lecture exchanges, and fail to truly intervene in the core links such as talent cultivation program formulation, curriculum development and teaching implementation[2]; cross-regional inter-school

cooperation and school-enterprise collaboration lack a normalized operation mechanism, and collaborative activities present fragmented and campaign-style characteristics.

The deep-seated reason for this dilemma is that "collaboration" and "integration" often become two separate things in practical operation. Collaboration emphasizes the interaction and cooperation among multiple subjects, while integration requires the deep penetration of elements and the organic integration of functions. When collaboration lacks institutional guarantee and interest drive, integration is out of the question. Especially in the context of cross-domain collaboration, there are significant differences in policy environment, industrial foundation and educational resources in different regions, which further increases the difficulty of collaborative integration. How to effectively transform the complex collaborative needs of cross-region, cross-industry and cross-organization into systematic power and operable and implementable operation mechanisms to drive the precise docking and in-depth integration of the four chains is a key problem to be solved urgently.

3.2 Insufficient Motivation of Multiple Subjects: Lack of Interest Balance Mechanism

The in-depth promotion of four-chain integration depends on the active participation and continuous investment of multiple subjects such as government, industry associations, enterprises, schools and scientific research institutions. However, in reality, the participation motivation of all subjects is generally insufficient, and the core reason lies in the lack of interest balance mechanism.

From the perspective of enterprises, participating in the integration of industry and education requires investment in human, material and financial resources, but it is difficult to obtain direct economic returns in the short term[3]. Especially for platform-based or chain-leading enterprises with cross-domain attributes, their business layout is extensive and their demand for talents is highly customized, but the current cooperation mode is difficult to provide them with precisely matched talent supply, resulting in low willingness of enterprises to participate. From the perspective of schools, teachers need to pay a lot of extra energy to participate in cross-domain collaboration projects, but in the current assessment and evaluation system, these efforts are often not fully recognized, which affects teachers' enthusiasm. From the perspective of the government, although many policies supporting the integration of industry and education have been issued, the "last mile" problem of policy implementation is still prominent, and the guiding effect of special funds has not been fully exerted.

The core interest demands of various subjects are different or even conflicting, and there is a lack of effective interest coordination and compensation mechanism, which makes it difficult for four-chain integration to form sustainable endogenous power.

3.3 Rigid and Solidified Cultivation System: Insufficient Dynamic Response Capability

The long adjustment cycle and slow response of traditional talent cultivation programs are another key bottleneck restricting the effectiveness of four-chain integration. The technology iteration speed of the logistics industry is accelerating and business format innovation is frequent. Emerging fields such as cross-border e-commerce logistics, smart warehouse and distribution, supply chain finance and low-carbon logistics are emerging constantly, and the requirements for talents' knowledge structure and ability are constantly changing. However, the current talent cultivation programs are often revised systematically every three to four years, and the update of curriculum content lags behind industrial development.

This rigid and solidified cultivation system forms a significant structural contradiction with the rapidly changing industrial demand. The lag of curriculum content leads to the disconnection between students' learned knowledge and industrial practice; the slow update of teaching resources makes students unable to access the latest technical tools and business scenarios; the insufficient iteration of

faculty ability directly affects the timeliness and cutting-edge nature of teaching content. How to establish a dynamic adjustment mechanism for the connotation construction of specialty groups with high agility and flexibility, which can quickly respond to the cross-domain industrial technological changes and post ability migration needs, covering core links such as agile update of curriculum content, cross-domain co-construction and sharing of teaching resources, and continuous improvement of faculty ability, is a challenge that four-chain integration must face directly.

4. Optimization Paths of Four-Chain Integration for Logistics Engineering Technology Specialty Group in Vocational Undergraduate Education

4.1 Optimization of Governance Mechanism: Building a Cross-Domain Collaborative Platform with Multi-Party Co-Governance

The optimization of governance mechanism is the institutional basis for realizing four-chain integration. In view of the current virtualized collaboration mechanism, it is necessary to design a cross-domain collaborative governance structure with the participation of multiple subjects of "government, industry, enterprise, school and research".

