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Investigation and Research on the Integration of Production and Education in Vocational Education: Current Situation, Dilemma and Countermeasures -- Taking a Province as Sample

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Abstract: *Taking the three-spiral model of education-industry-government relationship as the research framework, using questionnaire survey and interview research methods, this paper studies the current situation of the integration of industry and education in vocational education in A province. It is found that in the process of promoting the integration of industry and education, vocational schools, industrial enterprises and local governments are respectively facing difficulties in policy understanding and grasp, teachers, students' personal development, professional Settings, facilities and equipment, strategic planning, talent docking, enterprise scale, policy support, resource allocation, evaluation and supervision. Therefore, from the perspective of local governments, vocational schools and industrial enterprises, countermeasures and suggestions are put forward in order to provide reference for deepening the integration of production and education in vocational education. Local governments should strengthen policy guidance and resource support, and improve the supervision mechanism of the integration of production and education. Vocational schools should optimize the teaching team and professional setup, and build a new development model of the integration of production and education. Industrial enterprises should strengthen enterprise participation and coordination, and expand the depth and breadth of the integration of production and education.*

Keywords: *vocational school, Integration of production and education, investigation and research*

1. Introduction

Vocational education is the type of education most closely related to local economic and social development, with the training of high-quality technical and technical talents as its orientation. The orientation of vocational education determines that its direction of running a school should be market-oriented and serve development [1-2]. The integration of production and education is an effective way for vocational education to embed in the market and connect with industries, and is the most essential feature of vocational education. The Implementation Plan for National Vocational Education Reform issued by The State Council in 2019 put forward a number of measures to promote the integration of industry and education. In October 2021, the Ministry of Education and the provincial government of A issued the Opinions on Promoting the Integrated High-quality Development of Vocational Education in the whole Province and Accelerating the Construction of Skills in Anhui, taking the lead in starting the construction of a skills-based society in the country. In November of the same year, the Implementation Opinions of A Province on Promoting the High-quality Development of Modern Vocational Education were issued, which clearly pointed out that the system of integrating production and education in running schools should be improved and the school-enterprise cooperation mechanism should be innovated. This series of policy documents aims to promote the integration and cooperation between the education sector and the industrial sector, promote the organic connection of the education chain, the talent chain with the industrial chain and the innovation chain, comprehensively improve the quality of vocational education, promote the transformation and upgrading of local economy, and cultivate new driving forces for local economic and social development. This paper conducted A survey and research on the current situation of the integration of industry and education in vocational education in A province, found the problems and difficulties faced, and discussed the countermeasures to further promote the integration of industry and education in vocational education, in order to speed up the construction of modern vocational

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education system in A province, help the deep integration of industry and education in vocational education in A province, and promote the healthy development of regional economy.

2. Research design

2.1 Research and analysis framework

The integration of industry and education is a cooperative activity and relationship of complementary resource advantages between education and industry in order to promote the cultivation and development of skills. According to the triple spiral model of education-industry-government relationship proposed by Etzkowitz et al. the three are indispensable, interconnected, exchange elements and promote each other, and at the same time create a continuously developing integration-development relationship of the whole system in which they belong [8]. Under the policy guidance and institutional support of the government, the education sector (talent chain) and the business sector (industrial chain) integrate and support each other, and jointly affect the industrial and economic development of the regions where the three are located, forming a trinity integration development trend. This model provides an important theoretical basis for studying the effective promotion of the integration of industry and education by studying the interaction between various elements.

2.2 Research objects

In this study, the principal or secretary of vocational school in A province was selected as the research object, and 90 students participating in the national training project of vocational school principal training in A province were selected to carry out the investigation. The subjects were all principals or secretaries of vocational schools.29 percent of the respondents had industry backgrounds in their schools, while 71 percent had no industry backgrounds.28 percent had fewer than 2,000 students, 41 percent had 2,000 to 4,000, 14 percent had 4,000 to 6,000, and 17 percent had more than 6,000 students. Public schools accounted for 86 percent, private schools 13 percent and mixed-ownership schools 1 percent. National model schools and state key schools accounted for 32 percent, while provincial model schools and provincial key schools accounted for 53 percent.

