

Study on Effectiveness Evaluation and Improvement Strategies of the Construction of Industrial Colleges in Vocational Undergraduate Universities—A Case Study of Shenzhen Polytechnic University

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Abstract: Industrial colleges are a new practical form for deepening the integration of industry and education in China's current vocational education, and an important implementation carrier for achieving high-quality development of vocational undergraduate education. Scientifically evaluating the construction effectiveness of industrial colleges and exploring improvement strategies are crucial means to promote their quality and efficiency enhancement. Taking 18 industrial colleges of Shenzhen Polytechnic University as the research objects, this paper analyzes their construction effectiveness by constructing an evaluation system, identifies the common problems in the current development of industrial colleges, and puts forward strategic suggestions from aspects such as improving the multi-stakeholder collaborative governance model, reconstructing the long-term mechanism of interest compatibility, and addressing the shortcomings in the construction of teaching staff. It is expected to provide guidance for the high-level construction of industrial colleges in vocational undergraduate universities.

Keywords: Vocational undergraduate universities; Industrial colleges; Effectiveness evaluation; Improvement strategies

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1. Current status of industry-academia collaboration institute development

Industry-Academia Collaboration Institutes (hereinafter referred to as "Industry Institutes") have gradually developed under the guidance of government policies and through their own practical exploration. In 2020, the Chinese government successively issued the Guidelines for the Construction of Modern Industry-Academia Collaboration Institutes (Trial) and the Action Plan for Improving the Quality and Excellence of Vocational Education (2020-2023), marking that the construction of Industry Institutes has been elevated to the national action level. In June 2023, the Implementation Plan for the Action to Enhance the Empowerment of Industry-Education Integration in Vocational Education (2023-2025) further emphasized optimizing the industry-education integration cooperation model and supporting qualified industrial parks, vocational colleges, and other entities to jointly establish mixed-ownership branch campuses or Industry Institutes.

The construction of Industry Institutes in China first emerged in Zhongshan City, Guangdong Province. Typical

examples include the Shaxi Textile and Garment Institute, Nanqu Elevator Institute, and Redwood Furniture Institute established by Zhongshan Polytechnic. By carrying out in-depth, multi-dimensional, and all-round school-enterprise cooperation in running schools with government agencies, leading enterprises, and industry associations, these institutes demonstrate characteristics such as diversified funding entities, industrialized service targets, market-oriented operation mechanisms, and corporate governance structures^[1].

Taiyuan City Vocational and Technical College in Shanxi Province has established the Urban Rail Transit Industry Institute and Qingxu Mature Vinegar Institute based on its advantageous disciplines, exploring solutions such as a mechanism for dynamic adjustment of majors to match local characteristic industries and an entity-based operation model^[2]. Jiangxi Province has summarized the basic experience and existing problems of the construction of 17 Industry Institutes, and explored a path for the orderly development of Industry Institutes^[3]. The Liuzhou Snail Rice Noodle Industry Institute in Guangxi is the first characteristic Industry Institute in China focusing on talent cultivation for the snail rice noodle industry chain. It has proposed six key focuses for construction and development, namely: transforming the service concept of higher vocational education, clarifying the industrial service targets, cultivating talents needed by the industry, promoting the two-way flow of teachers, accelerating the transformation and application of technology, and establishing a long-term cooperation mechanism^[4].

In June 2023, the Ministry of Education approved the establishment of Shenzhen Polytechnic University, which became the first undergraduate-level vocational college established on the basis of high-quality “Double First-Class” (first-class schools and first-class majors in vocational education) institutions. Currently, it has built 18 characteristic Industry Institutes, including the Huawei Information and Network Technology Institute, BYD Applied Technology Institute, China Merchants Haisi Institute, and Han’s Laser Institute, covering more than 70% of the university’s majors. The construction of Industry Institutes has entered a stage of quality improvement and excellence development.