Specifically, we can explore the establishment of a substantively operated specialty group council mechanism, which includes relevant departments of local governments, logistics industry associations, representative enterprises (especially platform-based enterprises and chain-leading enterprises with cross-domain attributes), vocational undergraduate colleges and universities, and scientific research institutes as council members, and clarifies the rights, responsibilities and interests of all parties. The council shall establish normalized rules of procedure, decision-making procedures and implementation supervision mechanisms, hold regular joint meetings, and negotiate and make decisions on matters such as the development direction of the specialty group, talent cultivation specifications, and major cooperation projects.

Under the framework of the council, several special working committees can be set up, such as the talent cultivation program demonstration committee, the curriculum and textbook construction committee, the practical teaching base construction committee, and the technology R&D and transformation committee, which are respectively responsible for the coordination and promotion of specific fields. Through this hierarchical and classified governance structure, the macro strategic collaboration and the micro operation and implementation can be effectively connected to avoid collaboration becoming a mere formality.

At the same time, we should actively promote the contractual management mode, where schools and partners sign cooperation agreements with clear rights and responsibilities and legal protection, and clarify specific agreements of all parties in terms of resource input, achievement sharing, risk bearing and so on. And we should explore a diversified cost-sharing and compensation mechanism featuring government special subsidy guidance, enterprise resource input dominance, and school fund support, so as to provide sustainable resource support for cross-domain collaboration.

4.2 Optimization of Motivation Stimulation Mechanism: Designing "Resource-Interest" Exchange and Value Co-Creation Scheme

The key to solving the problem of insufficient motivation of multiple subjects is to design an effective interest incentive and value co-creation mechanism, so that all participants can obtain substantive returns in the process of collaboration.

For enterprises, a systematic return scheme should be designed. The school-enterprise collaboration encompasses the following dimensions: providing "order-based customized talent cultivation" services to cultivate talents tailored for enterprises and meet their specific job

requirements; carrying out "enterprise employee skill improvement training" to help enterprises enhance the professional competence of existing employees; providing "joint technical research and consulting" services to help enterprises solve practical technical problems by leveraging the university's scientific research resources; and granting cooperative enterprises priority in recruiting outstanding graduates to reduce their recruitment costs. In addition, we can explore the establishment of "outstanding contribution award for industry-education integration", and incorporate enterprises' participation contributions into their social responsibility evaluation system to enhance the social reputation value of enterprise participation.

For schools and teachers, a clear incentive orientation should be established. The achievements of teachers participating in cross-domain collaboration projects shall be included in the workload assessment as an important basis for professional title evaluation and merit evaluation[4]. The school-level "industry-education integration education and teaching innovation fund" should be established to specifically support teachers in conducting relevant educational reform research and practical exploration, and provide special rewards and preferential resource allocation to teacher teams that have made outstanding contributions to four-chain integration.

For students, a sound growth incentive system should be constructed. We should establish a supply mechanism for high-quality internship positions to ensure that students can gain access to high-level enterprises and engage in real business operations; provide opportunities to participate in real projects to enhance students' practical abilities; provide industry certification support to help students obtain valuable vocational qualification certificates; and establish a seamless employment referral system to provide priority access to employment opportunities for outstanding graduates.

4.3 Optimization of Dynamic Adjustment Mechanism: Establishing an Agile System of "Three Committees Linkage and Rapid Response"

In view of the rigid and solidified cultivation system, it is necessary to establish a set of dynamic adjustment mechanism that can quickly respond to industrial changes. The core of this mechanism is the institutional design of "three committees linkage".

Relying on the "Specialty Group Construction Steering Committee" led by industry and enterprise experts, regularly carry out industrial talent demand research, form a report on changes in talent demand and ability standards, and provide demand-side basis for the adjustment of cultivation programs. The "Teaching Steering Committee" composed of internal and external education and teaching experts is responsible for demonstrating the feasibility of the reform plan to ensure that the adjustment plan not only meets the industrial demand but also follows the law of education. The school "Academic Committee" performs the final examination and approval duties to ensure the academic level and standardization of the plan. The three committees form a rapid closed loop of "proposition — demonstration — examination and approval", ensuring that necessary content fine-tuning can be carried out every year and a systematic program revision can be completed every three years.

In the operation of the dynamic adjustment mechanism, industrial big data monitoring means should be fully used to track information such as technology development trends, post ability changes, and emerging business forms of the logistics industry in real time, so as to provide data support for adjustment decisions. Meanwhile, we should establish a normalized graduate tracking and feedback mechanism and an employer satisfaction survey system, and use the effectiveness of talent cultivation as an important reference for program optimization.