2.3 Research methods

Interviews and questionnaires were used in this study. The researcher pay attention to the linkage between government, school and enterprise.

2.3.1 Interview method

The researcher interview principals and secretaries of Excellent Principals (Secretaries) of vocational schools in A province who participated in the National training Program to understand the current situation of the integration of industry and education in vocational schools, and investigate open questions such as the inherent difficulties encountered in the process of promoting the integration of industry and education in schools, obstacles from enterprises, and incentives for promoting the integration of industry and education in the local city.

2.3.2 Questionnaire survey method

The researcher compiled the "Questionnaire on the Current Situation of the Integration of Production and Education in vocational Schools", and conducted A questionnaire survey through the network platform for the principals and secretaries of 90 vocational schools in A province. A total of 90 questionnaires were distributed, and 87 valid questionnaires were recovered, with an effective recovery rate of 96%.

ISSN 2663-8169 Vol. 6, Issue 8: 220-226, DOI: 10.25236/IJNDE.2024.060835

3. Analysis of the current situation of the integration of production and education in vocational education

3.1 The current situation of promoting the integration of production and education in vocational schools

3.1.1 The school and industry enterprises jointly carry out professional construction and personnel training

Schools arrange students to practice or practice training in cooperative enterprises, nine schools (10%) arrange more than 80% of the students to practice training in enterprises, but the proportion of the majority of schools is still relatively low, 32% of schools only arrange 20% to 40% of the students to practice training. Students with excellent performance in internship or practical training in enterprises can stay and work in cooperative enterprises after graduation, and more than 80% of graduates in three schools (5%) stay and work in cooperative enterprises. However, in most schools, the proportion of students working in cooperative enterprises after graduation is still low.57% of school graduates can work in cooperative enterprises after graduation, and the proportion is less than 20%.The university closely cooperates with enterprises in the formulation of professional training programs, teaching plans and teaching syllabuses. Four schools (5%) jointly develop professional training programs with enterprises, covering more than 80% of the majors. However, in most schools, the degree of school-enterprise cooperation in the formulation of training programs and teaching plans is not high enough.53% of schools and enterprises jointly develop professional training programs, teaching plans and teaching syllabi, and the proportion of majors is less than 20%.Vocational schools generally pay attention to professional practical teaching, and 46% of the schools' professional practical teaching hours account for 40-60% of the total class hours. Schools also invite experts from enterprises and technical backbones as external teachers to teach practical courses and theoretical courses and to guide graduation design. In twenty-four schools (28 percent), 20% to 40% of the practical courses were taught by enterprise lecturers. In twenty-three schools (26%), the professional coverage rate of inviting enterprise technical backbone to campus for theoretical teaching and graduation design guidance is 20%-40%, and in ten schools (11%), the professional coverage rate is 40%-60%.In addition, some schools also carry out modern apprenticeship system and new apprenticeship system for enterprises, and carry out order-type talent training for enterprises. Thirty schools (34%) have more than 20% of their specialties offering modern apprenticeships and enterprise new apprenticeships.

3.1.2 Schools work with industry enterprises to build their teaching staff

The school actively attracts employees from enterprises as part-time teachers, and the part-time teachers in twenty-four schools (28%) account for 20%-40% of the teaching staff. The university attaches great importance to the improvement of full-time teachers' practical ability, and organizes full-time teachers to enter enterprises for training in a planned way. Sixty-four schools (74%) have formulated a system to support in-service teachers to practice in enterprises on a regular basis, and twenty-seven schools (31%) send 20-40% of their full-time teachers to receive training or practice in enterprises every year. Eight schools (9%) have more than 40% of their full-time teachers receiving training from enterprises every year. In addition, schools attach importance to teachers' enterprise-related work experience in the introduction of new teachers and the training of new teachers. Twenty-three schools (26%) made clear requirements for working experience in enterprises when selecting new teachers. Thirty schools (34%) have a system requiring new teachers to practice before they start their jobs.

