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Research on the construction of an evaluation model for industry-education integration training bases in vocational education

Yitong CHEN, Xinghua HAO*

School of Undergraduate Education, Shenzhen Polytechnic University, Shenzhen 518055, China
Corresponding Author
Email address: haoxinghua@szpu.edu.cn

Abstract: The industry-education integrated training bases in vocational education serve as a crucial starting point to deepen industry-education integration and advance the reform of key teaching elements. Establishing a scientific and rational evaluation model provides an effective guarantee for promoting the high-quality development of the training bases. From the perspective of the reform of key teaching elements, including majors, curricula, textbooks, teaching staff development, and practical training, this paper explores the guiding, systematic, and scientific principles for constructing an evaluation model; discusses evaluation procedures and implementation mechanisms, including multi-stakeholder participation, annual assessment, and AI-enabled digital monitoring; clarifies the vocational and structural logic of implementation mechanisms behind indicator design; and develops a comprehensive framework covering base management, talent cultivation, resource co-construction, teaching staff development, social services, and social impact assessment. The model comprises six first-level and fourteen second-level indicators with assigned weights, value rules, and result application mechanisms, with the aim of building a multi-stakeholder collaborative and multi-element linked evaluation model, thereby facilitating the reform and development of vocational education.

Keywords: vocational education; key teaching elements; industry-education integration; training base; evaluation model

1 Introduction

The *Opinions on Deepening the Reform of Key Teaching Elements in Vocational Education* released by the Ministry of Education in 2026 state that "the reform of key teaching elements in vocational education—including majors, curricula, textbooks, teaching staff development, and practical training—is a fundamental project for building the vocational education system and a key measure for cultivating high-skilled talents". These key teaching elements in vocational education have become an important lever for vocational institutions to achieve high-level school-running capacity and high-quality industry-education integration. The five elements form an organic structured system: majors serve as the foundation, curricula as the core, textbooks as the carrier, teachers as the driving force, and practical training as the key. The *Opinions* further require that "bidirectional empowerment between schools and enterprises shall be achieved through enterprise-commissioned construction, school-enterprise co-construction, and cluster-based joint construction to plan and develop a number of industry-education integrated training bases in schools, enterprises, and industrial zones, helping students develop genuine skills on the front lines of production in real environments". It is evident that industry-education

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integrated training bases are a key platform and important lever for promoting high-quality industry-education integration and deepening the reform of key teaching elements, and a critical element for enhancing talent cultivation quality and serving regional industrial development.

Driven by national policies, the government, schools, enterprises, and other parties have collaborated closely, embedded and co-existed, jointly investing resources and efforts to create various types of industry-education integrated training bases. These include open regional industry-education integrated practice centers, public training centers, on-campus production-oriented practical teaching bases, virtual simulation training bases, off-campus practical teaching bases, and industrial colleges. Their functional positioning has expanded from traditional practical training venues to comprehensive platforms integrating practical teaching, social training, real production, and technical services [1].

The scale, structure, quality, and distinctiveness of training base construction directly affect whether industry-education integration in vocational colleges can move toward innovative models, in-depth development, and a new ecosystem, and whether talent cultivation can effectively support regional economic strategic objectives [2]. Therefore, it is highly necessary to construct and continuously improve a scientific and rational evaluation model for industry-education integrated training bases, which is of great significance for promoting the high-quality development of vocational education. Existing evaluation models focus more on whether construction funds and resources are in place, whether projects are completed on schedule and accepted smoothly, whether procedures are standardized, and whether base utilization rates meet targets, while neglecting key element indicators for teaching elements such as innovations in the operational mechanisms of practical training bases, school-enterprise co-construction of majors, joint development of curricula and textbook resources, and co-construction of teaching teams, as well as the performance generated by linked reforms. The evaluation philosophy lags behind the needs of the coordinated reform of the five key elements. Based on this, this paper explores evaluation research on vocational education industry-education integrated training bases in the context of key element reform, with the aim of constructing a multi-stakeholder collaborative, multi-element linked, whole-process evaluation model to effectively promote the sustainable development of industry-education integrated training bases.