4.4 Optimization of Curriculum and Teaching: Constructing a Flexible, Project-Based and Cross-Domain Integrated Curriculum System

The curriculum system is the core carrier for the implementation of four-chain integration. According to the characteristics of the logistics engineering technology specialty group, a flexible curriculum system of "platform sharing + module self-selection + project penetration" should be developed.

At the level of "professional platform courses", consolidate the general core knowledge and literacy of logistics, including courses such as logistics system planning, fundamentals of supply chain management, logistics information technology, and introduction to logistics engineering, so as to lay a solid foundation for students' professional development. Courses at this level are relatively stable to ensure the basic specifications of talent cultivation.

At the level of "professional direction module courses", set up multiple optional modules, such as cross-border logistics module, smart warehouse and distribution module, supply chain management module, low-carbon and green logistics management module, etc. Each module can be opened, updated or replaced dynamically according to industrial hotspots. For example, with the in-depth advancement of the "dual carbon" strategy, the "low-carbon and green logistics management" module can be added in a timely manner; with the wide application of artificial intelligence technology in the logistics field, the "intelligent logistics system design and operation and maintenance" module can be added. The dynamic adjustment mechanism of modules ensures the synchronization between curriculum content and industrial development.

At the level of "cross-border project courses", offer comprehensive practical courses, requiring students to form teams across majors to complete real or highly simulated projects from enterprises. The project content is deeply integrated into typical cross-domain scenarios such as cross-border e-commerce logistics, smart warehouse and distribution operation, and supply chain finance, focusing on cultivating students' ability to collaboratively solve complex problems. This project-based curriculum design breaks the traditional subject barriers and promotes the cross-border integration of knowledge and comprehensive improvement of ability.

In terms of teaching mode, we should vigorously promote the "workshop" teaching mode based on real enterprise projects and new teaching organization forms such as cross-domain virtual teaching and research offices. The workshop mode introduces real business problems of enterprises into the classroom, and students complete the whole process from problem analysis, scheme design to implementation verification in the form of teams under the joint guidance of teachers and enterprise mentors. The cross-domain virtual teaching and research office uses information technology means to connect teachers and experts from different regions, different colleges and universities, and different enterprises to jointly carry out curriculum development, teaching seminars and resource construction, break through the limitations of physical space, and realize the integration and sharing of cross-domain teaching resources.

4.5 Optimization of Practical Teaching System: Constructing a Multi-Level and Cross-Domain Shared Practical Platform

Practical teaching is the core feature that distinguishes vocational undergraduate talent cultivation from ordinary undergraduate education, and also an important focus of four-chain integration. We should construct a three-level progressive practical teaching system of "on-campus productive training base — cross-regional and cross-enterprise shared training platform — on-the-job training at industrial sites".

The on-campus productive training base should introduce real business scenarios and operation standards of enterprises, and build smart warehousing training centers, cross-border logistics

simulation operation centers, supply chain collaborative simulation laboratories, etc., so that students can carry out skill training in an environment close to reality. The construction of the training base should maintain close cooperation with enterprises, and introduce the latest technical equipment and business processes of enterprises to ensure that the training content is synchronized with the industrial practice.

The cross-regional and cross-enterprise shared training platform is a key measure to solve the problem of limited resources of a single college and difficulty in meeting cross-domain collaboration needs. By uniting colleges and enterprises in multiple regions to jointly build and share training resources, complementary advantages and resource intensification can be realized. The platform can adopt a mixed mode of "online + offline", providing services such as virtual simulation training and remote operation guidance online, and arranging physical training nodes in key regions offline to meet the practical needs of students in different regions.

On-the-job training at industrial sites is the highest level of the practical teaching system, requiring students to go deep into the front line of enterprises and participate in real business operations. A standardized on-the-job training management system should be established to clarify training objectives, contents and assessment standards, and equip on-campus instructors and enterprise mentors for dual guidance to ensure the quality and effect of on-the-job training.

4.6 Optimization of Faculty Capacity: Implementing the "Continuous Iteration of Dual-Qualification Ability" Plan

Faculty is the key executive force of four-chain integration. In view of the common problems of teachers in the logistics engineering technology specialty group of vocational undergraduate education, such as insufficient industrial practical experience and limited cross-domain vision, a systematic "continuous iteration of dual-qualification ability" plan should be implemented.

