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Exploration of the "Dual Subject" Education Model between School and Enterprise Based on Deep Integration of Industry and Education

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Abstract: Industry-education integration is crucial for the success of vocational education. The “four cooperations” – cooperative school-running, cooperative education, cooperative employment, and cooperative development – represent a key pathway towards achieving effective industry-education integration. Recognizing the challenges in current school-enterprise 'dual subject' cooperation, such as the lack of a clear framework, inadequate platforms, and insufficient enterprise engagement, this study explores potential solutions from three key perspectives: "strengthening top-level design, building a new pattern of ‘dual subject’ education", "building an industry-education integration platform, giving play to the role of ‘dual subject’ of schools and enterprises", and "closely connecting with needs, deepening the reform of the talent cultivation model of ‘dual subject’ between schools and enterprises".

1. Introduction

Under the background of high-quality development, the relationship between vocational education and economic development is closer and more direct. In October 2021, the General Office of the CPC Central Committee and the General Office of the State Council issued the "Opinions on Promoting the High-quality Development of Modern Vocational Education", proposing to improve the system of integrating industry and education, and jointly promote the deep integration of industry and education. It is a general trend to attach great importance to deepening the integration of industry and education and promoting the high-quality development of vocational education. In November 2024, Wu Yan, Vice Minister of the Ministry of Education, pointed out at the World Conference on the Development of Vocational and Technical Education that "there are three inevitable paths for vocational education and industry-education integration: industry-education integration is the inevitable path for vocational education, "four cooperations" are the inevitable path for industry-education integration, and "hardware" construction is the inevitable path for "four cooperations". It further clarified that industry-education integration is an inevitable requirement for higher vocational

education, and the "four cooperations" (cooperative school-running, cooperative education, cooperative employment, and cooperative development) constitute crucial pathways and focal points for effectively running vocational education programs. However, at present, industry-education integration in many instances primarily focuses on internship and training programs, often limited to school-enterprise collaborations. While these efforts are valuable, they have not yet fully realized the potential for deep and transformative integration. How to promote the deep integration of industry and education in higher vocational education and the implementation of the "four cooperations" has become an urgent problem to be solved. This study adopts a problem-oriented approach to explore the "dual-subject" education model between schools and enterprises. By strengthening the coordination mechanism, this study aims to propose strategies for building a comprehensive coordination mechanism for the Industry-education integration in higher vocational education, thereby achieving deep integration of organizations and resources, enhancing interaction and cooperation, and empowering the high-quality development of higher vocational education.

2. Problem Analysis

In recent years, national and provincial authorities have implemented a series of policies to foster deeper integration between industry and education. These policies actively encourage higher vocational colleges to align with local economic and social development needs. Key initiatives include optimizing program structures and strengthening school-enterprise collaborations, resulting in some notable achievements. The "dual subject" of school and enterprise is an educational model that draws on the German "dual system" and has the characteristics of Chinese vocational education [1]. Because the German vocational education system and governance are very different from those of China due to national conditions, at present, the German "dual system" education in my country is gradually evolving into a "dual subject" education model of school and enterprise. Although some vocational colleges have explored the "dual subject" education model of school and enterprise, there are still some problems, which are mainly manifested in the following three aspects.

2.1 The "dual-subject" education pattern has not yet been formed

Industry-education integration involves collaborative efforts between industry and educational institutions. To foster its development, the implementation of targeted promotion policies is crucial. The "Opinions on Deepening the Reform of the Construction of a Modern Vocational Education System" issued by the General Office of the CPC Central Committee and the General Office of the State Council in December 2022 calls for strengthening the construction of municipal industry-education consortia and industry-education integration communities, promoting the effective connection between the education chain and the industrial chain, and realizing the in-depth combination of educational resources and industrial needs, improving the adaptability and service capabilities of vocational education, and providing talent and technical support for regional economic development and industrial upgrading. Although government departments actively promote it, schools generally regard "industry-education integration, dual-subject education" as an emerging model for talent training, but due to lack of experience, effective implementation rules for industry-education integration have not yet been formulated. For example, policies such as mixed ownership and shareholding schools that support "dual-subject" education have not yet been introduced. Therefore, there are still problems such as schools being "feverishly passionate" in industry-education

integration, and enterprises not having a strong intrinsic motivation and enthusiasm for participating in talent training [2].

