

Research on City-Region Industry-Education Alliance: A Case Study of Zibo China

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Abstract: In 2022, China proposed the concept of "city-region industry-education alliance," aiming to integrate resources from government, enterprises, schools, and research institutions based on industrial parks, to create an industry-education alliance that combines talent development, innovation and entrepreneurship, and promotes high-quality economic development. The city-regional industry-education alliance is a new concept, and China is currently in the exploration phase of its construction. Whether it is the establishment or the operationalization, there is a lack of relevant experience, which may lead to detours or mistakes during the exploration process. Therefore, conducting comprehensive research on the construction mechanism of the industry-education alliance and quickly obtaining detailed experience summaries is very necessary. This article conducts a study on the construction method, operation mode, achievements, and effectiveness of the city-region industry-education alliance in Zibo, China. It summarizes successful experiences, existing issues, and provides guidance for the construction of similar alliances and the deep development of industry-education integration and school-enterprise cooperation.

Keywords: The City-Region Industry-Education Alliance; Vocational Education; School-Enterprise Cooperation; Industry-Education Integration

1. Introduction of City-region Industry-Education Alliance

In December 2022, the Chinese government issued the "Opinions on Deepening the Reform of the Modern Vocational Education System," proposing a general framework of "one body, two wings, and five key points." Among them, the "city-region industry-education alliance" is

one of the "two wings" and is a key element in promoting the reform and development of vocational education and the high-quality development of industrial economy. Subsequently, the construction of city-region industry-education alliances has been actively carried out in Beijing, Shanghai, Shandong, Hubei, Guizhou, and other places. As a major initiative of China's reform in the new era, how to seize the opportunity of constructing city-region industry-education alliances, solve the problem of organic integration of education and industry chains, and assist in the cultivation of high-level industrial clusters and the high-quality development of regional industries are important issues that need to be addressed urgently. This article conducts a study on the establishment entities, participating units, and operation mode of the city-region industry-education alliance in Zibo, China. It analyzes the potential problems and solutions in the construction process and presents an empirical analysis and summary of successfully established and operated city-region industry-education alliances, constructing a replicable model for city-region industry-education alliances.

2. The Situation of the City-region Industry-education Alliance in Zibo, China

In recent years, Zibo has deeply promoted industry-education integration and school-enterprise cooperation, continuously deepened the quality improvement of higher education institutions in Zibo, accelerated the integration of vocational education and industry, and enhanced the city's capability for high-quality development. Zibo possesses the following advantages:

2.1 Placing Vocational Education in the Strategic Layout Supporting the Transformation and Development of the City's Economy and Society

Coordinating the development planning of

vocational colleges, sharing and building resources together, and introducing measures to deepen vocational education reform and innovation, focusing on improving the management mechanism of vocational education, and proposing 22 specific measures to deepen vocational education reform and innovation to address bottlenecks and challenges hindering the development of vocational education in the whole city. This has resulted in a roadmap and task book for promoting high-quality development of vocational education in Zibo in the new era.

2.2 Pioneering Support for Enterprises to Organize Vocational Education in the Province

Formulating "Supplementary Provisions on the Establishment Standards of Private Secondary and Below Educational Schools in Zibo for Enterprises to Organize Vocational Education," which reduces the admission conditions for schools, allows enterprises to participate in running schools using existing resources, and supports the operation of vocational schools by enterprise-led integrated companies. The first batch of provincial-level industry-education integration enterprises, Shandong Laiyin Coster Intelligent Technology Co., Ltd. led the establishment of Zibo Sino-German Intelligent Technology School, and Shandong Xinjingbiao Industry Co., Ltd. led the establishment of Zibo Xinjing Vocational School, both of which have achieved enrollment and operation, truly building schools in factories and classrooms in workshops.

2.3 The Province's First Implementation of the Integration of Secondary and Higher Vocational Education

Support six high-level vocational schools to actively apply for a five-year higher vocational education, where the five-year training is conducted in secondary vocational schools, enabling students to obtain higher vocational diplomas without leaving the secondary vocational school, avoiding the dilemma of Zibo's students not staying in the local area after graduation and being unable to use their talents locally, making vocational schools in Zibo truly belong to and serve Zibo, becoming a "local university," where graduates can stay and find employment.