For full-time teachers, establish institutional requirements, stipulating that full-time teachers in the specialty group shall have no less than six months of enterprise practice experience cumulatively every five years. Practice can be carried out in stages, and teachers are encouraged to complete practice in cooperative enterprises of different regions and types to broaden their industrial vision and cross-domain experience. Enterprise practice should not be a mere formality, but require teachers to deeply participate in the actual business operation, technology R&D or management improvement of enterprises, form practical achievements and feed back to teaching.

For industrial mentors, clearly require that the proportion of professional core course teaching tasks undertaken by industrial mentors from enterprises shall not be less than 30%. The selection and employment of industrial mentors should focus on their cross-domain work experience and actual business ability, rather than only looking at academic qualifications or professional titles. We should establish an assessment, evaluation, and dynamic adjustment mechanism for industry mentors to ensure teaching quality.

In addition, establish a teacher cross-domain exchange and cooperation mechanism, encourage teachers to participate in cross-regional academic conferences, enterprise inspections, cooperative research and other activities, and continuously update their knowledge structure and ability reserves. We should develop a specialized training plan to enhance teachers' instructional competencies, focusing on enhancing their proficiency in project-based teaching, cross-domain collaborative teaching, and digital teaching, among others.

4.7 Optimization of Digital Empowerment: Building a Smart Education Ecology of "Cloud Integration and Real-Time Update"

Digital technology provides a powerful enabling tool for four-chain integration. We should build

a digital teaching resource library and a smart education platform of "cloud integration and real-time update" to provide technical support for four-chain integration.

In terms of digital teaching resource construction, cooperate with enterprises to transform the latest technologies, processes, procedures and cases into granular digital teaching resources. Resource forms include micro-lecture videos, virtual simulation software, interactive case bases, online assessment systems, etc. Resource construction shall follow the principle of "co-construction, sharing and dynamic update", and realize real-time sharing across colleges and regions through the cloud platform. We should establish a resource update mechanism to ensure that resource content can reflect the latest industrial developments in a timely manner.

In terms of smart teaching platform, integrate functions such as online learning, virtual training, project collaboration and data analysis to provide one-stop teaching services for teachers and students. The platform should support cross-domain collaborative learning, enabling students in different regions to form teams online to complete cross-domain projects; support personalized learning path recommendation, and provide differentiated learning resources and suggestions according to students' learning progress and ability level[5]; support the collection and analysis of teaching process data to provide data support for teaching quality improvement.

In terms of industrial data docking, explore the introduction of industrial big data into the teaching process, so that students can access and analyze real logistics operation data, market data, supply chain data, etc., and cultivate their data-driven decision-making ability. Meanwhile, we should leverage the results of industrial data analysis to guide the dynamic adjustment of curriculum content and the optimization of talent cultivation programs.

5. Implementation Guarantees for the Optimization Paths of Four-Chain Integration

5.1 Organizational Guarantee

The effective implementation of the optimization paths of four-chain integration requires strong organizational guarantee. At the school level, a leading group for four-chain integration work led by school leaders should be established to coordinate the promotion of various reform measures[6]. At the specialty group level, a normalized work promotion mechanism should be established to clarify the division of responsibilities and time nodes. Concurrently, we should leverage the roles of organizations such as the Specialty Group Construction Steering Committee, the Teaching Steering Committee, and the Academic Committee to establish a governance model of multi-stakeholder participation and collaborative advancement.

5.2 Institutional Guarantee

Institutional construction is the fundamental guarantee for the sustainable promotion of four-chain integration. We should establish and improve the institutional system covering school-enterprise cooperation management, teacher enterprise practice, dynamic curriculum adjustment, teaching quality monitoring, achievement evaluation and recognition, etc. Specifically, we should improve the assessment and evaluation system for teachers' engagement in industry-education integration, and incorporate cross-domain collaboration achievements into key areas such as professional title appraisal, performance distribution, and merit evaluation to create positive incentives.

5.3 Fund Guarantee

Various measures of four-chain integration require sufficient fund support. We should establish a diversified fund raising mechanism, actively strive for government special fund support, guide

enterprises to increase investment, and reasonably arrange school own funds. We should establish special funds for four-chain integration, focusing on key areas such as curriculum development, platform construction, teacher training, and practice base construction. Furthermore, establish a performance evaluation mechanism for fund utilization to ensure the efficient use of funds[7].