2.2 Lack of "dual-subject" education platform

Industry-education integration is the cooperation and integration between industry and education. To achieve deep integration, we must first solve the problem of what platform to use for integration, and then solve the problem of how to integrate. Therefore, the "dual-subject" education platform of vocational colleges and enterprises plays an important role in promoting the organic connection between the education chain, talent chain, industrial chain and innovation chain. However, there are currently few "dual-subject" education platforms for schools and enterprises, and there is a lack of effective resource sharing mechanisms. Both schools and enterprises have difficulties in the co-construction and sharing of resources such as venues, equipment, personnel, and intellectual property rights, which affects the effectiveness of the education platform. In addition, some vocational colleges are not currently playing a significant role in the "dual-subject" education platform for schools and enterprises. For example, vocational colleges use modern industrial colleges as "dual-subject" education platforms, but their management systems and operating mechanisms are rigid, and their functions are similar to academic divisions within a college. They have not played their due role in talent training, skills training, technological innovation, enterprise services, innovation and entrepreneurship, etc.

2.3 The participation of enterprises in the “dual subject” education is not deep

As an important participant in vocational education, the enthusiasm and depth of enterprise participation directly affect the effect of school-enterprise cooperation. Although many enterprises are willing to sign cooperation agreements with schools, due to the lack of systematic and holistic policy support, their participation in talent training is mostly limited to providing internship positions and simple training, and they fail to participate deeply in the whole process of talent training. The integration of school-enterprise collaborative education is not deep enough, and a collaborative development pattern has not been formed. The first challenge is the low enthusiasm of enterprises. Many enterprises may be hesitant to participate in vocational education due to cost considerations, conflicts of interest, differences in culture and concepts, etc., which to a certain extent affects the in-depth cooperation between the two parties and the effective operation of the education platform. The second is the lack of enterprise participation in the “dual subject” education. The primary reason lies in the absence of adequate support policies, such as financial and tax incentives, to encourage enterprise participation in vocational education talent training. A cost-sharing mechanism between schools and enterprises has not been established, and the return on investment for enterprises in this training remains uncertain. For instance, some graduates from collaborative programs between schools and enterprises have failed to fulfill their contractual obligations, leading enterprises to fear that their years of investment may be wasted.

3. Problem Solving Strategies

3.1 Strengthen top-level design and build a new "dual subject" education pattern

3.1.1 Improve the policy guarantee system

Comprehensive and systematic policy support and guarantees are necessary when vocational education plays an important role in serving national strategy, regional economy, and industrial development. In order to improve the matching degree between the supply side of talent cultivation and the demand side of the industry, and effectively enhance the adaptability and pertinence of talent cultivation, the competent departments of Education, Finance, and Development & Reform should work together with industry enterprises, focusing on industrial demand and aiming to introduce supporting policies quickly for the reform of the "dual subject" education model between schools and enterprises. These policies should propose targeted goals and measures on how universities can enhance the matching degree between the education chain, talent chain, innovation chain, and industry chain, so as to improve the demand-oriented, enterprise-based and integrated innovation-mechanism under the background of the collaborative research between industries and universities, and form a benign interactive mechanism of benefit sharing, process co-management, and multi-party participation.

3.1.2 Accelerate the construction of municipal industry-education consortiums and industry-industry integration communities

Firstly, the construction of municipal industry-education consortiums should be strengthen. Provincial government departments should actively align with the development of national and provincial industrial parks. They should foster a collaborative model involving government leadership, industrial park initiation, and active participation from the government, industry, enterprises and educational institutions, and launch a series of projects to establish municipal industry-education consortia that integrate talent training, innovation, entrepreneurship, and the promotion of high-quality industrial economic development.