2.4 Promoting the Construction of Modern Industrial Colleges

Building a group of industry colleges co-built and co-managed with industry enterprises that have distinct characteristics and close connections with the industry, actively exploring new paths for school-enterprise collaboration in nurturing talents that adapt to and lead the development of modern industries. Fifty-six municipal modern industrial colleges were identified in two batches. Using this as a carrier, it promotes deep cooperation between vocational colleges and leading local enterprises to create a community of shared development of schools and enterprises that is mutually beneficial and symbiotic.

2.5 Strengthening the Construction of Public Training Bases Comprehensively

Twenty-seven public training bases above the municipal level were identified in the city, facilitating the cultivation of 12 provincial-level public training bases for the conversion of new and old kinetic energy. Among them, the construction of the Zibo Shared Large-scale Internship Training Base (Sino-German Intelligent Manufacturing Industry-Education Integration Demonstration Base), with an investment of 21.1 billion yuan, has implemented a new model of comprehensive development of professional education through "school + base + enterprise," achieving an annual average of 60,000 person-times of skilled personnel training and practical teaching.

3. Progress in the Construction of the City-region Industry-education Alliance in Zibo

The city-region industry-education alliance is a collaborative alliance established among enterprises, universities, and research institutions within the city-region, aimed at deepening the integration of industry, education, and research, and jointly promoting regional economic development and high-quality development. A series of national policies have been issued, highlighting the strategic significance of this initiative. Based on the exemplary creation of "industry-education integration and city-school integration," Zibo actively responded to the requirements of the superior authorities regarding the construction of city-region industry-education alliances, closely aligning

with the actions in key industrial chains across the city. In May 2023, Zibo issued a notice to start the construction of city-region industry-education alliances, actively responding to regional development needs, exploring the creation of city-region industry-education alliances based on industrial parks, reflecting the functions of talent development, innovation and entrepreneurship, and promoting high-quality development of the industrial economy. It implements a government-led, school-enterprise main body, and multi-party participation, entity-based operation mechanism, guides the integration of industry-education resources, strengthens regional coordinated development, and improves regional development coordination.

Zibo has established a "cross-shaped" overall layout of "double axes and multiple support points" for the development of industry-education integration, constructing 17 city-region industry-education alliances covering development zones, economic development zones, and key economic parks, fully leveraging the leading role of Zibo National High-tech Industrial Development Zone, New Material Industrial Park, Chemical Industry Industrial Park, etc., to lead comprehensive development. Three city-region industry-education alliances were selected in the first batch of 26 city-region industry-education alliances in the province—Zibo National High-tech Industrial Development Zone Industry-Education Alliance led by Zibo Vocational College, Zibo Electronic Information Industry-Education Alliance led by Shandong Institute of Light Industry, and Zibo Lu Zhong New Material Industry-Education Alliance led by Shandong Industrial Vocational College—ranking among the top in the province by quantity. In September 2023, a seminar on the construction of the city-region industry-education alliance and the industry-education integration community was held in Zibo, attended by over 300 leaders, experts, and scholars from various industries across the country.

4. Shortcomings in the Construction of the City-region Industry-education Alliance in Zibo

Although the construction of the city-region industry-education alliance in Zibo started early, research has found that there are still the

following shortcomings:

4.1 The Joint Mechanism among Government, Schools, and Enterprises Needs Further Improvement

Currently, the construction of the industry-education alliance is in the exploratory stage, lacking specific practical and normative policy documents clarifying the rights, responsibilities, and benefits of the board of directors. Some established industry-education alliances have not yet established a solid organizational structure, and the status, role, and responsibilities of the participating parties within the industry-education alliance are subject to debate. The construction of the industrial development service mechanism requires the establishment of a technology service platform by industry-education alliances, integrating the technical strengths and resources of all parties, and collaborating on activities such as technological breakthroughs and product research and development. This will better promote the transformation of technological achievements and solve practical production problems for enterprises [1]. Currently, the operation of the industry-education alliance is often based on "cooperation agreements," and the multi-party entities have not truly become the main body of the alliance. There is a lack of mature risk prediction, information communication, democratic decision-making, and other management regulations, resulting in insufficient cohesion among the entities, loose organizational structure, and shallow integration, leading to issues such as virtualization, hollowing out, and superficiality.

