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Research on the Collaborative Education Path and Strategy in Vocational Colleges for the Integration of Science and Industry Education

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Abstract: Research and education, as well as industry and education, are merging as a development trend in collaborative education within the context of digital transformation. To improve the integration of science and technology with vocational education, increase the capacity of students in vocational education to transform technological advancements, and give businesses clear, doable strategies for cutting costs and improving efficiency, it is imperative to clarify the collaborative education mechanisms of industry education integration and science education integration and to develop a life cycle of industry education integration and science education integration based on technological adaptability. It is essential to use technology to facilitate the integration of science and industry education. Establish a platform to raise the bar for technological innovation and talent development in vocational education, strengthen the process of knowledge-technology interaction and innovation, and help educators and students use technology in a more normalized way.

1. Introduction

According to the Communist Party of China's 20th National Congress report, "education, science and technology, and talent are the fundamental and strategic support for the comprehensive construction of a socialist modernized country." Nowadays, rivalry between nations is mainly a contest for total national power, with competition in talent, science and technology, and education being the three main facets. A key pillar and potent engine supporting the development of a country is vocational education. Industry education integration and scientific education integration are two examples of vocational education approaches that have significantly developed technical and skilled talents with all-encompassing professional capabilities for the nation. The objectives are to further

integrate industry and education, science and education, and vocational education, as well as to coordinate and resolve the issue of discord and mismatch between talent development and industrial development. These goals are in line with the spirit of the 20th National Congress of the Communist Party of China and the decisions and deployments made by the Party Central Committee and the State Council. In order to achieve this, the Implementation Plan for the Empowerment and Enhancement of Vocational Education Industry Education Integration (2023-2025) was jointly released by the National Development and Reform Commission, the Ministry of Education, the Ministry of Human Resources and Social Security, and eight other departments. According to the Implementation Plan, there will be about 50 pilot cities by 2025 for the integration of science and education as well as industry and education. A sound system of integrated enterprises and combined incentive policies will be established, and more than 10,000 integrated enterprises will be built and cultivated nationwide. This will gradually form a development pattern of coordinated and benign interaction between industry and education.

Bates (2022), in his effort to assist teachers in modifying their teaching practices, stated that due to the increasing availability of digital content and the expansion of digital education in higher education, students would increasingly seek out institutions for learning support under flexible schemes, which would impact the role of teachers and the design of courses. According to Jung (2019), it was necessary to resume the results that had been generated. In recent years, research has focused on various theoretical proposals related to open education in order to verify their validity and redefine and update the theoretical framework in new digital environments. According to Chand et al. (2023), in 2022, a large number of institutional training initiatives were created, such as webinars, conferences, workshops, books, and articles, as well as networks and international groups that shared and collaborated in both academic activity and professional development.

Following the COVID-19 epidemic, an increasing number of industry regulators, companies, and institutions are emphasizing the integration of industry, education, and science. Because most students are used to using electronic devices to replace all actions, and hands-on and practical ability are very important, we must build an effective platform for the integration of industry and education so that more students can participate in the production of enterprises and unmanned vehicles. this paper will analyze the connotation logic of the integration of vocational education and education in vocational education and science and technology, and combine the industrial characteristics of regional economy, to plan a development strategy to promote the integration of science and education, including accurate recognition of change, initiative to seek change, and active response to change, as a serious attitude and action guide for educators.

2. The positioning and internal mechanism of collaborative education

In response to the Implementation Plan's requirements, the National Development and Reform Commission, the Ministry of Education, and the Ministry of Human Resources and Social Security have taken the lead in promoting the integration of industry and education in vocational education, as well as the empowerment and enhancement of science and education integration. It is clearly stated that different regions should improve the mechanism for coordinated development of industry and education integration, as well as science and education integration in vocational education. In addition, the Central Committee's "Opinions on Deepening the Reform of Modern Vocational Education System Construction" suggest sticking to the principles of encouraging production through education, supporting education through production, strengthening the connections between industry and academia, and government coordination as well as industry aggregation, enterprise guidance, and schools as the primary institution.to develop a group of talented, innovative, and entrepreneurial people based on industrial parks a local partnership for industry education that

supports the superior growth of the industrial sector.

2.1.Positioning of vocational education talent cultivation

The educational characteristics of vocational education require that professional knowledge and technical skills elements be reflected in talent training programs and curriculum teaching standards. Knowledge and technology, as well as science and technology, are not independent and unrelated entities. Through the integration of industry and education, science and education, and collaborative education, vocational colleges can transform the practical experience gained on the production line into professional technical knowledge and impart it to students. At the same time, the theoretical knowledge obtained in the college classroom can be appropriately integrated into teaching activities such as enterprise observation and learning, on-the-job internships, etc. In the process of integrating industry and education, as well as science and education, schools and enterprises form new theoretical knowledge and technical skills.

