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Exploration of the Formation of Logistics Professional Cluster Using Dual Outcome-Oriented Integration with Industrial Cluster

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Abstract. The innovative driving force of the new round of technological revolution and industrial transformation requires the logistics industry to break through process innovation, technological innovation, and model innovation. As a multi-disciplinary interdisciplinary and integrated logistics engineering major, it will inevitably move towards the development path of professional group construction and industrial group integration. This article takes the development of logistics engineering as the goal, analyzes the difficulties and contradictions in the development of professional talents, and through the construction of a dual core professional group application mechanism based on the value chain and the construction of a "government administration school enterprise" collaborative education platform system based on the integration of professional groups with industrial groups, identifies various factors that affect the dual composition result orientation, and provides reference and reference for professional construction.

Keywords. Logistics engineering major; Achievement oriented; Professional group construction; Industrial cluster construction.

1. Introduction

The logistics industry has become a pillar industry of a country [1]. Although China's logistics industry started late, it has developed rapidly, with indicators such as logistics infrastructure network, logistics enterprise operation entities, and total logistics volume entering the forefront of the world. The development of the logistics industry has provided strong support for China to become the world's second largest economy and the largest trading country [2,3]. The total amount of social logistics in 2022 exceeded 340 trillion yuan, an increase of about 3.6% year-on-year; The total revenue of the logistics industry reached 12 trillion yuan, an increase of about 5% year-on-year. The national railway completed 3.9 billion tons of cargo shipments throughout the year, a year-on-year increase of 4.7%, the highest growth rate in nearly three years; The scale of the cold chain logistics market exceeded 490 billion yuan throughout the year, an increase of about 7.2% year-on-year; The cumulative volume of express delivery business has reached 110.58 billion pieces, a net increase of 2.28 billion pieces compared to the

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previous year. The total number of enterprises in the cross-border e-commerce logistics industry showed a slow upward trend from 2017 to 2020, with an annual growth rate higher than the GDP growth rate. Especially since the outbreak of the epidemic, the demand for cross-border e-commerce has surged, driving the growth rate of cross-border e-commerce logistics enterprises to a new peak, reaching 11.82%. The development of the logistics industry is in the ascendant [4].

With the vigorous rise of the logistics industry in various fields in recent years, the prominent supply-demand contradiction of logistics talents has become the main factor affecting the rapid development of logistics majors in Chinese universities [5-8]. To solve this problem, the education community has conducted extensive research. Promote ideological and political education in the curriculum and cultivate talents with both morality and talent [9,10]. Strengthen cooperation between schools and enterprises, adopt collaborative education methods, and cultivate specialized talents capable of logistics work [11-13]. Promoting the integration of professional groups and industrial zones can better achieve collaborative education [14-16]. The complementary advantages between various schools and the establishment of virtual teaching and research rooms nationwide have been proven to be a very effective attempt [17-20]. The construction of the curriculum system has also achieved outstanding results, playing a prominent role in the cultivation of logistics professionals [21-23].

2. Outstanding Contradiction Between Supply and Demand of Logistics Talents

The contradiction between supply and demand of logistics talents has slowed down the speed of industry development. The main problems are reflected in the following aspects.

(1) The mismatch between talent supply and demand is not high, making it difficult to meet the requirements of the modern logistics industry.

The modern logistics industry, as the third source of profit for cross industry and multi-industry integration, has become a new industry that closely combines knowledge intensive, and technology intensive industries based on information technology and high-tech. It is a new composite industry that is compatible and coexisting across industries and departments. This endows the logistics engineering major with a unique nature as an emerging comprehensive edge science. Since the establishment of the undergraduate program in Logistics Engineering in 2001, there have been 138 universities in China that have established undergraduate programs in Logistics Engineering. However, the training of logistics engineering professionals still cannot keep up with the changes of the times and cannot meet the needs of the rapidly developing economic industry. The main reasons are concentrated in two aspects: the mismatch between students' willingness to work and the supply of enterprises, and the mismatch between students' ability level and job requirements. This urgently requires the logistics engineering major to align with the industry, keep up with the pace of industrial development, timely understand market dynamics and the needs of industries and enterprises, and optimize professional talent cultivation in a timely manner. The construction and development of the Industrial College will undoubtedly create a favorable external environment for the development of logistics engineering majors. Nanning University has included the development and construction of the New Energy Vehicle Industry College and the Digital Economy Industry College in the school's 14th Five Year Plan, further promoting the integration and development of logistics engineering majors with industry clusters.