4.2 Information Linkage among Government, Schools, and Enterprises Needs to be Further Improved

At the current stage, the 17 city-region industry-education alliances established in Zibo are still in the early stage of development, and a diverse information linkage system has not been established. There are flaws in information feedback, and the information platform is weak. The combination of professional settings and industry demands is not sufficiently close, and the connection between the education system and the actual needs of the industry, enterprises, and industries can easily lead to a "double-faced"

result in the social network, making it difficult to form a mutual-benefit symbiotic model in a short period. For example, in May 2023, the first city-region industry-education alliance in Zibo—the Zibo National High-tech Industrial Development Zone Industry-Education Alliance—was established, comprising eight government agencies, 15 research institutions, 44 enterprises, five industry associations, eight higher education institutions, and 11 secondary vocational schools. Considering the large number of units involved, all of which have independent operating attributes, the operation of the industry-education alliance inevitably poses significant communication challenges, restraining the improvement of its development quality.

4.3 The Internal Driving Force for Government, Schools, and Enterprises to Participate in Construction Needs to be Further Strengthened

The construction of the city-region industry-education alliance involves multiple stakeholders and requires the input of resources such as capital, technology, land, and manpower. However, it is difficult to quantify the returns in the short term and predict future benefits, leading to an imperfect benefit distribution mechanism. Additionally, there is a difference in strength among the members of the industry-education alliance. Some participating entities overly rely on leading enterprises and leading schools and fail to maximize the economic benefits and value-added value of the industry-education alliance, making it difficult to achieve resonance among multiple entities. For example, in communication with Shandong Shanbo Electric Group, the leading enterprise of the "Zibo High-end Equipment Industry-Education Alliance," it was revealed that due to the current domestic and international market environment, the company's market development has been constrained, and its willingness to invest is not strong. Even though there is an urgent need for some key professional technical talents, the company believes that the training cycle through the industry-education alliance is too long, resulting in a lack of enthusiasm for participating in the construction of the alliance.

5. Key Directions for Accelerating the

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Construction of the City-region Industry-education Alliance.

For the future development of the city-region industry-education alliance and in response to the aforementioned shortcomings, it is recommended to leverage the leading role of the industry, coordinate planning and coordination by the municipal government and the leading unit, and actively explore effective paths for the construction of the city-region industry-education alliance from the following aspects.

5.1 Improve the Top-level Design and Establish a Sound Management and Guarantee Mechanism

5.1.1 Establish an industry-education alliance board of directors

Set up a system where the government is responsible, functional departments, schools, and enterprises participate in the board of directors, establish a mechanism for joint meetings, improve systems for consultation, supervision, assessment, rewards and punishments, and information sharing. The board is responsible for organizing the formulation of key tasks and plans for the city-region industry-education alliance, and allocating work to each member of the board. By using a project-based and target-oriented management approach, it organizes various education, production, and operational processes, emphasizing government leadership, strengthening industry guidance, highlighting the leading roles of leading enterprises and leading schools, and deepening the educational function of schools.

5.1.2 Improve policy guarantees

Fully implement the "Notice on the Implementation of Ten Incentive Measures for Industry-Education Integration with 'Finance + Finance + Land + Credit' by the Education Department of Shandong Province and Other 11 Departments" and the "Implementation Opinions on Accelerating the Construction of Industry-Education Alliances," focusing on advantageous industries and designing a "mapping" of vocational education resources and industrial resources. Use industry colleges, training bases, and collaborative innovation centers as carriers to integrate funds from education, science, industry, and finance, and formulate incentive policies and supporting implementation rules in Zibo for finance,

finance, taxes, land, credit, employment, and income distribution to support the construction of city-region industry-education alliances.