3.1.3 Schools cooperate with industry enterprises to build bases

The university has signed agreements on university-enterprise cooperation on the integration of industry and education with industry enterprises, and actively promoted school-enterprise cooperation to improve the quality of talent training and expand social services.70 schools (80%) signed agreements with enterprises on the integration of industry and education. Schools and industrial enterprises have established special committees for the integration of industry and education to coordinate cooperation between schools and enterprises and promote mutual benefit and win-win results. Thirty-one schools (36%) set up special committees for the integration of industry and education with industries and enterprises. The schools have established alliances with industry enterprises for the integration of industry and education and the integration of work and work, jointly built off-campus talent training bases, and cooperated with large and medium-sized enterprises to build "double-qualified" teacher training and training bases, so as to promote resource sharing, enhance

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students' vocational skills and teachers' industry teaching ability, and better adapt to industry needs and market changes. More than 40% of the majors in seventeen schools (19%) have established off-campus talent training bases in cooperation with industry enterprises, and forty-eight schools (55%) have established school-enterprise cooperation and work-study combination alliances with enterprises. Sixty-two schools (71%) have established "double-qualified" teacher training bases in cooperation with large and medium-sized enterprises. In addition, schools have set up school councils with the participation of industries, research institutes and social organizations to promote communication and cooperation between schools and all sectors of society, and enhance the adaptability of vocational education and the ability to serve society. Twenty-two schools (25%) have set up school councils with the participation of industry enterprises, scientific research institutes and social organizations.

3.2 Current situation of industrial enterprises' participation in the integration of industry and education

Industrial enterprises invite schools to provide training services and technical services, and participate in product research and development to promote the improvement of employees' skills and technological innovation. Enterprises directly benefit from the educational resources and research and development capabilities of schools, realize the sharing of school-enterprise resources, reduce enterprise costs and improve the overall competitiveness of enterprises. Sixty-five schools(75%) provide training services to industrial enterprises, thirty-nine schools(45%) provide technical services to industrial enterprises, and eleven schools(13%) participate in product research and development of enterprises. The cooperative enterprises invited outstanding teachers to serve as enterprise consultants or temporary posts, obtain the latest educational information, translate the theoretical knowledge and research results of the schools into business practice, and promote the communication between schools and enterprises. In the eleven schools (13%), 20%-40% of the teachers serve as consultants or temporary positions in the cooperative enterprises. The most resources provided by industrial enterprises to schools are practical training space resources, in addition to professional lectures, financial support, research and development equipment.

3.3 The current situation of the government's promotion of the integration of industry and education

As an important force in promoting the integration of industry and education in vocational education, the government has actively acted in terms of policy support and service guarantee, fiscal and tax incentives, support for school-enterprise cooperation projects, and personnel training in vocational education, promoting the deep integration of education and industry from multiple perspectives, and improving the quality and efficiency of personnel training [3]. First, policy support and service guarantee: the local government has issued relevant policy documents to clarify the goals, principles and measures of the integration of industry and education, to provide policy basis for the integration of industry and education, and at the same time to enhance services for enterprises integrating industry and education, to ensure that the employment needs of enterprises are met, and to provide a stable employment environment for the integration of industry and education. Second, fiscal and tax incentive measures: the local government issued preferential tax policies to reduce the operating costs of enterprises and encourage the integration of industry and education through tax reduction and exemption; At the same time, the government provide financial support and incentives to encourage enterprises and schools to participate in the integration of industry and education projects. Third, school-enterprise cooperation project support: Through project support and industrial chain integration, the government promotes the close integration of school education and local industrial development, awards units with outstanding results in school-enterprise cooperation, and encourages more extensive school-enterprise cooperation. Fourth, vocational education personnel training: local governments promote the establishment of vocational education groups, through the group operation, improve the utilization efficiency of educational resources and the effect of the integration of production and education.

4. The difficulties faced by the integration of production and education in vocational education

4.1 Difficulties faced by vocational schools in promoting the integration of industry and education

Vocational schools face difficulties in the process of promoting the integration of industry and education in terms of policy grasp, teachers, students' personal development, professional Settings,