(2) The degree of cooperation and integration between schools and enterprises is not high enough, and the grasp of the era's requirements for innovative development of industrial clusters is not accurate enough

In 2020, the national government proposed to "enhance the modernization level of the industrial chain supply chain", "develop strategic emerging industries", "coordinate infrastructure construction", and "accelerate digital development", promote the development of advanced manufacturing clusters, promote the deep integration of modern service industries with advanced manufacturing and modern agriculture, and accelerate the digitization of service industries. More and more enterprise logistics and logistics companies are transforming logistics into an empowering and value-added entry point, elevating it to an ecological industry chain that can provide comprehensive solutions for the entire process. The logistics industry has ushered in intelligent upgrading and innovative integration development. The "dual core drive" strategy of deepening the development of the Beibu Gulf Economic Zone and the Xijiang Economic Belt in Guangxi's regional development strategy, as well as the construction of the Western Land Sea New Passage, the major project of the Pinglu Canal, the construction of the Free Trade Pilot Zone, RCEP, and the integration into the Guangdong Hong Kong Bay Area, have brought new development opportunities to the logistics industry in Guangxi. Over the years, the logistics engineering major has achieved certain results by integrating industry and education, constructing professional talent cultivation characteristics and course systems, exploring course projects and teaching cases. However, most of the school enterprise cooperation units are concentrated in e-commerce, logistics, and express delivery enterprises, with a single model and less obvious effects. With the upgrading of the industry, the upgrading and replacement of intelligent warehousing, intelligent sorting, and intelligent distribution gradually elevate the job demand to a higher level and put forward different requirements for professional knowledge system and quality. In order to seek development, majors must deepen into industries and fields, strengthen the integration and development of professional groups with industrial groups, and provide systematic, innovative and breakthrough full process logistics service solutions and supply chain solutions for industries and enterprises.

(3) The degree of sharing among professional groups is not strong, and information exchange between different majors and colleges is not smooth, lacking internal communication mechanisms.

Professional groups are often composed of one or several similar related majors and their professional directions and can complete their basic practical teaching in the same training system, with good sharing. The core concept of professional groups is also the sharing concept. However, in the actual operation process, there are often difficulties in sharing and exchanging information among various majors or directions within the group, as well as lack of communication between basic courses and teaching teams. This has brought significant obstacles to the co construction of professional groups, limited the effective implementation of professional group teaching activities, and prevented the advantages of professional group teacher teams from being fully utilized. The sharing rate of training bases and equipment is also at a relatively low level.

3. Industry to Enterprise Integration Based on Dual Composition Fruit Orientation

To achieve good collaborative education, the following ideas have been designed for the integration of logistics engineering majors with industries and enterprises.

(1) Establish a dual core core professional group application mechanism based on the value chain

Combining the professional characteristics and advantages of the School of Transportation, integrating digital economy and business management majors to form a professional chain based on the enterprise value chain. Based on the correlation between majors, a dual core professional group with transportation and new energy vehicle engineering as the core majors and logistics engineering and automotive service engineering as the backbone majors is constructed, highlighting the integration, sharing, and intersection of professional groups, Establish a professional group operation and interaction mechanism. Construct a professional chain structure based on the value chain, as shown in Figure 1.

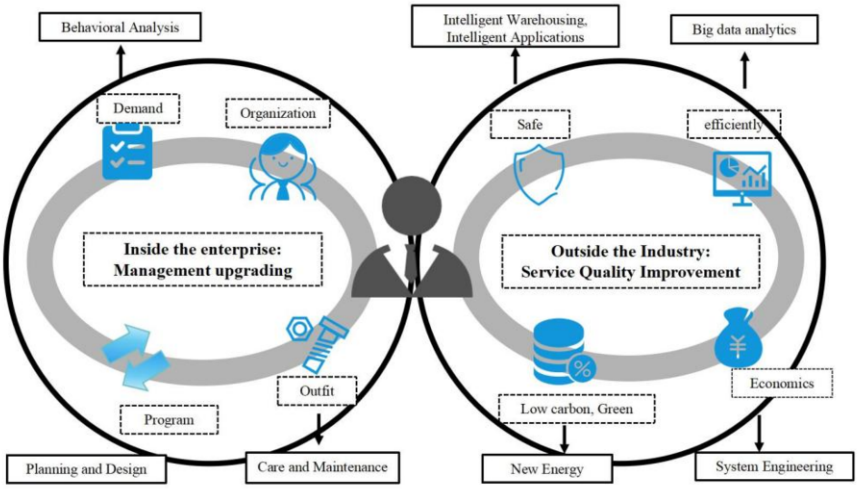

Figure 1. Operating mechanism of dual core professional groups based on value chain