5.1.3 Create a strong atmosphere

It is recommended that the Municipal Education Bureau take the lead in summarizing typical experiences in the construction of city-region industry-education alliances in the city and promptly introduce them, guide public opinion, and praise and reward units and individuals who have made outstanding contributions according to regulations, creating a good atmosphere for society to fully understand, actively support, and proactively participate in the construction of the alliance.

5.2 Build an Education Chain Together to Enhance the Professionalism of Talent Development

5.2.1 Improve the effectiveness of accurate matching of supply and demand information

It is recommended that the government, schools, and enterprises jointly establish a dynamic and updated list of shared information for the city-region industry-education alliance, including policy support, enterprise demand, student information, training resources, and technical services, to improve the control capacity of the industry-education alliance operation.

5.2.2 Enhance the connection and systematization of professional settings

Regional vocational colleges need to enhance the coupling compatibility between their professional structure and the structure of local industries. They should focus on the demand for industrial talents and the trends of changes, aiming to achieve effective alignment between talent supply and industry needs.[2] According to the requirements for high-quality technical and skilled talents in the development of the industrial chain, build a supply-demand platform for joint enrollment and recruitment between vocational colleges and industry enterprises, formulate joint enrollment and recruitment programs, timely convert new technologies, new processes, and new standards of industry-leading enterprises into courses and teaching standards, focus on typical work positions and products of industry enterprises, develop distinctive courses and teaching resources, and promote precise matching of talent development specifications

and industry enterprise talent needs.

5.2.3 Innovate talent development models

Within the framework of the alliance, vocational colleges should deepen the reform of modern apprenticeship, order classes, and named classes in school-enterprise "dual-element" talent development mechanisms; as a pilot for related majors in line with the industry, on the basis of the existing talent development models like "3+2," "five years integrated," "3+4," explore the implementation of the "2+2+2" talent development model (i.e., 2 years of secondary vocational education, 2 years in an enterprise, and 2 years of higher vocational education) between schools and enterprises. Continuously enhance the adaptability of talent development. Additionally, improve the cooperative mechanism for internships and employment. Vocational colleges within the alliance should establish regular cooperation mechanisms with enterprises, use project structures to organize teams, start from the perspective of industry enterprises' real projects, base teaching tasks on them, select typical projects of member enterprises, actively use real industrial scenarios, create educational environments, implement integrated operation of "one project-one mentor-one team," promote the improvement of professional skills and professional qualities of high-quality technical and skilled personnel, and lay a solid foundation for the development of the city-region industry-education alliance.

5.3 Focus on the Industry Chain and Promote the Transformation of Scientific Research Achievements

5.3.1 Establish applied research and technology development platforms together

Enhance the connection between industry, academia, research, and application, and promote the transformation of research achievements in universities and the alignment of technological demands from enterprises.[3] Vocational colleges and enterprises within the alliance should explore the establishment of collaborative innovation centers, engineering technology centers, key laboratories, academician workstations, and other research and innovation platforms, and construct a research platform operation mechanism focusing on research and development, collaborative research, and open sharing.

Focus on the key areas and technologies of enterprise production, use technology accumulation as a link, and carry out basic and applied research based on the research platforms jointly built by schools and enterprises, to create a "chain-like" technology service model that integrates technological research, technological application, technological solidification, technological transformation, and technological innovation, promoting technological innovation, process improvement, and product upgrades.

5.3.2 Jointly tackle research challenges and transform research results

To guide the continuous innovation of industry-education alliances through market forces, fully leverage the roles of "proactive government" and "effective market," and take the core leading industries in the region where the industry-education alliance is located as the entry point. Adhering to the concept of using education to promote industry and using industry to support education, it drives the free flow of diverse resources between industry and education. Clarifying the common goals and shared interests in the governance framework of "diversity in unity" and establishing a collaborative operational concept of value creation, information sharing, benefit sharing, and risk sharing.[4] Vocational colleges should aim at the forefront of industrial technology and the practical development needs of enterprises, promote teachers and enterprise technology teams to conduct joint research and collaborative research on production lines through the "science and technology special envoys," "deputy chief technology officer," "enterprise technology and management clinics," and "enterprise visiting engineers" projects, and promote the application and transformation of research results.