2 Principles for constructing the evaluation model

2.1 Guiding principle

Compared with traditional practical training bases, the functions and characteristics of industry-education integrated training bases are more reflected in the collaborative governance among multiple stakeholders and the deep reconstruction of industry-education integration. Parsons' structural functionalism theory particularly emphasizes the importance of social integration function, where the key to integration lies in forming shared values, organically linking various elements, and constructing stable operational relationships [3]. For industry-education integrated training bases, the key to reflecting the value demands of multiple stakeholders and maintaining stable operation lies in the depth of industry-education integration. Therefore, taking the construction of substantive operating mechanisms, school-enterprise co-construction of majors, joint development of curricula and textbooks, and the integration level of industry-education teaching teams as important dimensions of the evaluation model not only highlights their functional positioning but also makes the evaluation more vocationally oriented and effective. In addition, the application of evaluation results should be linked to resource allocation and funding support. For example, industry-education integrated training bases with good evaluation results can be prioritized for recommendation to apply for provincial and national-level industry-education integrated bases, and granted preferential funding, which embodies the incentive orientation of the evaluation system.

2.2 Systematic principle

The evaluation of industry-education integrated training bases is a complex systematic project. Examining the

operation and construction effectiveness of training bases only from a local or single-stakeholder perspective is not enough. Instead, it should conduct all-round evaluation and assessment of the entire process of construction, operation, management, service, and performance output of training bases, incorporating the entire construction implementation process and key elements into evaluation indicators, with indicators mutually supporting and supplementing each other to form a complete evaluation model. In addition, the subjects participating in training base evaluation should also be diversified, combining government, school, industry associations, enterprise, student, and social entities. Different evaluation subjects evaluate training bases based on common construction goals and multiple value demands, and evaluation structures can mutually corroborate, thereby reducing errors. Secondly, the systematization principle also requires that indicators have internal logic and interrelation. It examines the effectiveness of government-school-industry-enterprise coordinated advancement of integrated construction of training bases, majors, curricula, textbooks, teachers, and other key teaching elements relying on industry-education integrated training bases, achieving linkage in the evaluation of key teaching elements.

2.3 Scientific principle

The construction of the evaluation model should conform to the objective laws of vocational education and the goals of industry-education integrated training base construction. Indicator selection and weight allocation should have a scientific theoretical basis, and each formulated indicator should have a clearly defined connotation, with clear logical hierarchy among indicators. At the same time, methods such as the Delphi method and Analytic Hierarchy Process should be used to determine indicator weights. Experts in the field of vocational education, practical training teachers, training base management personnel, and enterprise executives can be invited to conduct two or more rounds of correspondence consultation and deliberation on the indicator system, to further screen and optimize indicators based on consultation results, and adjust and finalize the dimensions and weights of each indicator. After the evaluation indicator design is completed, one or two industry-education integrated training bases can be selected as evaluation pilots to ensure the adaptability of evaluation indicators. Furthermore, the evaluation dimensions and indicators should be appropriately measured. Evaluation items and standards should be specific, clear, and measurable, with precise quantitative bases identified, such as utilization rates and performance outputs; those difficult to quantify should be given appropriate qualitative treatment, such as base positioning and operating mechanisms. Language expression should be clear and unambiguous, without using vague terminology.

3 Construction and implementation of the evaluation model

3.1 Evaluation procedures and methods

Multiple cooperative entities of industry-education integrated training bases, including government, schools, industries, and enterprises, can establish a base management committee under the leadership of a council. As the executive body, the base management committee should establish and improve a comprehensive quality monitoring management and evaluation model for the training base, set up a scientific and rational evaluation indicator system, and effectively organize evaluation activities. An evaluation team composed of representatives from all stakeholders and third-party institutional personnel should be established, with a team size generally no fewer than five members. Evaluation should be conducted once a year, with the evaluation process open and transparent, and evaluation results objective and fair.