(2) Building a talent training system for the "government administration school enterprise" collaborative education platform based on the integration of professional groups and industrial clusters

Targeting the transportation and logistics industry cluster in Guangxi Zhuang Autonomous Region, collaborating with industry associations and leading enterprises, integrating campus laboratory resources, Guangxi China ASEAN International Joint Key Laboratory of Comprehensive Transportation, and relying on the cooperation foundation established between enterprises and schools, conducting sufficient research activities, establishing a collaborative education mechanism of "government administration school enterprise" linkage, and collaborating to develop and revise logistics engineering talent training plans and curriculum standards, Collaborate to form a mixed practice teaching team, extract and design real engineering problems from industry enterprises as teaching cases and teaching projects, plan and organize the participation of teachers and students in project research, design, development, implementation, operation, and summary activities, and strive to build a talent cultivation model of "industry education integration, engineering learning integration, and knowledge and action integration", as presented in Figure 2.

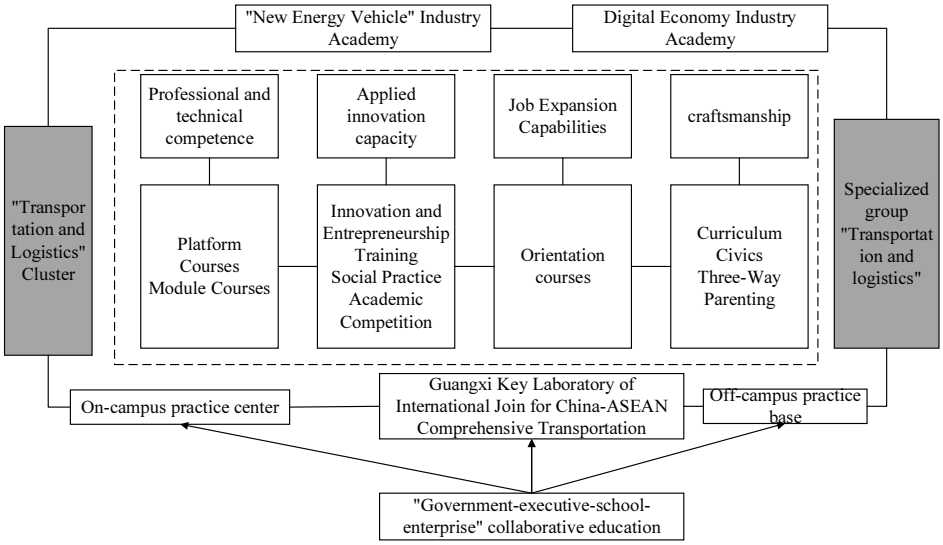

Figure 2. A "Government Administration School Enterprise" Collaborative Education Platform System Based on the Integration of Professional Groups with Industrial Groups

The training of logistics engineering majors should focus on professional technical abilities, application innovation abilities, job expansion abilities, and promoting the spirit of craftsmanship. Taking "developing integrated intelligent transportation services (passenger and freight)" and "building an intelligent green logistics transportation system (low cost, high efficiency, new energy)" as the intersection point, analyze the commonalities and differences in subject basic courses, professional basic courses, professional core courses, and centralized practical courses within the professional group, and based on the knowledge, skill, and quality systems trained by the professional group talents, Build a professional group curriculum system that can be shared at the grassroots level, integrated at the middle level, and mutually selected at the senior level, namely a "platform + module + direction" curriculum system.

4. Factor Analysis of Logistics Professional Group Docking with Industrial Group Based on TOPSIS Method

Constructing a talent cultivation model of "integration of industry and education, integration of engineering and learning, and integration of knowledge and practice" can effectively achieve the integration of logistics majors and industrial clusters and achieve the development of professional group construction. To verify the effectiveness of the "government administration school enterprise" coordinated education platform, the following analysis was conducted on its influencing factors using TOPSIS.

Firstly, the logistics experts determine the evaluation indicators for the plan, as shown in Table 1.

Table 1. Scheme Evaluation Indicators

Serial number	Evaluating indicator
1	Teaching operation system
2	On campus teacher team on the platform
3	Platform off campus teacher team
4	Teaching evaluation
5	On campus teaching resources
6	Off campus business resources
7	Student source situation
8	Course Settings

The evaluation of A's original talent training plan and the plan based on the platform is based on various evaluation indicators, as shown in Table 2.