5.3.3 Establish employee training bases

It is recommended that the government within the alliance take the lead in establishing an educational guidance service center and an employee education and training center. Based on the development of the industry, combine ecological human resource and innovation factors within the park, focus on the needs of positions, and conduct training in production technology, information technology, and business management for enterprises in the park, sharing curriculum resources, faculty teams, and research results, promoting the

integration and mutual promotion of academic education and vocational training. In addition, implement key tasks. With the core of serving the high-quality development of the economy and society, implement the key tasks of modern vocational education system construction and reform, accelerate the construction of a community of shared destiny between schools and enterprises, form a development pattern of deep integration of industry and education, close cooperation between schools and enterprises, and positive interaction between the industry and the city, use the construction of the city-region industry-education alliance as a focal point, and do a good job in research and achievement transformation, retaining graduates from colleges stationed in Zibo.

5.4 Highlighting the Results Orientation and Establishing an Assessment and Evaluation System

It is recommended to incorporate the construction of urban-industrial-educational alliances into the important index system for performance evaluation and assessment of the responsibilities of various district and county government departments. This will enhance the synergy of various district and county governments. Scientifically use evaluation results, focusing on assessing the specific measures and achievements of local governments in promoting the construction of urban-industrial-educational alliances, including coordination and consultation mechanisms, substantive operating mechanisms, and the construction of common technical service platforms, using assessment results as a "barometer" for government annual educational quality evaluations. Units leading the construction and reliance on park recognition and commendation should be based on assessment results. For excellent alliances, commendations will be given, while those found to be unsatisfactory will be ordered to rectify within a time limit, with non-compliant ones being removed from the planned construction. The assessment criteria should emphasize the focus on serving the development of the regional economy and society and improving the quality of talent cultivation. They should allocate a larger proportion of assessment scores to research and innovation, technical research, vocational

training, and other content, leading to the substantial operation of the urban-industrial-educational alliance and the prominent role of results orientation in the assessment. This will comprehensively promote the healthy, rapid, and high-quality development of the urban-industrial-educational alliance.

5.4.1 Well-organized organization

Whether the city-region industry-education alliance has established a sound organizational structure, including a council (board of directors) and a secretariat (office), clarifying the organizational framework, operational mechanisms, task division, and the responsibilities, rights, and obligations of each unit, to ensure the smooth operation of the city-region industry-education alliance. The city-region industry-education alliance should rely on the council (board of directors) to establish a flat decision-making organizational structure. Through the negotiation and governance of relevant interest groups in public affairs, the ultimate goal is to enhance the scientificity of decision-making [5]

5.4.2 Reasonable layout

Whether the city-region industry-education alliance focuses on the advantageous industries and characteristic clusters in the industrial parks, whether it is aligned with the 20 key industrial chains in the city, and whether it has deep cooperation with the leading enterprises in those chains. The city-region industry-education alliance needs to pursue differentiated development based on the local policy environment and organizational form, highlighting internal characteristics and external features that distinguish it from other regions [6].

5.4.3 Comprehensive functions

Whether the city-region industry-education alliance has formulated its charter, development plans, and construction schemes, coordinating the promotion of talent cultivation and recruitment, vocational skills training, technology research and development services, transfer and commercialization of achievements, innovation and entrepreneurship, and other work.

5.4.4 Diverse entities

Gathering resources such as funds, technology, talents, and policies, whether the member units include secondary vocational schools, higher vocational schools (including undergraduate vocational education), general undergraduate

universities, relevant research institutions, large-scale enterprises, and small and medium-sized micro-enterprises, with a total number of more than 30.

5.4.5 Data and information sharing

Whether to establish a big data platform, where the enterprises and colleges within the city-region industry-education alliance can input their data, gathering various types of information such as enterprise demands, human resources, technology research and development, and school-enterprise cooperation, to facilitate accurate matching of industry-education demands.