2. Literature review

There is currently no unified understanding in the academic community regarding the connotation and positioning of industrial colleges. Some scholars argue that an industrial college is a substantive vocational education platform for the integration of industry, education, research, and application, as well as for mutual benefit through interaction. It is co-founded by higher vocational colleges in collaboration with local governments in industrial cluster areas, industry associations, leading enterprises, and other stakeholders. Other scholars define industrial colleges as interest communities for the integration of industry and education, as well as talent cultivation communities that integrate teaching, research and development, training, and services. The operation modes of industrial colleges can be categorized in multiple ways. Based on cooperative partners, they are divided into school-enterprise order-based, school-enterprise comprehensive, school-local government cooperative, school-industry association cooperative, school-association joint, and multi-stakeholder integrated modes. Alternatively, based on the leading entity, they include government-led, leading enterprise-led, university-led, and industry association-led modes, among others.

Regarding the talent cultivation models of industrial colleges, existing studies have summarized several models, such as the “four dual-integration” talent cultivation model, the “nine joint efforts” concept, the “dual-subject” education model, and the “multi-stakeholder co-construction, co-governance, and shared-benefit” model. Research on issues related to industrial colleges mainly focuses on analyzing the causes of problems and exploring countermeasures from aspects such as policy support, stakeholder participation, governance systems, benefit-sharing mechanisms, value orientations, property rights definition, and cultural integration.

Performance evaluation is a crucial means to measure the effectiveness of industrial college construction. However, the evaluation of industrial colleges faces several challenges, including insufficient reflection of vocational education characteristics, inadequate manifestation of industrial features, lack of diversified evaluation subjects, and insufficient demonstration of substantive attributes^[5]. The construction of industrial college evaluation models primarily involves

introducing the Context, Input, Process, Product (CIPP) evaluation model, the Analytic Hierarchy Process (AHP), the Fuzzy Comprehensive Evaluation (FCE) method, maturity theory, the Balanced Scorecard theory, and the stakeholder theory^[6]. Evaluation indicators focus on operable and measurable aspects, such as the main entities of school-running, operation mechanisms, construction content, and construction effectiveness. The weights of these indicators are generally determined using expert interviews and the Delphi method^[7,8,9].

3. Research questions and study design

3.1. Research questions

A review of literature related to industrial colleges reveals that existing studies primarily take either a single industrial college or different industrial colleges across multiple institutions as research objects^[10-12]. These studies rarely account for the heterogeneity in the contextual backgrounds of industrial college development. Additionally, the small sample sizes in previous research have made it difficult to identify common characteristics, resulting in insufficient typicality and representativeness. Furthermore, the research objects are mostly concentrated on junior college-level vocational education, with limited attention paid to undergraduate-level vocational education^[13-15].

3.2. Research design

This study selects 18 characteristic industrial colleges of Shenzhen Polytechnic University as the research objects, specifically including Huawei School of Information and Network Technology, Tianjian School of Architectural Engineering, Baike Rongchuang · ARM · School of Intelligent Hardware, Yutong School of Graphic Communication, School of Financial Technology, Alibaba School of Digital Trade, BYD School of Applied Technology, Meituan School of Digital Life, Han's Laser School, Shuibei School of Jewelry Design, China Merchants Haisi School, Perfect World School of Digital Creativity, C-MER School of Optometry, Hepalink School of Biomedical Sciences, Shenzhen Industrial School of Environment and Water Affairs, Shenzhen Industrial School of Lithium Battery, DJI Innovation School of Drone, and School of Digital and Intelligent Finance and Economics. A full-sample analysis is adopted to make up for the defects in sample selection in previous studies and ensure the typicality and representativeness of the research. The consistent policy environment and operational system and mechanism can eliminate the heterogeneous impact caused by different construction backgrounds.