Table 2. Scoring of various indicators

Serial number	Evaluating indicator	Original talent training plan	Platform solution
1	Student source situation	84	92
2	Course Settings	82	91
3	On campus teaching resources	81	94
4	Off campus business resources	81	95
5	On campus teacher team on the platform	85	90
6	Platform off campus teacher team	84	92
7	Teaching operation system	92	85
8	Teaching evaluation	79	91

Data source: Compiled based on the author's actual investigation.

Next, the forward normalization results of the evaluation indicators are described in Table 3.

Table 3. Positive normalization of indicators

No.	Evaluating indicator	Original talent training plan	Platform solution	Indicator type
1	Student source situation	84	92	Extremely large
2	Course Settings	82	91	Extremely large
3	On campus teaching resources	81	94	Extremely large
4	Off campus business resources	81	95	Extremely large
5	On campus teacher team on the platform	85	90	Extremely large
6	Platform off campus teacher team	84	92	Extremely large
7	Teaching operation system	0	7	Extremely large
8	Teaching evaluation	79	91	Extremely large

Data source: Compiled based on the author's actual investigation.

Using formula $Y_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^{m} r_{ij}^2}}$ to process the data for the forward normalization of indicator scores to obtain a standardized matrix:

$$Y = (r_{ij})_{3\times 8} \tag{1}$$

The calculation results are shown in Table 4.

Table 4. Standardization of indicators

No.	Evaluating indicator	Original talent training plan	Platform solution
1	Evaluating indicator	0.547	0.599
2	Student source situation	0.537	0.596
3	Course Settings	0.518	0.602
4	On campus teaching resources	0.520	0.610
5	Off campus business resources	0.551	0.584
6	On campus teacher team on the platform	0.547	0.599
7	Platform off campus teacher team	0	0.614
8	Teaching operation system	0.525	0.605

Data source: Compiled based on the author's actual investigation.

The score matrix *Y*, which has undergone forward and standardized processing, all data are extremely large and ideal optimal and worst solutions are extracted from it.

Firstly, take out the smallest number in each column to form the ideal worst solution vector:

$$Y^{-}=[0.547,\ 0.537,\ 0.518,\ 0.520,\ 0.551,\ 0.547,\ 0,\ 0.525]$$

Similarly, the ideal optimal solution vector is the largest number in each column:

$$Y^{+}=[0.599,\ 0.596,\ 0.608,\ 0.610,\ 0.596,\ 0.599,\ 0.789,\ 0.605]$$

Apply formula $d_i^+ = \sqrt{\sum_{j=1}^{m} (y_j^+ - y_{ij})^2}$ and $d_i^- = \sqrt{\sum_{j=1}^{m} (y_j^- - y_{ij})^2}$ separately to calculate the distance between the optimal solution and the worst solution, and then use $C_i = \frac{d_i^-}{d_i^+ + d_i^-}$ to count the distance score and obtain the ranking table of advantages and disadvantages as revealed in Table 5.

Table 5. Evaluation Results

	Original talent training plan	Platform solution
d_i^+	0.810	0.176
d_i^-	0	0.639
C_i	0	0.784
Sort of advantages and disadvantage	2	1

Data source: Compiled based on the author's actual investigation.

$$0 \leq C_i \leq 1,$$

To judge the distance between solution and optimal solution, when d_i^+ smaller, the

greater the comprehensive score C_i.

Similarly, the distance between the solution and the worst solution d_i^-, the smaller the comprehensive score *Ci*.

Sorting according to the comprehensive score can result in the optimized plan one being better than the original plan. The establishment of the platform is helpful for the cultivation of professional talents and the construction of course systems.

5. Conclusion

To truly achieve educational transformation and promote disciplinary construction and professional development, it is necessary to fully leverage the advantages of logistics and achieve dual driving forces of interdisciplinary and enterprise oriented approaches. This requires adjustments to teaching concepts, methods, content, and evaluation to better apply emerging technologies to promote education and teaching, driven by solving practical logistics problems and centered around real enterprise applications, Seize the good opportunity of the construction of the Industrial College, adapt to the future development trend of digital and intelligent logistics, and promote the construction of the "government school business enterprise" collaborative education platform and the construction of logistics virtual teaching and research rooms.

Establish a dual core professional cluster application mechanism based on the value chain, establish a "government administration school enterprise" collaborative education platform talent training system based on the integration of professional clusters with industrial clusters, and use TOPSIS to systematically analyze and evaluate its influencing factors. The above research provides useful exploration for building logistics professional clusters on the basis of dual result guidance and industrial cluster integration and provides reference and reference for the construction of related majors.

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References

[1] Moross A. Key development strategies need implementation in logistics industry[J]. Creamer Media s Engineering News & Mining Weekly, 2022, (4): 42.