Evaluation methods can include online review, document review, on-site inspection, questionnaire survey, and focus group interviews, combining qualitative evaluation with quantitative evaluation, process evaluation with terminal evaluation, and self-evaluation with external evaluation.

In addition, AI technology can be used to carry out training base quality management and evaluation, such as

intelligent teaching evaluation, intelligent student evaluation, and evaluation of the maturity of intelligent industry-education integration. Digital monitoring platforms can be used to conduct regular assessments of industry-education integrated training bases, with early warning reminders based on data analysis.

3.2 Construction logic of evaluation indicators

Vocational logic: The underlying logic of vocational education teaching is the occupation orientation. Carrying out the reform of key teaching elements based on vocational logic addresses the problem of weak adaptability between vocational education and industrial development [4]. The underlying logic of coordinated reform of key teaching elements in vocational education is no longer to organize teaching elements according to the disciplinary knowledge logic within general education, but to reconstruct teaching elements following the logic of industrial development and job requirements. Specifically, vocational education should establish majors aligned with industrial chains, determine curricula aligned with job competency maps, develop textbooks aligned with new processes, enhance teacher capabilities aligned with industrial technologies, and establish training bases aligned with real industrial scenarios.

Structural logic: Key teaching elements in vocational education are not isolated from one another. This inherent interconnection requires us to strengthen the structural linkages between these elements to form an integrated system and achieve maximum element value through appropriate structural relationships, thereby achieving goal synergy.

Based on the above analysis, the evaluation of industry-education integrated training bases from the perspective of key teaching element reform needs to follow the basic logic of deep industry-education integration and resource co-construction and sharing. It incorporates substantive operatinonal mechanisms, the provision rate of practical training projects in real scenarios, school-enterprise joint development of curricula and textbooks, and the maturity of teacher-industry integration into the core indicators of the evaluation indicator system.

3.3 Content of the indicator system construction

Based on the integration of existing literature and practices related to industry-education integrated training base evaluation, and through the above analysis and reflection, this study mainly conducts evaluation from six dimensions: base management, talent cultivation, resource co-construction, teaching staff, social services, and social impact. On this basis, a preliminary evaluation model for vocational institution industry-education integration has been constructed. The model includes 6 first-level indicators with weights of 20%, 25%, 25%, 10%, 10%, and 10% respectively, with a total score of 100 points. Under the first-level indicators, 14 second-level indicators are set, with indicator connotation descriptions and weights specified, as shown in Table 1.

3.3.1 Base management

Base management serves as one of the core indicators within the evaluation model for vocational education industry-education integrated training bases. It mainly examines three aspects. First, base positioning: the major cluster led by the school should be broadly aligned with the business directions of cooperating enterprises; leading enterprises are preferred, and the positioning should fit national strategies and regional industrial clusters. The base should have a scientific and rational development plan, jointly approved by multiple co-construction entities, with its development plan having high compatibility with the cultivation of high-skilled talents and the need of regional industrial development. Second, organizational structure and management systems. Multiple co-construction parties of the base should set up a council, which serves as the decision-making body to decide on the strategic goals, cooperation models, and top-level institutional design of the training base. Under the council, a management committee is established as the executive body, responsible for formulating training base development plans, coordinating resource allocation, and conducting supervision, inspection, and evaluation. The base sets up several daily operation and management departments with full-time staff

responsible for implementing the decisions of the council and the management committee, and carrying out daily teaching, training and R&D, safety management, and logistical support. It is recommended to establish and improve management systems covering practical teaching, equipment and asset management, safety management, personnel management, funding management, and quality monitoring management. Third, the industry-education integrated operational mechanism: a multi-stakeholder collaborative operational mechanism should be established, clearly stipulating rights and responsibilities, funding and resource input, benefit distribution, intellectual property ownership, and cooperation exit mechanisms. The entity-based operation model of mixed ownership should be actively explored to strengthen self-sustaining capacity and stimulate the enthusiasm of all parties.

