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Exploration and Practice of "Multi-layer,Multi-dimensional and Diversified" Double-high Talent Training Mode of Industrial Internet in Higher Vocational Colleges

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Abstract. No experience to follow for industrial Internet talent training, training mode of the single, produced the research with lack of fusion, quality security problems, such as Guangdong Industry Polytechnic industry Internet professional group of focusing on the Internet technology, artificial intelligence, a new generation of communications technology, the Internet+ industries, Enabling light manufacturing industry to transform and upgrade, Form "multi-level multi-dimensional diversity" industrial Internet "high skill + highly educated" combined "skilled + technology" combination of training mode, break through the industrial Internet industry of engineering technology, information technology, manufacturing technology for compound talents bottleneck, in talents cultivation, professional construction, team construction, social service has made remarkable achievement.

Keywords: Industrial Internet; Cross-border Talent; Integration of Industry and Education; Professional Group; Talent Training Model.

1. Introduction

The "industrial Internet" was first proposed in the government work report in 2015[1-2]. In 2017, The State Council issued the Guiding Opinions on Deepening "Internet + Advanced Manufacturing" to develop the Industrial Internet, establishing the strategic position of the industrial Internet [3-8]. Industrial Internet is the product of the deep integration of the new generation of information and communication technology and modern industrial technology. It is an important carrier of digitization, networking, and intelligence in manufacturing industry, and the commanding point of a new round of global industrial competition [9-11]. And the traditional simple processing and manufacturing and repetitive labor of the industry employees skill requirements are different, the industrial Internet needs more stringent technical personnel, the development of industrial Internet technology and industry put forward higher requirements for talent, need composite, multi-dimensional, multi-level talent; The standardization degree of industrial Internet posts is low, resulting in low matching degree of talent supply and demand; The talent system has not yet been formed, and talent training faces many difficulties. We seize the opportunities, from January 2017 to explore in the field of computer professional Internet culture industry direction combination of talent, and gradually formed a docking industry professional group of the Internet industry chain, has prepared a large number of excellent talents for the Internet industry, according to the "cross-border integration, classification of cultivation, the multiple coordination and cohesion" train of thought, The talent cultivation mode of "multi-level, multi-dimensional and diversified" has been constructed (as shown in Figure 1), namely: Around a core (double high talent training for industrial Internet application), the implementation of multi-level talent training from low to high, from general to special (medium and high proficiency, three-year general high school, 4+0 undergraduate, modern apprenticeship, flexible educational system, "Watt Workshop" pilot class), Establish multiple dimensions of the implementation of the path (cooperative development-oriented professional group, three-dimensional teaching resources, double mixed team, high level education platform), deepen the multiple cooperative education model (government, school, bank, enterprises and research the five one), build a system of quality assurance (talent training quality monitoring system), provides a typical demonstration cases made with depth fusion.

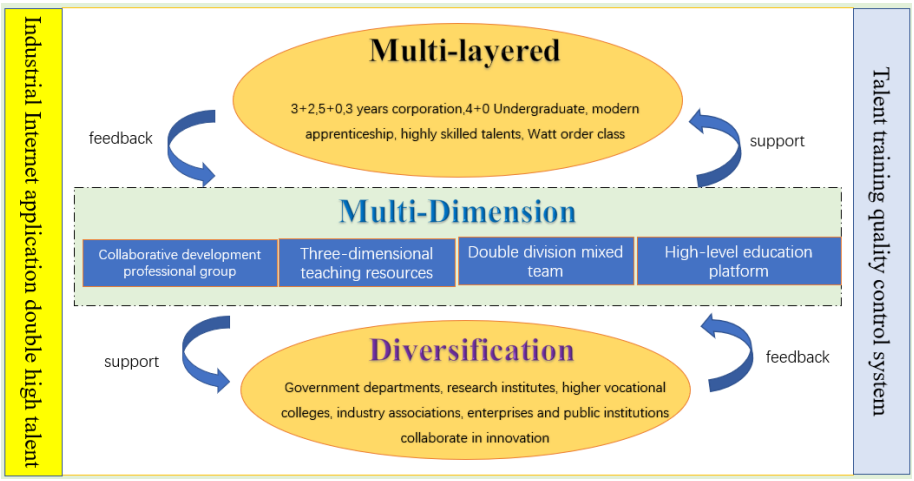

Figure 1. "Multi-level, Multi-dimensional and Diversified" talent training mode

2. Main Methods

2.1. Focus on the Characteristics of Interdisciplinary Integration and Establish the Core Goal of Industrial Internet Double High Talent Training

On industrial jobs demand as the guidance, the Internet industry chain service industry economy, for the purpose of constructing a new mode of higher vocational teaching, establish the "Internet + advanced manufacturing + vision + innovation + practice + craftsman spirit" of the talents training goal of industrial Internet play and meet the demand of industrial Internet inter-disciplinary talent of keeping pace with The Times change. In the "Internet + advanced manufacturing" cross-border integration background, the students grasp the ICT in addition to professional knowledge, but also improve dimension of knowledge, understanding of engineering technology, manufacturing technology and related knowledge, can flexible use of artificial intelligence, big data, Internet of things and industry as well as a new generation of information technology to solve problems in the process of assignment of the Internet to transform and upgrade manufacturing, To enable students to have a broad vision, a high degree of innovation and craftsmanship spirit of excellence.