[2] Fu H., Li H., Fu W. Research on optimization of Anyang logistics industry development[J]. International Journal of Social Science and Education Research, 2020, 3(4): 69-76.

[3] Liu M. Research on the development status, problems and countermeasures of the logistics industry in Guizhou Province[J]. Modern Economy, 2020, 11(3): 632-644.

[4] Nand A., Sohal A., Fridman I, et al. An exploratory study of organizational and industry drivers for the implementation of emerging technologies in logistics[J]. Industrial Management & Data Systems, 2023, 123(5): 1418-1439.

[5] Mccrea B. Logistics labor: solving the talent gap[J]. Logistics Management, 2021, (6): 60.

[6] Han Q., Q. Research on current situation, problems and countermeasures of marine logistics talent training in the postepidemic era[J]. Meteorological and Environmental Research: English Version, 2021, 012(002): 30-33.

[7] Mann H. Cultivating supply chain talent[J]. Inbound Logistics, 2021, (12): 41.

[8] Wren A. Tackling the talent gap from the inside out[J]. Inbound Logistics, 2019, 39(4): 38-38.

[9] Yu Xiaomo. Exploration of the ideological, political, and innovative training system for logistics engineering talents facing China ASEAN[J]. China Logistics and Procurement, 2023, (16): 116-117 (in Chinese).

[10] Zhang Lingmin, Kong Weida. Exploring the practical path of integrating "curriculum ideology and politics" into logistics engineering teaching in the new era[J]. Logistics Technology, 2023, 46(14): 170-172 (in Chinese).

[11] Jiang W., Guofeng Z., Shuyang W. Teaching reform path of architecture specialty under the collaborative education of "production, teaching and research" and its application effect[J]. Landscape Research: English Version, 2021, 13(5): 3.

[12] Ma J. Analysis of the collaborative education system of local universities under the fundamentals of "Emerging Engineering Education" construction[J]. Contemporary Education Research, 2021, 5(5): 5.

[13] Zine Benotmane, Ghalem Belalem, Abdelkader Neki, "A Cost Measurement System of Logistics Process", International Journal of Information Engineering and Electronic Business, Vol.10, No.5, pp. 23-29, 2018.

[14] Liao Xianqiong. The logic and path of building design professional group construction based on the green and low carbon industrial chain[J]. Journal of Taiyuan City Vocational and Technical College, 2023, (09): 12-15 (in Chinese).

[15] Jia Haiyan, Liu Xiaomin. Research on the reform of professional group talent training mode based on modular teaching - taking the professional group of building steel structure technology as an example[J]. Journal of Changjiang Engineering Vocational and Technical College, 2023, 40 (03): 40-43 (in Chinese).

[16] Luo Yao, Tan Qibing. A study on the value co creation path and evaluation of professional groups matched to industrial groups[J]. Occupational Technology, 2023, 22 (11): 56-63 (in Chinese).

[17] Liu Hui, Feng Xiumeng. Exploring the construction path of a new organizational system for virtual teaching and research offices in the era of "Intelligence+"[J]. Chinese University Teaching, 2023, (08): 82-91 (in Chinese).

[18] Li Ming, Liu Yonghua, Ma Mingxiao, Sun Li. Research on the construction of virtual teaching and research rooms in universities under the background of academic community[J]. Health Vocational Education, 2023, 41 (15): 3-6 (in Chinese).

[19] Cheng Yinghui. Construction of integrated teaching mode based on virtual teaching and research room[J]. Science and Education Guide, 2023, (20): 36-38

[20] Nyme Ahmed, Dip Nandi, A. G. M. Zaman, "Analyzing Student Evaluations of Teaching in a Completely Online Environment", International Journal of Modern Education and Computer Science, Vol.14, No.6, pp. 13-24, 2022.

[21] Han Bing, Wang Liwei. Construction of computer professional group curriculum system based on "school enterprise management"[J]. Communication and Information Technology, 2023, (05): 112-114 (in Chinese).

[22] Li Qiaojun, Wang Wei, Zhu Qi. Research and practice on the modular curriculum system of "four positions and four capabilities" in the electronic communication professional group under the background of industry education integration[J]. Journal of Anhui Electronic Information Vocational and Technical College, 2023, 22 (03): 61-64 (in Chinese).

[23] Kong Jili, Liu Jia. Exploration of the construction of graduate professional courses under the background of ideological and political curriculum - taking the course of "Logistics System Engineering" as an example[J]. Logistics Engineering and Management, 2023, 45(09): 192-197+183 (in Chinese).