Innovation and Practice of the Cooperative Education Mechanism of Industry and Education Under the "Double High Plan"

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ABSTRACT

The integration of industry and education is the fundamental and essence of vocational education. The "Double High Plan" construction colleges need to innovate on the mechanism of collaborative education between industry and education to further enhance the role of the industrial chain in the training of talents in the education chain. This article elaborates on the connotation of the "Double High Plan (i.e., High-level Vocational Colleges and Professionals Construction Plan with Chinese Characteristics)" to build the college's industry-education collaborative education, analyzes the enterprise-college communication mechanism, operation governance mechanism, and professional and industrial docking mechanism of the industry-education collaborative education, gathers together from the enterprise-college cooperation platform and professional group integration, Industry-Education Group (Alliance), and Technical Service Platform, and puts forward path references and suggestions for the collaborative education of industry-education.

Keywords: "Double High Plan", industry and education collaborative education, mechanism innovation, path

I. INTRODUCTION

The integration of industry and education is the main line, essence of the high-quality development of vocational education and an important way for the development of the service industry of vocational colleges. The "Several Opinions of the General Office of the State Council on Deepening the Integration of Industry and Education" clearly stated: "Deepen the reform of vocational education and give full play to the important role of enterprises, and promote the full integration of structural elements on the supply side of talent training and the demand side of the industry". As the pioneer of vocational education in the country, the "High-level Vocational Colleges and Professionals Construction Plan with Chinese Characteristics" (referred to as "Double High Plan") construction colleges must adhere to the integration of industry and education, implement a task-based training model oriented to the real production environment of enterprises, and carry out multi-level cooperation between colleges and industries, and also establish a long-term mechanism for collaborative education between industry and education. This article takes Changzhou College of Information Technology as an example to study the innovation of industry-education collaborative education mechanism in vocational education. [1]

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II. THE CONNOTATION OF THE "DOUBLE HIGH PLAN" TO BUILD THE COLLEGES' INDUSTRY-EDUCATION COLLABORATIVE EDUCATION

A. Ideas and goals of industry-education collaborative education in vocational colleges

The "Double High Plan" construction college's integration of industry and education must adhere to the service as its purpose and employment-oriented, and vigorously promote the integration of work and study, and industry-education cooperation. The integration of industry and education in vocational colleges needs to serve the country's major strategies and socio-economic development as the goal, with the core of cultivating high-quality composite technical and technical talents required for regional economic integration and industrial structure upgrading, and . It is necessary to deepen the idea of “cooperation and win-win, common development” of the integration of industry and education into the whole process of higher vocational talent training, give full play to the leading role of industry-education cooperation and integration of industry and education in running colleges, and continuously improve the integration of industry and education in the training of technical and skilled personnel. In the role.[2]

B. "Double High Plan" colleges build the college's industry-education collaborative education

There are 1,482 higher vocational colleges nationwide. On December 10, 2019, the Ministry of Education announced the list of construction units of the "Double High Plan". A total of 56 higher vocational colleges were selected as college construction units of the "Double High Plan" and 141 higher vocational colleges were selected as a professional construction unit of the "Double High Plan". Among these "double high plan" construction colleges, some colleges are making many useful explorations in the system and mechanism of cooperative education of industry and education. Tianjin Vocational University puts forward the "Industrial College Model of Building in Enterprises, Moving Classrooms to Workshops, Moving Podiums to Posts, Internships and Employment, and Enterprise-led Industrial Colleges" to create a industry-education of "Resources, Benefits, Risks, and Destiny" the dual-subject mixed ownership secondary college model. Beijing Electronic Technology Vocational College relies on the development zone to run higher vocational education, relying on industry to run majors, and establishes a college-development zone cooperation management platform, a vocational education group industry-education docking platform, a industry-education consortium resource sharing platform, and a development zone award policy support platform system. Jinhua Vocational and Technical College promotes the cultivation of modern apprenticeship and enterprise apprenticeship by building a industry-education community of destiny, constructing a multi-party vocational education group and a characteristic industry college with government, college, social and enterprise collaboration.