3.3.2 Talent cultivation

Talent cultivation, including the implementation and effectiveness of practical teaching, is the core indicator in the evaluation model for the industry-education integrated training bases of vocational education. It mainly examines two aspects. First, school-enterprise collaborative education. Implement talent cultivation models featuring post internships and real project-based teaching through school-enterprise collaborative education, achieving the connection between teaching processes and production processes. A practical teaching curriculum system should be built and continuously optimized; internship and training curriculum standards should be formulated, and practical teaching activities should be organized as planned to ensure that training hours, project offering rates, base utilization rates, and teaching satisfaction meet standards. Second, cultivation quality and educational effectiveness: relying on base resources, innovation and entrepreneurship education and skills competition guidance should be provided to develop students' practical abilities, innovative spirit, and professional competence. Each year, the base should proactively admit major students for internships and employment, improve the pass rate of training assessments and employment competitiveness, help students achieve outstanding results in skills competitions and innovation and entrepreneurship competitions at or above the provincial level, and support the incubation and implementation of student innovation and entrepreneurship projects.

3.3.3 Resource co-construction

Resource co-construction and sharing is an important indicator in the evaluation model for vocational education industry-education integrated training bases. It mainly examines three aspects. The first is the cooperative development of curriculum resources (databases) relying on the base. Centered on core occupational skills, a modular core curriculum system for relevant majors shall be built. Relying on the training base and oriented toward typical production tasks, relevant parties shall draw curriculum competency maps, and jointly formulate curriculum standards with industry enterprises. Curriculum content should be optimized by removing redundant theoretical knowledge unrelated to job requirements and adding practical teaching content; new industry technologies, processes, and standards should be integrated into the curriculum to highlight practical relevance [5]. The co-construction parties should establish curriculum development organizations dedicated to developing distinctive courses and improving industrial adaptability and job relevance. Second, jointly compiling textbooks based on the base: relying on industry-education integrated training bases, textbook reform should be continuously advanced. A "three chief editors" mechanism—comprising enterprise technical experts, school academic leaders, and industry authoritative experts—should be established. Textbook content should center on production processes, job skills, and practical cases to ensure effectiveness and vocational relevance. New-form textbooks such as loose-leaf textbooks, workbook-style textbooks, technical specification cards, pocket books, and digital textbooks should be actively developed, incorporating practical cases and virtual simulation into textbook resources. Third, open sharing of co-constructed resources: curriculum and textbook resources should be opened to peer institutions, communities, and industrial clusters, expanding the application boundaries and service scope of the training base's various

practical resources.

3.3.4 Teaching staff

Teaching staff is a supporting indicator in the evaluation model for industry-education integrated training bases. It mainly examines two aspects. First, workforce structure: teachers are key to driving the reform of core teaching elements and improving base construction quality. The teaching workforce generally consists of vocational college teachers and part-time teachers from industry and enterprises; a reasonable structure and sufficient numbers are needed to meet practical teaching demands. High-level skilled personnel such as master technicians, model workers, and master craftsmen should be encouraged to join the part-time teaching staff. Second, promoting targeted development: co-construction partners are encouraged to establish teacher development centers at the training base, study and formulate competency lists for practical teaching teachers, and conduct targeted training focused on job skills and digital teaching capabilities to improve practical teaching abilities. A two-way flow mechanism between school teachers and enterprise technical backbones should be established, along with an industrial mentor system, to increase the proportion of "dual-qualified" teachers and improve practical teaching quality.

