Ecological Construction and Promotion Strategies of Industry-Education Integration in Vocational Education under the Background of Digital Economy

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Abstract. With the rapid development of the digital economy, the demand for highly skilled talents continues to grow, and the importance of vocational education has become increasingly prominent. This paper takes the Intelligent Manufacturing College and the Information Engineering College of Guangdong Innovation and Technology Vocational College as the research objects, and combines the development trend of the digital economy to explore the ecological construction and promotion path of engineering majors in the process of industry-education integration in vocational education. The article analyzes the current practice status and existing problems of industry-education integration, and proposes optimization strategies, aiming to provide reference and reference for engineering majors in higher vocational colleges to deepen industry-education integration and achieve high-quality development.

Keywords: Digital Economy; Vocational Education; Industry-Education Integration; Engineering Specialization; Ecological Construction

1 Introduction

The digital economy, as a major economic form after the agricultural economy and industrial economy, is profoundly changing the mode of production, lifestyle and social governance. Under the wave of digital economy, industrial transformation and upgrading have accelerated, and the demand for technical and skilled talents has changed profoundly, which puts forward higher requirements for the cultivation of talents in vocational education. The integration of industry and education, as the basic schooling mode of vocational education, is the key path to cultivate high-skilled talents adapted to the needs of the digital economy era. As the main teaching units of the school's engineering majors, the Intelligent and Intelligent Manufacturing College and Information Engineering College of Guangdong Institute of Innovation and Technology Vocational College have been actively exploring the mode of industry-teaching integration under the background of digital economy, but they are still facing a lot of problems. Therefore, it is of great practical significance to study the ecological construction and promotion

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strategy of the integration of industry and education in vocational education under the background of digital economy[1].

2 Current Situation and Problems

2.1 Industry-Collaborative Education Model of the School of Information Engineering

The School of Information Engineering offers majors such as computer application technology, software technology, and Internet of Things technology, and actively carries out in-depth cooperation with digital technology companies such as Huawei, Tencent. The college has established industrial colleges such as "Huawei ICT College" and "Tencent Cloud Internet Industry College", jointly developed curriculum standards and practical projects, and formed a new talent training model of "school-enterprise co-education and dual-teacher teaching". In addition, the college attaches importance to the integration of project-driven teaching and innovation and entrepreneurship education to enhance students' comprehensive abilities[2].

2.2 Industry-Education Integration Practice of the School of Intelligent Manufacturing

The School of Intelligent Manufacturing focuses on the needs of the intelligent manufacturing industry in the Guangdong-Hong Kong-Macao Greater Bay Area and has established majors such as industrial robot technology, mechanical manufacturing and automation, and numerical control technology. Relying on school-enterprise cooperation projects such as the "Nanxing Equipment Co., Ltd. Modern Apprenticeship Pilot" and the "South China Intelligent Manufacturing Industry-Education Integration Platform", the college promotes the integration of "job courses, competitions and certificates" and explores a collaborative education mechanism based on the industrial chain. At the same time, it builds an intelligent manufacturing training base that integrates teaching, training, practical training and production to enhance students' practical ability.

2.3 Existing Problems

Insufficient depth of industry-education integration: Although the college has established a cooperative relationship with enterprises, the cooperation is mostly superficial, such as the lack of in-depth cooperation in the construction of internship and training bases and curriculum development. Enterprises are not very enthusiastic about participating in the formulation of talent training programs, and there is a certain gap between the course content and actual work needs[3].

Imperfect ecological system: Industry-education integration involves multiple subjects such as government, schools, enterprises, and industries. The coordination mechanism between the subjects has not been perfected, and there is a lack of effective

communication and collaboration platforms. The government's role in policy guidance and resource integration is not fully played, and the participation of industry organizations in standard setting and guidance is relatively low[4].

Talent training is out of touch with industrial needs: The digital economy is developing rapidly, and industrial technology is rapidly updated, but the college's professional settings and curriculum system adjustments are relatively lagging, resulting in a certain degree of disconnection between talent training and industrial needs. The knowledge and skills learned by some students cannot meet the actual needs of enterprises, and their employment competitiveness is insufficient[5].