Technical skills and professional knowledge must be represented in talent development programs and curriculum teaching standards in order to meet the educational requirements of vocational education. Just as science and technology are not distinct and unrelated fields, neither is knowledge and technology. Because different users have varying levels of experience and skill, using the same tool or machine can produce noticeable variations in its effectiveness. As a result, the main goals of promoting the integration of science and education as well as industry and education are to: define the vocational education's talent cultivation positioning; develop implementation standards and norms that adjust to the teaching activities of vocational education; raise students' levels of technology and knowledge cognition; and establish the logical relationship between the two.

Most Chinese branches and enterprises have yet to develop a positive and dynamic collaborative education model. The school curriculum focuses on imparting knowledge and skills, and developing students' abilities in knowledge transfer, knowledge application, technology transfer, and technological innovation is insufficient. Part of the reason is that most students who receive vocational education have low learning initiative, necessitating collaboration between vocational colleges and industry enterprises. Accurately positioning talent training goals, refining training methods, and facing the rapidly changing technological environment and complex job market environment necessitates a continuous understanding of job demands of industries and enterprises while paying attention to students' career aspirations and demands and understanding their true evaluations and opinions.

In response to the prominent problems of insufficient connection between vocational education and industry, as well as insufficient cooperation between industry and education, as well as the integration of science and education and school enterprise cooperation. It is proposed to improve the diversified educational pattern, establish a collaborative promotion mechanism for industry and education integration, innovate and promote school enterprise cooperation, and optimize the policy environment for school enterprise cooperation. The integration of industry and education, as well as the synergy of science and education, has become a development trend in the logistics industry against the backdrop of digital transformation. The vocational education talent cultivation positioning consists primarily of three basic methods: skill-oriented, technical-oriented, and technical-skill-oriented.

Subsequently, as the industrial structure was upgraded and adjusted, a variety of approaches to developing talent emerged, including applied technology-oriented, engineering technology-applied, and technology-and-engineering applied. Following the idea of vocational orientation is the first step in creating a professional talent training plan for vocational education. It makes sense to start with the fundamental skills required for occupations. The type of talent training is determined by

analyzing the ability structure of positions and job groups, and then the talent training is implemented. As a result, optimizing the logic and path of talent cultivation is of great practical significance in response to the positioning requirements of vocational education talent cultivation.

2.2. In order to cultivate students, the intrinsic mechanism of collaborative education through the integration of science and education as well as industry and education

First, Vocational education must continually take into account the trends in science and technology development, the features of industry technology structures, and the interrelationships between job technical elements. The need for job technical skills in the growth of industry enterprises, as well as science and technology, are closely related, and this means that vocational educators must take note of both of them. This includes the key elements of technology adaptability in vocational education.

Although there are natural connections between skills, technology, engineering, and applications, there are also distinct differences between them. In the production field, skilled talents concentrate on mastering and applying experiential technology, technical talents concentrate on functional technology, and engineering talents concentrate on the integration and application of physical and functional technology. Talents who receive vocational education and training have a knowledge structure that focuses on bottom-up theoretical, abstract, and generalized technical knowledge from work practice and pays more attention to gradually mastering the theoretical and global technical knowledge system from learning empirical technical knowledge in the work context.

Second, There are differences in the characteristics of technological adaptability among different majors, but their unified manifestation is the ability of learners to master, transfer, and expand the functional technologies required for positions and job groups. Technological adaptability is derived from ecological terminology and refers to an individual's ability to adapt to the advancement and changes in modern technology. Technical adaptability is an important characteristic that distinguishes vocational education from other types of talent development. Thus, it is crucial for vocational education to investigate and practice the technical adaptability training mode.

3. The Collaborative Education Model for Industry Education Integration and Science Education Integration Based on Technology Adaptability

In order to fulfill the mission of developing technical talents in this day and age, higher vocational colleges are the primary locations for developing technical and skilled talents. The nation, society, and business organizations have high expectations for the new force that is vocational education. Though there are some distinctions and similarities, its creative use of technology and skills is closely linked to traditional higher vocational education. Vocational education focuses on developing students' technical thinking, technical application, and technical reflection abilities; developing their ability to adapt to changes in the work environment for production practice; solving complex technical problems; operating high-end and complex equipment; diagnosing and repairing equipment faults; and possessing technical transfer ability.