Many "Double High Plan" construction colleges are closely following the latest requirements of the country in terms of industry-education collaborative education, but they do not reflect innovative elements in the mechanism, and lack a platform for industry-education integration closely integrated with the national development strategy. And parts of the content (such as mixed ownership) stay on the concept with less substantial advancement. Higher vocational colleges need to implement innovative research on the talent training mechanism of the college's "combination of work and study, integration of knowledge and action" task-based training model on the basis of a collaborative education platform that fits the national development strategy, so as to form a long-term mechanism and practice for the collaborative education of industry and education. [3]

III. INNOVATION OF INDUSTRY-EDUCATION COLLABORATIVE EDUCATION MECHANISM

Through the close connection between professional clusters and the industrial chain, innovate the in-depth integration mechanism of government, industry, colleges, and enterprises, and establish a multi-party transportation mechanism led by government support, industry guidance, industry park participation, enterprise entities, and colleges to form college-enterprise faculty construction interaction. The multi-drive mechanism of cooperation platform construction interaction, talent cultivation mutual benefit and mutual aid of technological innovation. Multi-party joint construction of a dual-subject college, information industry park, professional technology enterprise alliance, engineering technology center and collaborative innovation center industry-education collaborative education carrier, and comprehensively promote the implementation and development of the college's integration of production and education.

A. Establishing a normalized communication mechanism for "government, administration, college and enterprise"

According to the requirements of college resource construction and industrial development, innovate the construction and management mechanism of industry-education joint carrier. Through the cooperation of both colleges and enterprises to jointly build and manage teaching and research institutions, internship training bases, engineering technology and product R&D
centers, as well as joint carriers such as student innovation and entrepreneurship, employee training, and skill appraisal, improve the development capabilities of the education service industry and save corporate capital investment and operations cost, and form a task-based training model that combines students, teachers, two-way part-time, and practical training. Implement coordination and integration among multiple departments within the college, and build the internal management of teaching departments, teaching management departments, science and technology management departments, and human resources management departments based on the mechanism of "industrial chain, education chain, innovation chain, and talent chain" collaborative education Integrated long-term collaborative education mechanism. [4]

At the college level, part of the functions of the Academic Affairs Office and the Industry-University Cooperation Department are integrated to form a specialized functional department for the integration of industry and education to coordinate the integration of industry and education throughout the college. In the second-level school or department, the functions of the Office of Industry-Education Integration and the Office of Academic Affairs shall be merged to ensure that teaching and industry-education integration are fully connected. At the same time, it effectively connects with provinces, municipalities and industry enterprises, establishes normal communication channels, and keeps abreast of local industry, technology, talent and other policies and demand information.

B. Innovating the cooperative governance mechanism and giving full play to the role of industry enterprises in running colleges

With the aim of sharing and win-win, mutual benefit and mutual benefit, based on the investigation of the status quo of industry-education collaborative education in the "Double High Plan" construction college, it needs to innovate the school function, connotation characteristics and training mode of production-education collaborative education. According to the interests of the two main bodies of industry and education, starting from the cooperation mechanism, the school and enterprise will transform from the emotional mechanism to the interest mechanism, and establish the access standards and regulations for the integration of industry and education, and form a clear property right, clear rights and responsibilities, scientific and efficient Cooperative education mechanism of production and education. According to the principles of co-construction, co-management, and sharing, it will jointly carry out personnel training, scientific and technological services, project development, technical training and product research and development, and achieve mutual sharing and interdependence in governance mechanisms, benefit mechanisms, and evaluation mechanisms.

In the industry-education collaborative education cooperation mechanism, the internal industry-education cooperation governance mechanism, the industry-education integration platform incentive and management mechanism, the industry-education integration joint carrier governance structure and operation evaluation mechanism are integrated, reflecting the optimization and adjustment of the school-running mechanism of vocational colleges. Through the close connection between professional clusters and the industrial chain, it will innovate the deep integration mechanism of government, industry, schools, and enterprises, establish multi-faceted linkage, multi-mechanism drive, multi-platform construction, and multi-plan implementation of a new industry-education integration model (as shown in "Fig. 1" below), Continuously improve the main role of the integration of production and education in the training of technical and skilled personnel.