First, based on the principles of scientificity, rationality, and applicability of evaluation, the research team invited 15 experts from relevant fields—including local governments, Fortune 500 enterprises or leading enterprises, and heads of industrial colleges in “Double-High Plan” vocational colleges—to participate in the construction of the evaluation system. Through four rounds of the Delphi method, expert feedback was continuously integrated to adjust and optimize the indicators. Guided by the concept of “joint discussion, co-construction, co-management, co-governance, and win-win cooperation”, an evaluation system for the construction effectiveness of industrial colleges was built from four dimensions: operational system and mechanism, collaborative education model, faculty team construction, and social service capacity.

The specific composition of the evaluation system is as follows: (1) Operational system and mechanism, which includes observation points such as target positioning, development planning, organizational structure, rules and regulations, and condition guarantee; (2) Collaborative education model, which covers observation points like specialty construction, certificate development, curriculum development, teaching material research and development, practical training bases, modern apprenticeship system, enterprise-ordered classes, and talent training quality; (3) Faculty team construction, which includes observation points such as “double-qualified” faculty team, introduction of industrial talents, and faculty training bases; (4) Social service capacity, which encompasses observation points like industry-university-research-innovation platforms, social service platforms, and international exchange and cooperation.

Subsequently, questionnaires and in-depth interview themes were designed based on the evaluation system. The research team conducted in-depth interviews with representatives from both the university and enterprise sides of the 18

industrial colleges, distributed and collected questionnaires, and intuitively presented the current construction status of the industrial colleges by gathering overall data. Focusing on the current difficulties faced in the construction of industrial colleges, the study highlights common issues, clarifies their internal causes, and explores improvement paths to break through existing constraints.

4. Analysis of problems existing in industry colleges

By collecting and organizing questionnaire data from 18 industry colleges and integrating in-depth interview materials, the research team has summarized common problems in industry colleges, such as the urgent need to improve the multi-stakeholder collaborative governance model and the urgent need to reconstruct a long-term mechanism for interest compatibility.

4.1. The multi-stakeholder collaborative governance model urgently needs improvement

As a new practical form of deepening industry-education integration in vocational education, industry colleges are still in the exploration stage in terms of their development planning, organizational structure, rules and regulations, and decision-making mechanisms. The multi-stakeholder collaborative governance model of industry colleges needs to be further improved, and there are frictional costs in the promotion of the governance concept of “joint discussion, joint construction, joint management, and joint governance”. Differences in management models between schools and enterprises restrict the operational efficiency and construction effectiveness of industry colleges. Surveys show that most industry colleges currently adopt the president responsibility system, basically following the traditional management model, which has the characteristics of excessive administrativeization and conflicts with the market-oriented operation and management model of enterprises. The internal management and decision-making mechanism of industry colleges mostly presents a situation where “schools are strong while enterprises are weak”, and in essence, the two parties cannot conduct problem negotiation and communication on an equal basis.

4.2. The long-term mechanism for interest compatibility urgently needs reconstruction

At present, most policy documents related to industry colleges are guiding and programmatic in nature, and rarely involve implementation details such as the ownership of property rights and interest distribution of industry colleges. Due to the differences in goals and value divergences among multiple stakeholders, it is difficult to form an interest-compatible mechanism for mutual benefit and win-win outcomes when faced with complex interest games. There is an inherent contradiction between the goal differences and resource scarcity among the multiple stakeholders of industry colleges, which easily leads to imbalances in interest distribution and value divergences. The construction of industry colleges first needs to address the conflict in value orientation between the public welfare nature of schools and the profit-seeking nature of enterprises. Public welfare activities aim to pursue social benefits, usually covering a wide range and large scale with less consideration of economic factors; schools prioritize public welfare goals. Profit-seeking activities aim to pursue economic interests, focusing on cost control with a narrow scope and small scale; enterprises prioritize profit-making goals. Therefore, industry colleges are regarded as a form of short-term cooperation between the two parties based on specific needs. Without establishing a long-term mechanism for interest sharing, industry colleges are prone to the dilemma of insufficient industry-education integration.