Secondly, the construction of industry-education integration communities should be strengthened. Under the guidance of industry authorities, high-level vocational colleges should proactively engage “chain leader” and leading enterprises. This engagement should involve collaborative efforts with applied undergraduate colleges, vocational schools (including technical schools), research institutions, innovation platforms, and upstream and downstream enterprises. These collaborations should foster the establishment of dynamic, on-the-ground industry-education integration communities in key sectors such as new energy vehicles, intelligent connected vehicles, new-generation information technology, high-end equipment manufacturing, new materials, new energy and energy conservation, environmental protection, artificial intelligence, and life sciences.

3.1.3 Increase the cultivation of industry-education integration enterprises

The concept of industry-education integration enterprises originates from the cooperation and integration between industry and education. It refers to enterprises that deeply participate in industry-education integration and school-enterprise cooperation, play an important role in the operation and deepening of vocational colleges and universities, have standardized behavior, remarkable results,

create greater social value, and have a strong driving and leading demonstration effect on improving the quality of technical and skilled personnel training, enhancing attractiveness and competitiveness . In 2023, the National Development and Reform Commission and other relevant departments issued the "Implementation Plan for the Empowerment and Enhancement Action of Industry-Education Integration in Vocational Education (2023-2025)", which clearly proposed to cultivate more than 10,000 industry-education integration enterprises by 2025. In order to further increase the cultivation of industry-education integration enterprises, local government departments should formulate provincial industry-education integration enterprise certification standards and specific policies for combined incentives, adopt the principles of active guidance, voluntary enterprise participation, equitable selection, prioritized implementation followed by recognition, and dynamic adjustment, the government should cultivate and foster a cohort of exemplary industry-education integration enterprises. This cohort should include a diverse range of entities, such as central enterprises, local state-owned enterprises, outstanding private enterprises, manufacturing innovation centers, and leading manufacturers within their respective industries. Through cultivation and construction, we will guide enterprises to deeply participate in the integration of production and education, and school-enterprise cooperation, and play a crucial leadership role in the cultivation of technical and skilled personnel and the development of human resources, so as to promote production through education and assist education through production [3].

3.2 Create an industry-education integration platform and give full play to the "dual subject" role of schools and enterprises

3.2.1 Support industry enterprises to run schools.

Government departments should actively support industry authorities and state-owned enterprises to run existing vocational schools, encourage listed companies and industry leading enterprises to actively organize high-quality vocational education, and for pilot enterprises included in the provincial industry-education integration enterprise construction and cultivation scope, if the investment made by an enterprise in establishing vocational education programs complies with relevant regulations, the enterprise may be eligible for deductions on the education surcharge and local education surcharge payable in that year. In order to give full play to the important role of enterprises as the main body of school operation in the implementation of vocational education, local government departments should encourage enterprises and industry organizations to hold or participate in vocational education through various forms such as sole proprietorship, equity participation, and equity investment, support vocational education institutions held by enterprises in accordance with the law and regulations, and encourage the development of joint-stock and mixed-ownership vocational schools. Local governments should effectively play the role of enterprises as the main body of vocational school operation and actively promote the integration of industry and education.

3.2.2 Explore the construction of modern industrial colleges

Local governments should promote the coordinated efforts of government, schools, industry and enterprises, closely connect with the development needs of emerging industries, and jointly build modern industrial colleges. By building a cooperative mechanism involving the government, schools,

industries, enterprises and other parties, a construction model of co-construction, co-management and sharing can be formed to give full play to the advantages of all parties and promote the high-quality development of modern industrial colleges. Vocational colleges should take the initiative to connect with industrial parks, specialized industrial teams, "chain leader" enterprises, leading enterprises and core supporting enterprises within the industrial chain, integrate and optimize school resources, formulate modern industrial college construction plans, and promote the implementation of tasks; schools and enterprises jointly establish modern industrial college councils or dedicated working groups, establish and improve the operation and management mechanism of modern industrial colleges; colleges should give priority to modern industrial colleges in terms of capital investment and the purchase of experimental training facilities.