In order to effectively promote the comprehensive knowledge acquisition, data sharing, knowledge dissemination, and technology application capabilities of school and enterprise entities, the model of integrating industry and education, science and education, and collaborative education places emphasis on the process from learning empirical technical knowledge to gradually mastering theoretical and global technical knowledge systems. It also maintains smooth channels for innovative knowledge flow. It relies on the fusion of business and education and promotes integrating new information and technologies from the production line into the classroom. A science-education collaborative platform that guarantees the long-term functionality of new

knowledge and technologies integrated into classroom mechanisms. In actuality, the goal of learning is to solve particular issues, and concepts like strategies, rules, and methods are all related to homework situations. Classrooms, training rooms, production lines, markets, and other environments are important channels for knowledge acquisition.

4. Adaptable Talents in Vocational Education Training Path for Logistics Technology

Logistics is a critical supporting component for ensuring urban development, a key factor in determining regional economic development, and a driving force in optimizing resource allocation in regional transportation hubs. The reserve of logistics talents that can adapt to the development of the logistics industry in the local area, as well as the strong technical adaptability of existing logistics industry practitioners to adapt to the new infrastructure background, are two prominent manifestations of regional logistics competitiveness. The goal of logistics vocational education is to develop students' logistics system thinking ability, logistics technology cognition level, and logistics technology adaptation and innovation ability.

It focuses on developing students' abilities to master and apply logistics production operation systems, to concretize technical design and conception in logistics production, to operate and maintain high-tech digital facilities and equipment, and to carry out logistics knowledge. The capacity to apply and transfer technical knowledge, etc. Based on this, the following measures for the talent cultivation path of vocational education and technical adaptability in logistics are proposed in this article:

4.1. Establish a win-win logistics cooperation ecosystem among government, industry, enterprises, and universities

Vocational colleges should actively participate in the logistics industry's integration of industry and education, as well as the integration of science and education, and promote the effective participation of industry enterprises and other diverse entities in the management system of vocational colleges. To promote professional construction, establish a professional group construction council comprised of department leaders, enterprise experts, backbone teachers, student representatives, and social forces. Vocational colleges ought to establish and enhance the school council's communication system, develop a digital information platform, and effectively disseminate information about education, teaching, and school-business collaboration. Benefit-wise, plans for win-win outcomes and equitable rights and responsibilities are collaboratively explored by industry organizations, vocational colleges, and other pertinent education participants. Through the implementation of mechanisms such as resource integration, achievement sharing, value exchange, and other forms of benefit sharing, they encourage industry enterprises to take the lead in integrating science and education as well as industry and education.

4.2. Encourage the logistics sector to develop a cooperative education chain that unifies science and education, as well as industry and education

In addition to improving the standardization and adaptability of logistics major settings, vocational colleges should actively engage with regional logistics industry development plans. They should also improve the major settings' connectivity and systematicity. Vocational colleges ought to collaborate with industry experts in logistics to enhance curriculum creation, optimize talent training programs, and promptly incorporate new technologies, procedures, and industry standards into their course materials.

Simultaneously, vocational colleges should expand their sources of student internships and

employment resources; establish a formalized mechanism for cooperation with logistics companies; draw logistics companies to actively engage in hands-on learning, internship training, and other talent development initiatives; and work in partnership with schools and businesses to develop guidance plans for student internships; define the criteria for quality internships; strictly regulate the internship process; enhance feedback on the efficacy of internships; and establish an industry-education link in the logistics sector.

4.3. Expand the logistics industry's supply chain to facilitate the integration of science and education services, as well as the integration of industry and education

In order to fully utilize the benefits of resource integration and strengthen exchanges and cooperation with logistics industry enterprises in high-tech talent training bases, skill appraisal stations, community skill training service centers, and other areas, the logistics industry's extension of its industry education integration and science education integration service community primarily focuses on vocational colleges offering flexible social training and services to in-service employees, community members, retired soldiers, rural technical experts, and other groups. The goal is to create a multifaceted, three-dimensional talent training foundation that combines curriculum development, project cultivation, teacher training, and skill training. In addition to fully promoting the development of talents with technological adaptability in animal flow vocational education, this will extend the vocational education supply chain to include talent training, technical services, project development, cultural dissemination, and ecological protection.

4.4. Create a solid logistics framework and a dynamic evaluation mechanism for professional positions

For logistics technology adaptability, the logistics sector, businesses, and upstream and downstream associated businesses in the supply chain offer regularly updated and iterated work scenarios, technical goals, technical specifications, and technical evaluation standards. Front-line production provides evidence of graduates' flexibility with logistics technology. As a result, the implications and limitations of the logistics technology adaptability of industry and enterprise should be carefully considered by the sub-majors in the logistics professional group. With regard to the integration of science and education under technological adaptability, the project team has developed a cooperative evaluation mechanism.