Insufficient motivation for enterprise participation: The dominant position of enterprises in industry-education integration is not prominent enough, the cost of participating in industry-education integration is high, and the benefits are relatively insignificant. Enterprises are more concerned about their own economic benefits and lack understanding of the long-term benefits of talent training, resulting in low enthusiasm for enterprises to participate in the integration of industry and education[6].

3 Elements of the Industry-education Integration Ecosystem

3.1 Definition of the Elements of the Industry-Education Integration Ecosystem

Government Level. The government should issue focused policies around the development of the digital economy and the current status of vocational education, clarify the responsibilities of all parties involved, and standardize the cooperation process. Our school actively responded to the industry-education integration policies of Guangdong Province and Dongguan City, and participated in a number of municipal special projects. The government set up special funds to support the joint construction of training bases between schools and enterprises, teacher enterprise practice, and student internships and training. By holding government-school-enterprise docking meetings and establishing an industry-education integration information platform, the government helped our school to accurately connect with enterprise resources, effectively promote school-enterprise collaborative education, and build a good integration environment.

School Level. Our school closely follows the layout of Dongguan's digital industry, continuously optimizes the setting of professional groups, and highlights the advantages of majors such as "computer + intelligent manufacturing". According to the employment standards of enterprises, update the curriculum system and strengthen practical technology teaching. Promote "course and certificate integration" and "project-based teaching" to improve students' job competency. Deepen school-enterprise collaborative education through co-construction of training rooms and joint development of courses. The school also promotes the development of "dual-qualified" teachers, enhances the integration of teaching and practice, and is committed to cultivating high-quality technical and skilled talents to serve local economic development.

Enterprise Level. The School of Information Engineering and the School of Intelligent Manufacturing actively establish cooperation with leading local enterprises in Dongguan such as Huawei and Dongguan Carving, provide internship positions, and participate in curriculum development and talent evaluation. Enterprise technicians participate in our school's teaching and project guidance to promote the connection between teaching content and job requirements. Some companies also cooperate with our school in technical research and product testing, relying on the school's technical strength to solve practical problems and achieve win-win results. Through collaborative education and industry-university-research cooperation, enterprises obtain suitable talents and schools improve the quality of education.

Industry Organization Level. Industry organizations provide guidance for professional construction and curriculum design by assisting in the formulation of professional skill standards and job specifications. Our school works closely with organizations such as the Guangdong Software Industry Association to participate in skill competitions, industry seminars, and technical salons to understand the latest industry trends. Industry organizations also promote resource sharing between enterprises and schools, conduct employment demand surveys, and provide support for policy formulation. Through these links, industry organizations help our school deepen the collaboration between industry and education and improve the fit of talent training.

3.2 The Main Ecology of Industry-Education Integration

Constructing a Diversified Collaborative Ecology. Our school leverages the combined efforts of government coordination, industry organization coordination, enterprise participation, and school execution to establish a regular communication platform to coordinate professional construction, curriculum development, and talent training. All parties clarify their responsibilities, jointly formulate education plans, ensure that educational content and industrial technology are updated simultaneously, create a collaborative, open, and dynamic education ecosystem, and deliver technical and skilled talents with a higher degree of fit to the industry.

Build a Practical Application Ecology. Our school and local enterprises jointly build a high-level training base to form an integrated space of "teaching + production + research and development" to achieve resource complementarity and functional superposition. The base has the functions of student training, enterprise employee training, and new technology incubation, which not only improves students' hands-on ability, but also enhances the training efficiency and technological innovation of enterprises, and builds a practical ecological system of industry-education co-education and achievement sharing.

Activate the Innovation and Development Ecology. Relying on two provincial high-level professional groups and corresponding scientific research platforms, our school

builds innovation teams with enterprises to carry out technical research and joint research and development around the actual industry. Through project-driven teaching, the real needs of enterprises are introduced into the classroom to cultivate students' innovative consciousness and practical ability. At the same time, we promote the application of results in enterprises, form a virtuous cycle ecology of teaching chain, scientific research chain and industrial chain linkage, and enhance the ability to serve the industry.