3.3.5 Social services

Social service capacity is an important performance indicator. It mainly examines two aspects. First, social training and skill certification: while ensuring student internships and training, the base should actively provide skills training for enterprise employees and community members. It should also conduct vocational skill level accreditation, ensuring that annual accreditation numbers and pass rates meet standards and improving base utilization and effectiveness. Second, research innovation and technical service: the training base should fully exercise its R&D innovation and technical service functions to provide strong support for industrial development. School-enterprise cooperation should be deepened to jointly build sci-tech innovation teams and jointly apply for major key technology R&D projects and horizontal (industry-funded) projects. Services such as technical consulting, process improvement, and product R&D should be provided to enterprises; horizontal projects, patent authorizations, and technology transaction volumes should be incorporated into the evaluation indicators. Innovation and entrepreneurship platforms should be built to incubate projects and provide venues, equipment, and technical support for student and teacher innovation.

3.3.6 Social impact

Social contribution and influence is a comprehensive indicator in the evaluation model for vocational education industry-education integrated training bases. It mainly examines two aspects. First, social contribution and satisfaction. The base should actively fulfill social responsibilities, continuously deepen industry-education integration, enhance the scale effect and quality efficiency of high-quality skilled talent cultivation, and provide strong talent support for regional industrial economic development. At the same time, the evaluation should also examine the actual contribution of training base construction to the school, and quantify the supporting role of industry-education integrated training bases in the school's "dual-qualified" teacher cultivation and curriculum and textbook development. Second, social influence. The training base should win wide recognition and praise from all sectors of society, obtain designation as a municipal-level or above demonstrative industry-education integrated training base, widely promote and apply its practices, attract mainstream media coverage of its construction achievements, and continuously enhance its social reputation and influence.

Table 1. Evaluation indicators for vocational education industry-education integrated training bases

First-level indicator	Second-level indicator	Indicator description	Weight	Score
1.Base management (20%)	1.1 Positioning and development	1. The major cluster is aligned with cooperating enterprises' business directions, and positioning fits national strategy and regional industrial clusters; 2. Multiple co-construction entities formulate scientific and rational development plans.	7%	
	1.2 Organizational structure and management systems	1. Multiple co-construction parties establish a council as the decision-making body, with a management committee as executive level, and daily operation departments with full-time personnel; 2. Systems for practical teaching, equipment assets, safety, personnel, finance, and quality monitoring are improved.	7%	
	1.3 Industry-education integration mechanism	1. A multi-stakeholder collaborative mechanism is established, specifying rights and responsibilities, input, benefit distribution, IP ownership, and exit mechanisms; 2. Entity-based mixed-ownership operation is explored.	6%	
2. Talent cultivation (25%)	2.1 School-enterprise collaborative education	1. Implement follow-up internship and real project-based teaching talent cultivation models; 2. Training hours, project offering rate, base utilization, and teaching satisfaction meet standards.	15%	
	2.2 Cultivation quality and outcomes	1. Innovation/entrepreneurship education and competition guidance are provided; students' practical ability, innovative spirit, and professional competence are markedly improved; 2. The base annually accommodates students for internships and employment, improving assessment pass rates and employment competitiveness.	10%	
3. Resource co-construction (25%)	3.1 Jointly developed curriculum resources	1. A modular curriculum system is built with more practical content, and curriculum standards are jointly developed with industry; 2. New technologies, processes, and standards are integrated to improve industrial adaptability; 3. A joint curriculum development center is established.	10%	
	3.2 Jointly compiled textbooks	1. A "three chief editors" mechanism is established, with textbooks centered on production processes, job skills, and practical cases; 2. New-form textbooks are developed.	10%	
	3.3 Open sharing of co-constructed resources	1. Curriculum and textbook resources are opened to peer institutions, communities, and industrial clusters;	5%	