5. Collaborative Education Approaches for Science Education and Integration with Industry

It is necessary to optimize the supply structure of vocational education, improve the diversified educational pattern, establish a mechanism for promoting the integration of industry and education, innovate the promotion of school enterprise cooperation, and optimize the policy environment for school enterprise cooperation in order to address the prominent problems of unclear characteristics of vocational education types, insufficient connection between vocational education and industry, and insufficient cooperation between schools and enterprises in the integration of industry and education. There are several specific recommendations:

5.1. Create practical models for combining industry and education, as well as science and education

Based on this, it is possible to investigate and implement a professional group to connect with an industry, select a leading figure, form a teaching innovation team, establish a technical service team,

and develop an innovation and entrepreneurship team. A "six in one" talent training mechanism is established through the joint establishment of majors by schools and enterprises, the development of talent training plans, the construction of professional courses, the formation of teaching teams, the strengthening of student management, and the implementation of a two-way evaluation. The teaching process is closely aligned with job content, professional abilities, and job requirements, further integrating industry and education, science and education, and the collaborative education model.

5.2. Science and education, industry and education, and the co-construction and sharing of data related to vocational education are all made possible by technology-driven empowerment

By establishing standards for the development of industry education integration and science education integration data sharing and integration platforms, designing cross-regional, cross-level, and cross-industry education data sharing mechanisms, improving the efficiency of vocational education data collection, and making it easier for schools to establish basic science and education data centers. For example, we can collect data from various categories such as teaching, administration, scientific research, student management, health, preferences, strengths, honors, and good practical activities by using modern information technology methods. We can achieve a big data sharing platform across a wide range of fields in society, providing resource support for the application scenarios of teaching and positions, by combining public data in the vocational education system and job requirements in industries and enterprises. Improving the ability to allocate educational resources and industrial resources provides a practical carrier for precise cooperation, scientific management, and convenient services between schools and businesses.

5.3. Create a platform to improve teachers' and students' digital literacy and application abilities

The primary opportunity for school-business collaboration and collaborative education is the digitalization of vocational education. The logistics industry requires high-quality logistics technology as well as skilled individuals with an entrepreneurial mindset, professional ethics, and professional dedication. Technical adaptability is an important aspect of vocational education. Only by continuously deepening the integration of industry and education, integrating science and education, and improving the logistics technology adaptability of colleges, enterprises, and students can vocational education play a larger role. In practice, the goal of acquiring knowledge is to solve specific problems, and knowledge such as methods, techniques, and rules all involve homework scenarios. Knowledge can be acquired in a variety of settings, including markets, production lines, classrooms, and training facilities. Therefore, in order to actually achieve practical results in the integration of science and education, collaborative education, and vocational industry and education, teachers involved in vocational education must first grasp the concept of "application." It is necessary to strengthen the interactive communication platform between schools and enterprises, to investigate and practice ways to improve the innovation efficiency and ability formation of teachers and students, to maintain smooth channels for innovative knowledge flow, and to effectively promote schools' and enterprises' ability to acquire knowledge, share data, disseminate knowledge, apply technology, and adapt.

6. Conclusion and Prospects

The first step in putting the collaborative evaluation mechanism of science education integration

and industry education integration under technological adaptability into practice is figuring out which job openings are in the bottleneck areas and what the current logistics development focus is. The school and the business collaborate to create a multi-dimensional, multi-angle, diverse, and multi-level communication mechanism for professional settings. The project team actively aligns submajor formulation with enterprise needs, actively participates in developing student off-campus internship practice venues, effectively expands students' vision and innovation ability in logistics technology and technology, and achieves the overall goal of industry education integration, science education integration, and collaborative education.

Secondly, in order to fill the gaps in logistics career positions, the project team thoroughly investigates the talent development process as well as the technical structure of logistics positions in school enterprise cooperation units. There is a growing demand for job positions as the logistics industry grows quickly. We are making an effort to adjust to the requirements of the new logistics infrastructure environment while ensuring professional basic and general knowledge.

Thirdly, it is important to pay close attention to the dynamics of the logistics sector as well as the emerging forms and technologies used by logistics companies. This will help to create a long-term cooperative education mechanism where banks, businesses, and schools collaborate and support one another. To strengthen the soft power of education, for instance, universities actively create platforms for the integration of science and industry as well as the integration of industry and education. They also work with businesses to make sure that new information and technologies are incorporated into the classroom.

In addition, we should work harder to conduct and document the experience of combining in-person and virtual instruction in vocational education. In order to effectively implement the specifics, corresponding online and offline integrated teaching management methods and regulations should be put in place. These will help to foster the institutionalized reform of teaching modalities, enhance teachers' application of new information technology, mentor teachers and students in transforming digital teaching, investigate mechanisms for teaching evaluation based on the integration of science and industry and education into practice, inspire teachers' initiative and enthusiasm, and ultimately enable teaching modalities to continuously innovate.

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