3.2.3 Explore the construction of micro-majors

The construction of micro-majors is mainly a new model for compound talent training carried out by colleges and universities to serve the development needs of emerging industries, leading industries and future industries and give full play to the advantages and characteristics of disciplines and majors. Local governments actively encourage and support higher vocational colleges in their jurisdictions to offer micro-majors based on their own disciplinary advantages and professional characteristics, focus on the needs of new technologies, new formats, new models and new industries, cultivate students' interdisciplinary cross-integration capabilities, improve their employment competitiveness, and provide necessary financial support and policy guarantees for higher vocational colleges that offer micro-majors. All higher vocational colleges should work with industry enterprises to explore the construction of micro-majors based on existing advantages, characteristic majors or specific industries and fields, focusing on core knowledge and ability training. The construction of micro-majors should give full play to the advantages of vocational colleges and cooperate with enterprises to jointly formulate professional training plans, jointly develop 3 to 5 courses based on real projects, jointly implement evaluation and resource sharing, and jointly issue completion certificates to cultivate talents that meet the needs of enterprises. Through the reform of the dual-subject teaching model, higher vocational colleges actively explore diversified compound talent training models to further improve the adaptability of talents.

3.3 Closely match the needs and deepen the reform of the "dual subject" talent training model of schools and enterprises

3.3.1 Schools and enterprises jointly develop professional talent training programs.

Firstly, they should jointly formulate talent training programs. Schools and enterprises jointly discuss the establishment of professional groups and jointly develop industry talent training standards. Schools and enterprises jointly formulate (revise) professional (group) talent training programs, fully reflect the new requirements of industrial development for technical and skilled talents, achieve accurate matching of talent training with industrial needs, implement the "double release" system of schools and enterprises, and ensure the authority and practicality of talent training programs. Secondly, they should reconstruct the professional (group) curriculum system. The school incorporates the new technologies, new processes, and new specifications of enterprises into the curriculum standards and teaching content, realizes the close connection between teaching content and industrial needs, and

improves students' practical and innovative abilities. Thirdly, they should jointly formulate professional teaching standards. Schools and enterprises jointly formulate (revise) professional teaching standards, jointly develop professional (group) core curriculum standards, ensure the cutting-edge and practical nature of teaching content, and improve students' professional literacy and comprehensive abilities.

3.3.2 Schools and enterprises jointly develop teaching resources.

Firstly, schools and enterprises should collaboratively develop and share course resources. Schools and enterprises jointly design the curriculum system and jointly develop courses to ensure that the core professional courses offered can support professional qualification certificates, professional skills certificates and industry certification certificates. Secondly, they should jointly build a professional resource library. Schools and enterprises jointly build professional group teaching resource libraries, practical course case resource libraries combining work and study, and virtual simulation course resources based on real industry cases. Thirdly, schools and enterprises should jointly design teaching models. Drawing on the "five-step" teaching model (selection of typical application scenarios, knowledge decomposition, small-scale project training, medium-scale project reinforcement, and full-scale project design and implementation) [4], colleges and enterprises should collaboratively promote innovative teaching methodologies, including project-based learning, skills-oriented instruction, and work-process-oriented approaches. This collaboration should leverage industry expertise, integrating theoretical instruction with practical experience. Specifically, this involves utilizing enterprise technicians, real-world projects, industry processes, and work experience to provide students with a comprehensive and relevant education, so as to achieve zero-distance connection between workplace and classroom teaching.

3.3.3 The school and the enterprise jointly build a high-level "dual-qualified" teaching team.

The first is to jointly build "dual-qualified" teachers. The school and the enterprise should jointly establish a 'workstation' for 'dual-qualified' teachers and a flexible platform for part-time instructors. The enterprise annually selects a number of high-quality technical and managerial personnel to join the workstation, where they are employed as part-time instructors for relevant courses. Simultaneously, the college annually selects experienced teachers to join the workstation for full-time professional development. Through this collaboration, both the enterprise and the school contribute to the development of 'dual-qualified' teachers, equipped with the latest industry knowledge and skills. The second is to jointly create professional leaders and teaching masters. The school and the enterprise have in-depth cooperation, jointly cultivate high-level professional group leaders, jointly build teaching teams, and improve the overall level and competitiveness of professional groups; relying on the school-enterprise cooperation platform, colleges should strengthen the training and development of teachers, cultivate teaching masters or technical experts, improve the professional quality and influence of teachers, and promote the overall improvement of education and teaching quality. The third is to jointly create industry professors and skill masters. A group of qualified industry leaders and masters are hired from enterprises as industry professors to participate in the development of core courses, the construction of scientific research platforms and scientific research projects, promote in-depth cooperation between schools and enterprises, and improve the quality of education and teaching and the level of scientific research.