5.4 Quality Guarantee

Establish a quality monitoring and evaluation system covering the whole process of four-chain integration. We should incorporate external indicators such as industry satisfaction, graduate employment quality, and enterprise employment evaluation into the quality evaluation framework to form a quality guarantee mechanism that combines internal and external evaluation and complements process and result evaluation. Regularly evaluate the effectiveness of four-chain integration, promptly identify problems, and make adjustments and optimizations.

6. Conclusion

The optimization of talent cultivation with four-chain integration for the logistics engineering technology specialty group in vocational undergraduate education is a systematic project, involving collaborative changes in multiple dimensions such as governance mechanism, motivation stimulation, dynamic adjustment, curriculum teaching, practical platform, faculty construction and digital empowerment. The optimization path scheme proposed in this study, taking cross-domain collaboration as the perspective, four-chain integration as the framework, and problem orientation as the guide, strives to construct a path system with dynamics, systematicness and operability.

The essence of four-chain integration is to break the barriers among education chain, industry chain, innovation chain and talent chain, and realize the free flow of elements, deep coupling of functions and collaborative creation of value. In this process, as the core hub, the talent chain should not only accurately connect with the demand of the industry chain, absorb the achievements of the innovation chain, and rely on the supply of the education chain, but also reversely drive the optimization and upgrading of the other three chains through the actual performance of talents. This multi-directional interaction determines that four-chain integration cannot be achieved overnight, but needs to be continuously iterated and improved in continuous practical exploration.

Looking forward to the future, with the in-depth advancement of the digital transformation of the logistics industry and the continuous evolution of the global pattern, the four-chain integration of the logistics engineering technology specialty group in vocational undergraduate education will face more new opportunities and challenges. Only by adhering to systematic thinking, strengthening collaboration mechanism and maintaining dynamic adaptation can we continuously improve the quality of talent cultivation and provide solid talent support and intellectual guarantee for the high-quality development of the logistics industry. Although the exploration of this study focuses on the logistics engineering technology specialty group, its core concepts and methodologies are also of reference significance for the four-chain integration practice of other vocational undergraduate specialty groups.

Acknowledgement

This work was supported by the 2026 National Logistics Education and Teaching Research Project for Colleges and Vocational Colleges titled Research on Dilemma Resolution and Path Optimization of "Four-Chain Integration" Talent Cultivation for Logistics Engineering Technology Specialty Group in Vocational Undergraduate Education from the Perspective of Cross-Domain Collaboration (Project No.: JZW2026174), and this paper is a phased research result of the project.

References

[1] Zhang X R, Hu X T. Knowledge Production and Prospect of Undergraduate-Level Vocational Education Research: A Visual Analysis Based on CiteSpace[J]. Jiangsu Higher Vocational Education, 2025, 25(4): 75-88.
[2] Tong X Q. Exploration on the Cultivation Path of Digital Intelligent Accounting Talents in Higher Vocational Colleges under the Background of Industry-Education Integration[J]. Journal of Hubei Open Vocational College, 2025, 38(8): 158-159+163.
[3] Liu J H. Research on High-Quality Development of Industry-Education Integration in Higher Vocational Colleges from the Perspective of Industrial College[J]. Industrial Innovation Research, 2025(8): 187-189.
[4] Xiao X L, Shen J J, Yan R R. Core Essence and Mechanism Construction of High-Quality Development of Curriculum Ideology and Politics Driven by Ideological and Political Leading Force[J]. Journal of Huzhou University, 2025, 47(11): 41-48.
[5] Jiang X R. Application Evaluation and Optimization Measures of Digital Teaching Resources in the Course of Pharmaceutical Technology of Traditional Chinese Medicine[J]. New Curriculum Teaching (Electronic Edition), 2025(9): 182-184.
[6] Qiu P. Research on the Mechanism of Improving Logistics Service Quality of Vocational Colleges in Zhuzhou under the Background of In-Depth Integration of Artificial Intelligence[J]. Times Figures, 2025(29): 0101-0103.
[7] Guo Y P, Hu B X, Chen W H. Research on Construction Strategy of Sustainable Development Guarantee System for Vocational-General Collaborative Education Mode[J]. New Silk Road, 2025(33): 0075-0077.