![Industry-education integration model](image)

**Fig. 1.** Industry-education integration model.

C. Establishing a professional and "business-enterprise" cooperation mechanism

According to the school-running function, connotation characteristics and training mode of the cooperative education of industry and education, innovate the technological integration, cultural integration and value integration of the school-enterprise community of interests, explore the long-term cooperation path of industry and education collaborative education. Among the various integrations of industry and education, schools are talent training, education and scientific research output, and enterprises are enterprise technology, product development and economic value output. Through the research and innovation of professional talent training cooperation
methods (modern apprenticeship, enterprise apprenticeship, embedded training, order training, work-study integration, work-study alternation, etc.), improve school personnel training (professional construction, curriculum construction, teaching standards, textbook construction, etc.) and the degree of conformity with the needs of industrial talents, enriching the connotation of the integration of production and education and collaborative education. Relying on the school-industry integration platform, bases, scientific research institutes and other school-enterprise joint carriers, the implementation of work-study, on-the-job internship, innovation and entrepreneurship, achievement incubation and transformation, enriches and innovates the combination of work and learning, and the integration of knowledge and action based on tasks. The connotation of the training model of the enterprise work scene.

A second-level school-enterprise cooperation professional construction steering committee was established in the second-level college (department) to give full play to the guiding role of industry enterprises in professional construction. At the same time, based on serving regional economic development, focusing on serving the development of key industries in Changzhou, Wujin National High-tech Zone and the Yangtze River Delta region, we will dock industrial layouts and establish in-depth cooperative relationships with well-known enterprises.

IV. PATH OF COLLABORATIVE EDUCATION BETWEEN INDUSTRY AND EDUCATION IN HIGHER VOCATIONAL COLLEGES

A. Building an "Information Industry Park" industry-education cooperation platform, and innovating the connotation of the integration of "Three Parks in One"

Through the construction of the "three-in-one" education model of the Information Industry Park, Student Innovation and Entrepreneurship Park and Internet Crowd Innovation Park, the information industry park will play a supporting role in the cultivation of school talents and create a national demonstration park for the cultivation of student innovation and entrepreneurship capabilities. Introduce resources from the Jiangsu Provincial Department of Industry and Information Technology, the two national high-tech zones in Changzhou, the national vocational education reform experimental zone and industry and enterprise resources to optimize the resource allocation and industrial layout of the information industry park. Adopt the "classified management and garden maintenance" operation and management mode, improve the incentive policies for the introduction of enterprises into the park, such as work-study alternation, internship, innovation and entrepreneurship, and achievement transformation, promote the integrated development of schools and enterprises, comprehensively improve services for local enterprises and incubate entrepreneurial enterprises of college students, promote comprehensive service capabilities such as Internet technological innovation. [5]

B. Serving the national development strategy, and constructing the integration of industrial chain and professional groups

Relying on the development advantages of the industrial Internet in the Yangtze River Delta region, combining its own positioning and the characteristics of the new generation of information technology, equipment manufacturing, and modern service related majors, the integration of the industrial chain and professional groups is the core, and the "physical system of the industrial Internet" +Network + platform + security + application" system architecture, according to the industrial Internet system architecture, the school "based on some key positions and core technologies of the industrial Internet, build software technology, information security and management, intelligent electronic technology, equipment intelligent technology, industrial 7 professional clusters including e-commerce and lean management.

C. Establishing industry education groups (alliance) to form a collaborative education pattern for a model vocational education group

The school has led the establishment of the "Changzhou Industrial Internet Industry and Education Innovation Alliance", "Changzhou Cyber Security Alliance", "Yangtze River Delta Software Vocational Education Group", "China Cyberspace Security Industry and Education Integration Alliance" and "China Software Industry Education Alliance". At the same time, as the executive vice chairman unit and executive secretariat unit of the "China-South Africa Vocational Education Cooperation Alliance", the school is based on serving local development, facing future development, promoting the transformation and upgrading of manufacturing and high-quality development, and promoting the deep integration of industry and education. Promote vocational education cooperation in the Yangtze River Delta region and even the whole country, innovate the system and mechanism of integration of production and education, and promote the organic connection of the education chain, the talent chain, the industrial chain and the innovation chain in the region. [6] Relying on the Vocational Education Group (Alliance), give full play to the role of the alliance in professional system, curriculum system, talent training model reform and teaching resource construction, strengthen and optimize the group school
brand, and promote the integration of professional construction and industrial development. [7]