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facilities and equipment [4]. First, the lack of policy grasp. Vocational schools have insufficient understanding and policy grasp of the integration of industry and education, and lack of in-depth research on the integration of industry and education, resulting in the low feasibility of the integration of industry and education programs formulated by schools, lack of effective guarantee mechanism for cooperation with industry and enterprises, and loose and unstable cooperative relations. Second, the teaching staff is not strong. Compared with the development of the industry, there is a lag in teacher training, and vocational schools are short of teachers in specific professional fields, especially in technology-intensive or emerging industries. The existing teacher team has shortcomings in understanding the latest industry trends, mastering practical skills, and updating teaching methods, resulting in a poor match between teaching content and the actual needs of enterprises, which affects the depth and breadth of school-enterprise cooperation. Third, students' willingness to practice is not high. On the path of personal development, students' willingness to study is generally high. Influenced by higher education, many students are not willing to participate in internship and practical training in enterprises, resulting in low enthusiasm of students to participate in school-enterprise cooperation projects, which affects the talent training goal of the integration of production and education. In addition, the proportion of graduates pursuing higher studies is relatively high, and the proportion of employment is low. It is difficult for industrial enterprises to obtain the required interns and junior professionals through school-enterprise cooperation, which affects the enthusiasm of enterprises to participate in school-enterprise cooperation. Fourth, the degree of professional fit is not high. In terms of specialty setting, the degree of compatibility between the school majors and the needs of enterprises is not high, the updating of teaching content lags behind, which reduces the employment competitiveness of students, and enterprises cannot obtain talents with required skills from the cooperation, thus affecting the in-depth development and innovation of the integration of industry and education. Fifth, facilities and equipment are insufficient. The school has limited funds and lacks funds to purchase production-oriented teaching facilities and equipment for connecting industries, which limits students' practical operation opportunities and affects their vocational skills training, thus reducing enterprises' confidence in the quality of school training and their willingness to cooperate. Due to the shortage of funds, it is difficult for the school to continuously invest the necessary resources to support the in-depth cooperation with enterprises, resulting in loose cooperation between the school and enterprise, the effect is not obvious, and it is difficult to achieve the long-term goal and benefits of the integration of production and education.

4.2 Difficulties faced by industrial enterprises in promoting the integration of industry and education

In the process of promoting the integration of industry and education, industrial enterprises face difficulties in policy understanding, strategic planning, talent docking, and enterprise scale [5]. First, the policy understanding is not in place. Enterprises do not know much about the integration policies of industry and education, and do not understand the known policies well, so they cannot see the long-term benefits of participating in the integration of industry and education, lack the motivation to actively participate in and invest in school-enterprise cooperation, and gain limited benefits from it. Second, they lack strategic vision. In terms of strategic planning, enterprises lack strategic vision, only focus on short-term interests, it is difficult to find the sustainable win-win combination of the industry and education, and fail to jointly develop diversified cooperation models with schools, which limits the depth and breadth of the integration of industry and education. Third, the docking of talents is not accurate. It is difficult for enterprises to find professionals who meet their specific needs, and there is a disconnect between school education and the actual needs of enterprises, resulting in a mismatch between the skills of graduates and the expectations of enterprises, which affects the enthusiasm of enterprises to participate. Fourth, the scale of enterprises is limited. In some regions, there are fewer technical and skilled enterprises, small scale enterprises, lack of sufficient resources and ability to support the facilities, equipment and capital investment required for the integration of industry and education, which limits the implementation and effect of school-enterprise cooperation. In addition, the industrial chain of local enterprises in some regions is incomplete, and school-enterprise cooperation projects lack upstream and downstream synergies, which affects the practical application and market docking of projects, and reduces the attractiveness and success rate of cooperation.

4.3 Difficulties faced by the government in promoting the integration of industry and education

In the process of promoting the integration of industry and education, the government faces difficulties in policy support, resource allocation, evaluation and supervision [6-7]. First, the policy support is insufficient. The policy support and incentive measures provided by local governments for

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enterprises to integrate industry and education are insufficient, which fails to fully mobilize the enthusiasm of all parties. Relevant policies have been introduced, but the publicity and interpretation are not enough, and the implementation of the policies is not in place, resulting in the effect of the policies is compromised. Second, the allocation of resources is unbalanced. The uneven distribution of educational resources among different regions and schools leads to limited development of the integration of industry and education in some regions or schools. Insufficient financial support from the government has made it difficult for schools and enterprises to obtain the funds needed to implement high-quality cooperation plans and projects, and the effect of industry-education integration is not as good as expected. Third, regulatory evaluation is in place. The evaluation system and supervision mechanism are not perfect, the effectiveness of the integration of industry and education cannot be measured and evaluated in a systematic and standardized way, the government cannot effectively supervise and manage the process of integration of industry and education, and the continuous improvement and development of integration of industry and education are hindered, and it is difficult to ensure the continuous improvement of education quality and cooperation results.