5.4.6 Professional and dynamic adjustments

Whether to regularly monitor the matching degree between majors and industries, predict the demand for human resources, guide colleges and universities to timely adjust their major structures, strengthen the construction of distinctive professional groups, and promote close integration between the layout of majors and the structure of industries.

5.4.7 Talent supply

Whether the city-region industry-education alliance organizes member units to carry out talent supply and demand matching activities, increasing the proportion of graduates who stay locally for employment and entrepreneurship.

5.4.8 Construction of practical centers

Whether the city-region industry-education alliance benchmarks against the forefront of industrial development, constructing open regional practical centers that integrate practical teaching, social training, real production, and technical services, to serve student internships, enterprise employee training, product trials, process improvements, technology research and development, etc.

5.4.9 Teaching guidance committee

Whether to establish teaching guidance committees with various entities, jointly discussing training programs, forming teaching teams, building teaching resources, implementing academic assessment and evaluation, introducing new methods, new technologies, new processes, and new standards into educational practices in a timely manner, enhancing the advancement and adaptability of talent cultivation.

5.4.10 School-enterprise collaborative education

Whether to jointly establish industrial colleges,

widely promoting joint enrollment, joint training, and job-oriented Chinese-style apprenticeship. Enterprises set up positions in a certain proportion to accommodate students for internships and teachers for practical experience.

5.4.11 Teacher team construction

Whether to establish a two-way exchange mechanism for personnel between schools and enterprises, where enterprise engineers, skilled personnel, managers, and craftsmen work full-time or part-time at schools. Whether schools and enterprises jointly build "dual-teacher" teacher training bases, supporting the formation of professional teaching teams that combine fixed and rotating positions, as well as dual-teacher structure and dual-teacher qualities. Whether it is possible to achieve mutual employment between school and enterprise personnel, increase the speed of talent flow between schools and enterprises, and promote the construction of "dual-teacher" teams in vocational education are important indicators of the success of the city-region industry-education alliance.[7].

5.4.12 Scientific research and innovation

Around the optimization of resource allocation in the technological innovation chain, whether the member units of the city-region industry-education alliance jointly build platforms for technological and skill innovation, specialized technology transfer organizations, university science and technology parks, technology business incubators, and innovation spaces, connecting the chains of research and development, technological innovation, and achievement transfer, promoting the industrialization of innovative achievements and core technologies.

5.4.13 Technical breakthroughs

Whether the city-region industry-education alliance aligns with the needs of industrial development, identifies key areas for technical breakthroughs, establishes common technology service platforms, and whether schools help enterprises with technological innovation, process improvement, product upgrading, and solving practical production issues.

5.4.14 Vocational skills training

Whether the city-region industry-education alliance formulates training plans, whether schools undertake employment skills training for enterprise employees, job skills

enhancement training, and entrepreneurship and innovation training, providing "shared employee" training services for small and medium-sized micro-enterprises, improving the skills and job adaptability of enterprise employees. Strengthening continuing education and training for workers in different professions in the region, ultimately forming a practical model of "rooted in the region and oriented towards lifelong learning" for the city-region industry-education alliance [8].

5.4.15 Fruitful achievements

Through a period of tangible operation, whether the city-region industry-education alliance has produced successful experiences, typical practices, outstanding results, etc., effectively promoting the green, low-carbon, and high-quality development of the regional economy and society.

6. Future Development Prospects

In the future, China's city-region industry-education alliances will transition from establishment-focused to operational, service-oriented, and results-oriented. Within the city-region industry-education alliance, relevant colleges and industry enterprises will gradually jointly build a number of field engineer colleges, modern industrial colleges, industry-education integration practice centers, technology transformation and innovation platforms, virtual simulation training centers for job skills, and employee career development and vocational experience centers. Through scientific organization, efficient execution, and continuous improvement, the city-region industry-education alliance will be driven, healthy, and operate efficiently, contributing greater strength to the high-quality development of the regional economy.

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