5. Industrial college construction enhancement strategies

With “fostering virtue through education” as its fundamental mission, we will improve the diversified and collaborative governance model of industrial colleges, establish a long-term mechanism for compatible interests between schools

and enterprises, attract intellectual resources to build a high-level teaching team, promote joint discussion, construction, management, governance, and win-win cooperation between schools and enterprises, and achieve the sustainable, connotative, and innovative development of industrial colleges.

5.1. Improve the diversified and collaborative governance model

Establishing a stable, orderly management structure and operation mechanism for diversified collaboration is an important prerequisite for the sustainable development of industrial colleges. By improving rules and regulations such as management methods, implementation plans, assessment methods, and reward and punishment mechanisms, we will clarify the responsibilities, rights, and obligations of all parties, and form a governance system and operation guarantee mechanism featuring joint discussion, construction, governance, and management.

With the in-depth development of industry-education integration in industrial colleges, it will inevitably involve the communication and collaboration between multiple departments of both schools and enterprises. Building a flexible and efficient communication mechanism for school-enterprise cooperation is conducive to reducing frictional costs in daily operations. A joint school-enterprise working group will be set up under the council to coordinate the two parties in formulating project promotion plans, jointly discussing the construction goals and plans of industrial colleges, jointly cultivating the “double-qualified” teacher team (teachers with both teaching qualifications and industrial experience), jointly building characteristic majors, industry-education integration training bases and service platforms, jointly developing school-enterprise cooperation courses and skill level certificates, and jointly promoting international construction and exchanges. We will implement a long-term cooperation guarantee mechanism, respect the interest demands of all parties, establish a special supervision team to address new situations and problems in fields such as finance, personnel, procurement, and assets, and build an open, transparent, flexible, and inclusive interest distribution and coordination mechanism, thus forming a diversified and collaborative governance model based on equal cooperation and mutual benefit.

5.2. Establish a long-term mechanism for compatible interests

Aiming to build a school-enterprise community with a shared future featuring joint resource construction and achievement sharing, we will address the root causes of issues related to interest sharing and value conflicts. Through the reconstruction of the value chain, we will promote the formation of value consensus, introduce conflict governance tools, and establish a long-term mechanism for compatible interests. On the basis of upholding the public welfare mission of school-running, we will attach importance to the interest demands of enterprises in participating in the construction of industrial colleges. Through the design of specialized division of labor and cooperation, we will guide schools and enterprises to integrate resources to jointly carry out technological research, product development, achievement transformation, technical services, technical skill training, and other work, jointly complete teaching and scientific research tasks, share research achievements, and enhance the ability to serve the industry. Through the reconstruction of the value chain, we will form interest binding, and solidify the interest distribution mechanism in cooperation agreements, so as to truly realize the organic connection of the education chain, talent chain, industrial chain, and innovation chain, and form a pattern of mutual benefit and win-win between schools and enterprises.

6. Conclusion

Industry colleges serve as the implementation carriers for promoting the modern vocational education system to support the development of regional industrial economies. Conducting a systematic evaluation of the construction effectiveness of industry colleges is a crucial means to drive vocational education to deepen the integration of industry and education, effectively connect the education chain, talent chain, industrial chain, and innovation chain, and enhance the quality of talent cultivation. It is necessary to strengthen overall planning and design, actively explore the connotative development

of industry colleges, improve the multi-stakeholder collaborative governance model, reconstruct a long-term mechanism with compatible interests, and address the weaknesses in the construction of teaching staff, thereby creating a new model of multi-stakeholder collaborative talent cultivation. Taking the industry colleges of Shenzhen Polytechnic University as the research object, this paper analyzes their construction effectiveness by constructing an evaluation system, identifies the common problems in the current development of industry colleges, and provides theoretical guidance for the sustainable and healthy development of industry colleges. Given Shenzhen Polytechnic University's reputation and influence in China's vocational education field, it is hoped that this research can serve as a starting point to promote the high-quality development of undergraduate vocational education on a broader scale.

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