5. Measures to deepen the integration of industry and education in vocational education

5.1 Strengthen policy guidance and resource support, and improve the supervision mechanism for the integration of production and education

First, we will increase policy support. On the basis of thorough research, local governments will introduce more attractive preferential tax policies and fiscal subsidy policies, set up special funds to support school-enterprise cooperation projects, and encourage enterprises and schools to participate in the integration of industry and education. Second, we should strengthen the publicity and interpretation of policies. Local governments publicize and interpret the industry-education integration policy through government websites, media and other channels to improve the transparency and awareness of the policy. Local governments hold policy interpretation sessions to ensure that schools and enterprises can fully understand the policy content and make effective use of the advantages of the policy. Third, local governments establish a balanced mechanism for allocating educational resources. We should balance the distribution of educational resources to ensure that all regions and schools have access to the necessary funding and resource support and narrow the gap between regions. Fourth, improve the evaluation and supervision mechanism. We will establish an evaluation system for the effectiveness of the integration of industry and education, formulate supervision measures for the integration of industry and education, ensure that the effectiveness of the integration of industry and education can be measured and evaluated in a systematic and standardized manner, and regularly evaluate and supervise school-enterprise cooperation projects to ensure the quality of such cooperation projects.

5.2 Optimize the teaching staff and professional setup, and build a new development model for the integration of industry and education

First, we will strengthen the construction of teaching staff. Vocational schools formulate and perfect teacher training plans, guide and encourage teachers to participate in enterprise practice, improve teachers' understanding of industry trends and professional practice skills, and improve the matching degree of teaching content with enterprise needs. Second, adjust the professional Settings. According to the market demand and industry trend, vocational schools strengthen the communication with enterprises, regularly adjust the professional Settings, update the course content, and improve the matching degree of teaching content with the actual needs of enterprises. Third, strengthen the guidance of students' career planning. The university's career planning center shall be set up to hold lectures on career development planning, provide consultation and guidance for students' career development, guide students to reasonably plan their personal development paths, promote the balance between study and employment, improve students' enthusiasm to participate in school-enterprise cooperation projects, and enhance students' awareness and participation in the integration of industry and education. Fourth, improve facilities and equipment. *Vocational schools* strive for the support of the government and enterprises, cooperate with enterprises to establish practical training bases, update the practical teaching facilities and equipment of the school, and provide students with practical operation opportunities in line with the actual situation of the industry and enterprises.

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5.3 Increase the participation of enterprises and industrial coordination, and expand the depth and breadth of the integration of industry and education

First, policy research and strategic planning should be carried out. Enterprises should organize a special team to study the integration policy of industry and education, find a win-win combination with schools, and formulate long-term strategic planning. Industrial enterprises jointly develop diversified cooperation models such as joint research and development, internship and training with schools. Second, strengthen the connection and training of personnel involved. Enterprises should establish closer cooperation with schools, participate in the formulation of major Settings and curriculum content of schools, clarify talent needs, and improve the match between graduates' skills and enterprises' expectations. Third, improve industrial chain coordination. Enterprises should strengthen the synergy between the upstream and downstream of the industrial chain, form industrial chain alliances, make joint technological innovation and knowledge sharing, and promote the deep integration of teaching content and industrial practice through school-enterprise cooperation projects, so as to improve the practicality and innovation of education. At the same time, they should actively participate in local economic development planning and promote the deep integration of industry and education with local industries.

6. Conclusion

This paper suggests strengthening policy guidance and resource support from the perspectives of local governments, vocational schools, and industrial enterprises, and improving the regulatory mechanism for the integration of industry and education. This paper aims to construct a new model of integrated development between industry and education by optimizing the teaching team and professional settings; Strengthen enterprise participation and industry coordination, expand the depth and breadth of industry education integration, and provide reference for vocational education to deepen industry education integration.

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