		2. Number of jointly built open-shared courses; 3. Number of provincial-level or above premium courses.		
4. Teaching workforce (10%)	4.1 Workforce structure	1. Whether the composition of college teachers and industry part-time teachers is reasonable and sufficient; 2. Encouragement of skill masters, model workers, and skilled craftsmen to join the part-time staff.	5%	
	4.2 Targeted teacher development	1. A teacher development center is built, a practical-teaching competency list is set, and targeted training on job skills and digital teaching is offered; 2. A two-way school-enterprise flow mechanism and industrial mentor system are established to raise the proportion of dual-qualified teachers.	5%	
5. Social service (10%)	5.1 Social training and skill certification	1. Training provided for enterprise employees and community members; 2. Vocational skill level accreditation is conducted, with annual numbers and pass rates meeting standards to improve utilization and effectiveness.	5%	
	5.2 Research innovation and technical service	1. Joint sci-tech innovation teams and joint applications for major R&D and horizontal projects; 2. Technical consulting, process improvement, and product R&D for enterprises, including patent authorizations and technology transaction volume; 3. Innovation/entrepreneurship platforms providing venues, equipment, and technical support.	5%	
6. Social impact (10%)	6.1 Social contribution and satisfaction	1. Industry-education integration is deepened, enhancing the scale and quality of high-skilled talent cultivation and providing talent support for regional industry; 2. The base's feedback support for the school's dual-qualified teacher development and curriculum/textbook development.	5%	
	6.2 Social influence	1. Designation as a municipal-level or above demonstrative industry-education integration training base; 2. Practices widely promoted, achievements reported by mainstream media, and continuously rising social reputation and influence.	5%	
Total			100%	

3.4 Design of evaluation indicator value rules

To ensure the objectivity and comparability of this indicator system, this study adopts a quantitative grading method to divide each second-level evaluation indicator into four levels (excellent, good, qualified, and unqualified) based on its degree of achievement, and sets value rules for each level. A score greater than 90 points is excellent, indicating

satisfactory operation results and exceeding target completion; a score between 80-90 points is good, indicating acceptable operation results and basically completed targets; 60-79 is qualified, indicating partial achievement of targets with room for improvement; less than 60 points is unqualified, indicating failure to meet indicator requirements. An evaluation team can be composed of full-time teachers from higher vocational institutions, training base management personnel, industry experts, and student representatives to conduct scoring. Based on the actual scores of second-level indicators and weight indicators, first-level indicator scores are calculated, and finally the six first-level indicator scores are added together to obtain the total score.

3.5 Application of model

The evaluation results of vocational education industry-education integrated training bases are presented in the form of comprehensive scores, which can intuitively reflect the overall level of industry-education integrated training bases. Grade ratings can be divided into different levels such as excellent, good, qualified, and unqualified.

An information feedback mechanism for evaluation results should be established to provide timely feedback on evaluation information after it is collected, analyzed and summarized. After receiving the feedback, relevant departments should formulate rectification ledgers, implement them, and make timely optimization adjustments. In particular, when training bases are evaluated from the perspective of coordinated reform of key teaching elements, the evaluation outcomes can foster coordinated reform in majors, curricula, textbooks and teaching staff. The competency gaps observed among students during training and the talent-quality information fed back by enterprises will force the optimization of cultivation objectives and the updating of curriculum content, forming a dynamic cycle of "practical training inspection → quality feedback → goal optimization → curriculum adjustment → textbook updating → teacher empowerment → practical training upgrading" [6].

A closed-loop continuous improvement mechanism of "evaluation–feedback–improvement" should be established. Evaluation results can be adopted as an important basis for resource allocation and dynamic adjustment including policy preferences and funding support, and priority in recommending higher-level project applications, so as to drive a spiral improvement in training base construction quality.

4 Conclusion

In summary, establishing a multi-stakeholder collaborative, multi-element linked, whole-process evaluation indicator system for industry-education integrated training bases is the fundamental guarantee for improving practical teaching quality and deepening industry-education integration, and can also promote the sustainable development of vocational education industry-education integrated training bases. In future research and practice, further dynamic adjustment is needed to continuously improve the indicator evaluation model and optimize evaluation methods to adapt to the new situation of vocational education development and reform.

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Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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About the author

Yitong Chen (1993-), faculty member at Shenzhen Polytechnic University. Research interests: vocational education teaching management and applied economics.