Strengthen the Talent Supply Ecology. Through the construction of the "double teacher integration" mechanism, our school promotes professional teachers to work in enterprises to improve their industry cognition and practical ability; on the other hand, we invite enterprise engineers and industry experts to enter the classroom to achieve the integration and update of teaching content and technological development.

4 Promotion Strategies

4.1 Policy Support and Guidance to Build an Industry-Led Synergy Platform

The government should introduce precise support policies around the difficulties of enterprise participation, such as financial subsidies, tax incentives, etc., to reduce the cost of enterprises and improve the enthusiasm for participation. At the same time, it should strengthen quality monitoring and establish a multi-dimensional assessment system to ensure the integration effect. Guangdong Vocational College of Innovation and Technology actively integrates into the construction of the “industry-education integration community” promoted by the local government, and builds industrial colleges, technology research and development platforms, and high-level training bases with leading enterprises to realize the common construction and sharing of resources. Relying on the coordinating role of industry associations, we will build a bridge for school-enterprise docking, promote the accurate matching of supply and demand, and create a regional collaborative ecosystem for the integration of industry and education.

4.2 Enhance the Quality of Teachers' “Dual-Teacher” Qualities

Taking the construction of “dual-teacher” teacher team as a key, our school promotes teachers to practice in enterprises through the mechanism of school-enterprise cooperation, so as to grasp the cutting-edge technology and industrial dynamics and improve their practical teaching ability. At the same time, teachers are encouraged to obtain professional qualification certificates, so as to realize the double enhancement of theoretical teaching and skill transfer. Through the introduction of enterprise engineers and skilled craftsmen as part-time teachers, we have built a teaching team with reasonable structure and complementary abilities, continuously broadened the knowledge boundaries and technical vision of teachers, enhanced the industrial adaptability of

professional teaching, and provided students with learning experiences closer to the real world.

4.3 Constructing Dynamic Curriculum System

Relying on the platform of "School-Enterprise Community", the school builds professional courses with enterprises, dynamically adjusts the teaching content according to the demand of job competence, and strengthens the docking with industry standards. Focusing on new-generation information technology, the school integrates AI, big data and other modules to promote modularization and project-based teaching reform. The school also introduces real projects from enterprises into the classroom to create an integrated teaching scenario of "teaching-learning-doing", so that the content of the curriculum closely follows the technological evolution and job practice, improves the students' professional competence, and lays the curriculum foundation for creating a talent system that adapts to the needs of the digital economy. (d) Improve the evaluation of industry-teaching integration.

4.4 Improve the Evaluation and Incentive Mechanism of Industry-Teaching Integration

The university promotes the construction of an integration performance evaluation system based on the participation of multiple subjects, and the assessment covers the input of enterprises, the quality of student employment, and the effect of curriculum reform. Special attention is paid to the degree of compatibility between graduates' employment positions and specialties to ensure that the supply of talents is accurately aligned with the needs of enterprises. By setting up incentive policies for school-enterprise cooperation, the depth and enthusiasm of enterprise participation are enhanced. At the same time, the results of production and education are incorporated into the evaluation and incentive system of teachers, comprehensively mobilizing the resources of all parties to build a sustainable, quantifiable and optimized evaluation of the integration of the closed loop, and promoting the integration of production and education to a deeper and deeper development.

5 Conclusion

The digital economy brings new opportunities and poses new challenges for the development of vocational education. Higher vocational colleges and universities must take the initiative to integrate into the wave of digital development, and build an ecosystem for the integration of industry and education that is open and collaborative, resource sharing, and win-win for schools and enterprises. The exploration and practice of the Intelligent Manufacturing College and the Information Engineering College of Guangdong Innovation and Technology Vocational College show that only by opening up the barriers between nurturing and industry can we cultivate highly skilled talents who can truly meet the needs of the digital economy. In the future, reform should be further

deepened and opening up should be expanded to promote the integration of industry and education to a higher quality and deeper level.

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