D. Building a nationwide technological and technical innovation service platform, and building a carrier for the integration of industry and education, school-enterprise collaborative education

Focusing on technical services, talent training, scientific and technological research, innovation cultivation and other elements, strengthen in-depth cooperation with Changzhou City Government, industrial Internet and intelligent manufacturing and other related industries and enterprises, according to the industrial Internet technology application and service, technology research and development and innovation, and technical skills training. The logical main line is to gather the existing resources of the school to create a comprehensive service platform for industrial Internet industry, education, research and innovation through upgrading, transformation, expansion and new construction. The comprehensive service platform consists of an intelligent manufacturing collaborative innovation platform, a new generation of information technology application platform, an industrial network and security technology innovation service platform, an industrial big data technology research and development platform, a high-end equipment productive training platform, an industrial e-commerce double innovation incubation platform, Seven sub-platforms including the "Information Industry Park" Industry-University Cooperation Education Platform, as shown in "Fig. 2" below.

![Fig. 2. Industrial Internet Industry-University-Research-Creation Comprehensive Service Platform.](image)

The college integrates enterprise-college co-construction of related platform functions, such as dual-subject colleges, information industry parks, technology application and service centers, and strengthens cooperation with small, medium and micro enterprises through technology development, technology transfer, technology consulting, and technology services. So far, 14 dual-subject colleges have been jointly established by the school and well-known companies, and 16 engineering technology centers have been established as a school-enterprise technology innovation carrier including the Jiangsu Embedded Software Engineering Technology Research and Development Center.

V. INTEGRATION OF INDUSTRY AND EDUCATION, THE EFFECTIVENESS OF SCHOOL-ENTERPRISE COLLABORATIVE EDUCATION

Changzhou College of Information Technology has established 4 national-level training bases, 7 provincial-level training bases, 158 on-campus training bases, 336 off-campus training bases, including 156 compact training bases, and signed school-enterprise cooperation agreements with 824 cooperative enterprises. The proportion of internship students in cooperative enterprises has reached 17%. Each major has more than 5 stable off-campus cooperation bases. The college is gradually deepening the cooperative talent training methods of chemical engineering, titled classes/elite classes/innovative classes, modern apprenticeships, internships, and student employment. Among them, the total number of order training classes in 2018 is about 52 shifts and the number of orders is about 1940; The
total number of order training classes in 2019 is 35 classes with a total of 1,734 students. In the past three years, students have won 114 awards in provincial and above competitions, and more than 400 people have obtained high-level skills certificates in the industry. About 63.66% of the graduates are employed locally, providing human and intellectual support for the local economic development.

In the past five years, the number of full-time teachers entering the enterprise for training is 367, and the number of enterprise teachers entering the school part-time is about 625. In the past two years, the total number of part-time enterprise teachers is 165,394 class hours, accounting for 34.27% of the total professional class hours. More than 12.67 million Yuan of donations have been received from enterprises and 34 provincial and municipal industry professors have been hired. In the past three years, through school-enterprise cooperation, we have jointly carried out technical cooperation and technical services. The average annual technical cooperation and technical service projects are 210. In 2019, the amount of technical services received was 39.07 million Yuan, and the amount of technical services received in 2018 was 76.09 million Yuan. The annual amount of technical services is 16.62 million Yuan, 90% of which serve local enterprises in Changzhou. Each year, there are 15358 person-times of technical skills training conducted by regional enterprises. The average annual invention patent authorization exceeds 100, and the transformation of scientific and technological achievements exceeds 30.

VI. CONCLUSION

The "Double High Plan" builds schools with a foothold in China, facing the world, leading reforms, and serving development as their own missions. It is necessary to innovate the integration of production and education and coordinate education mechanisms, continuously enrich the connotation of school-enterprise cooperation, and effectively serve local economic development. Higher vocational colleges should adopt innovations in the communication mechanism of production-education collaborative education, operation management mechanism, and professional and industrial docking mechanism. Deepen the role and status of the main body of production-education collaborative education in school-enterprise cooperation carriers, vocational education groups (alliances), technical service platforms, and social services. Give full play to the leading role of school-enterprise cooperation and the integration of production and education in running schools, so as to continuously improve the role of integration of production and education in the training of technical and skilled personnel.

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