3.3.4 Schools and enterprises jointly develop industry-recognized certifications and formulate industry standards

Firstly, they should focus on certification development. Schools and enterprises can collaborate to translate product, technical, and service standards into industry-recognized talent certifications. This involves jointly developing and implementing certification programs that are valued and recognized throughout the industrial chain. Secondly, they should formulate industry standard. Schools and enterprises should establish expert cooperation teams to leverage their respective strengths in technology research and development, talent training, and industry best practices. These teams will collaboratively formulate and implement industry standards, thereby promoting standardization.

3.3.5 Schools and enterprises jointly overcome technical and technological difficulties

Firstly, they should jointly build a technical skills service platform. Schools and enterprises jointly build technical skills collaborative innovation centers, engineering (technology) research centers, product design centers, industry or product testing centers and other distinctive industry-education integration technical skills innovation service platforms with scientific research institutes to offer product testing capabilities, technical skills talent training, technical services, applied basic research, engineering technology development and results incubation and transformation [5]. Secondly, they should jointly form a scientific research team. With projects as the driving force and the goal of serving the innovative development of the industry, the school and enterprises jointly set up a scientific research team to carry out certain project research and achieve results transformation every year around new technologies, new processes or enterprise technological transformation, process improvement, product upgrades, etc. The third is to jointly carry out training. The school has set up an on-campus enterprise employee training base (center) to provide high-quality training services for employees of industrial chain enterprises, improve employees' technical level and professional quality, and meet the industry's demand for high-quality talents.

3.3.6 Schools and enterprises jointly implement a quality evaluation system

Joint evaluation by schools and enterprises is an important link in the integration of industry and education and school-enterprise cooperation. It aims to conduct a comprehensive and objective evaluation of talent training, teaching quality, scientific research results, etc. through the joint participation of both parties. Firstly, the diversity of evaluation subjects must be carefully considered. The joint evaluation by schools and enterprises should emphasize the diversity of evaluation subjects, including not only school teachers and students, but also enterprise experts and managers, so as to improve the objectivity and accuracy of the evaluation. Secondly, the comprehensiveness of the evaluation content must be taken into account. The content of the joint evaluation by schools and enterprises should cover all aspects of talent training, including students' professional knowledge, practical skills, and professional qualities. At the same time, the teaching quality, curriculum setting, teaching methods, etc. should also be evaluated to ensure that the quality of talent training matches the actual needs of the enterprise. Thirdly, the feedback and application of evaluation results must be a key focus. After the joint evaluation by schools and enterprises, the evaluation results need to be fed back to the relevant parties in a timely manner so that improvements can be made to the existing problems. At the same time, the evaluation results can also serve as an important basis for schools to adjust curriculum settings, improve teaching methods, and optimize talent training programs, as well

as a reference for enterprises to select talents and carry out technical cooperation [6].

4. Conclusion

Currently, the industry-education integration in Chinese higher vocational education primarily focuses on school-enterprise collaboration for talent needs assessment and internship arrangements. This approach, however, does not fully embody the principles of the 'dual subject' model. To achieve this deeper integration, six key areas of collaboration are crucial: 1) jointly formulating talent training plans, 2) jointly developing teaching resources, 3) jointly forming teaching teams, 4) jointly developing industry-recognized certifications formulating industry standards, 5) jointly addressing technical and process challenges, and 6) jointly implementing comprehensive quality evaluation. By fostering these collaborative efforts, schools and enterprises can effectively integrate industry and education, ultimately driving the high-quality development of higher vocational education.

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