2.2. Pay Attention to Multi-Layer Complementary, Realize the Diversification of Industrial Internet Double High Talent Training

Industrial Internet is the product of the integration of the new generation of information technology and manufacturing industry, which not only needs OT and IT compound talents, but also needs enterprise management talents, industry leaders, professional and technical talents, industrial workers, and other multidimensional and multi-level talents. Guangdong Polytechnic of Light Industry closely meets the urgency and diversity of regional industrial needs, and implements 3+2 and 5+0 secondary and high school majors, three-year general and 4+0 undergraduate programs. It aims to cultivate high-quality workers and technical talents of the industrial chain by classification (medium and high proficiency), high-quality technical talents (three-year general high school) and high-level technical talents (4+0 undergraduate), to meet the needs of the industrial Internet industry for skilled talents at different levels and r&d applied technical talents. On this basis, explore the implementation of modern apprenticeship system, training compound technical skills; Set up "Watt Workshop" class to accurately train talents in urgent need; To meet the needs of social talents for re-learning, we will hold courses for highly skilled talents with flexible schooling.

2.3. Pay Attention to Multi-Dimensional Interconnection and Realize the Standardization of Industrial Internet Double-High Talent Training

1.Collaborative development professional group of government, university, industry and enterprise research

Guangdong light industry professional technology institute based on vocational and technical education society of China, industrial Internet research institute, Guangdong association of Internet of things, the calculations of the Chinese Academy of Sciences, as well as the industry leading enterprises, use " Government, Schools, Industries, Enterprises and Research Institutes " multi-party cooperation, the development of the Internet industry for industry, cultivate IT precisely, CT, OT inter-disciplinary talent, Internet industry chain docking industry at all levels, Build a high-level professional group leading in China and influential in the world.

All majors in the group are organically combined and developed in a coordinated way, integrating information technology, communication technology and industrial technology, expanding the understanding of information technology and communication students on industrial knowledge, process, and business. In terms of teaching resources such as courses, training rooms and teachers, the university-enterprise cooperation has the characteristics of high sharing and mutual support, forming the organic connection between education chain, talent chain, industrial chain, and innovation chain, creating a community of destiny and exporting Guangdong Industry Polytechnic model.

2. University-enterprise construction of three-dimensional teaching resources

It is very important for the cultivation of inter-disciplinary talents in higher vocational colleges to establish scientific and reasonable curriculum system and three-dimensional teaching resources through deep cooperation between schools and enterprises. Guangdong Industry Polytechnic's Industrial Internet Professional group goes deep into the industry and conducts research on talent demand and job group in typical enterprises, and explores a dual-high talent training course system for modular industrial Internet application based on job group's professional ability. The course of industrial Internet instantiation project jointly developed by school teachers, enterprise engineers and scientists is introduced into the classroom to carry out "project-driven, rational and practical integration" teaching, and realize three-dimensional teaching by integrating modern information technology means, digital education resources and teaching content. In the professional group, the Ministry of Education has implemented the 1+X pilot certification of "motion control system development", "Industrial Internet data acquisition", "sensor network application development" and other modules. Schools and enterprises jointly share professional teaching resources, develop new loose-leaf and workbook-type three-dimensional teaching materials, and build three-dimensional teaching resources.

Through the sharing of teaching resources such as platform courses, core module courses, professional courses, and extension courses among professional groups, the "Internet +" cross-border integration is realized to cultivate composite innovative technical talents who understand both industrial technology and information technology.

3.University-enterprise joint construction of dual-division mixed team

In the context of cross-border integration, higher requirements are put forward for teachers in education and teaching ability, innovation ability, technical service ability and social service ability. Guangdong Industry Polytechnic Information Technology Institute has carried out in-depth cooperation with leading enterprises such as Gu High-tech Company to jointly build the "Industrial Internet Double Teacher Training Base". Through joint application of provincial and national training methods, vocational teacher training programs and standards are jointly formulated. Formed a stable regular double teacher training model. At the same time, relying on the project-based courses, we employ experienced industry elites as part-time teachers of the professional group, and form a cross-industry integrated teacher team with in-service teachers to make up for the shortcomings of campus teachers in market grasp and project execution. Relying on the professional group of teachers, through training, employment and other ways, the combination of professional and part-time, set up a mixed training team of teachers, to achieve the school of industrial Internet double high talent training.

4.high-level education platform jointly built by political schools, enterprises, and enterprises

Guided by the government, Guangdong Industry Polytechnic, in cooperation with industries, enterprises and research institutes, leads the establishment of "China Industrial Internet Technology Application Research Institute" and "Guangdong Industrial Internet Industry-Education Alliance" platforms, and promotes the establishment of industrial Internet Industry College. Carry out cooperation in the field of industrial Internet education, and form an ecological environment for in-depth integration of industry and education. In cooperation with industry-leading and internationally renowned enterprises, the university has established ICT Public Training Center, Taiwan TEMI Intelligent and Dynamic Innovation Talent Cultivation Center, Audiowell Innovation Research and Development Center and other on-campus training bases. It cooperated with the team of Academician Ni Gangnam of CAS Institute of Computing Technology in the integration of industry, education, and science, established the workstation of case Institute of Computing Technology, and built a high-level education platform for the cultivation of industrial Internet talents.

5, pay attention to the multiple interaction, realize the industrial Internet double high talent training system

Cross-border compound talent training is a complicated system project, only relying on the power of the school, after all, limited concerted government, industry, enterprises, research institutes and social forces to participate in, to achieve "government, school, bank, enterprises and research" to promote, can produce real has innovation consciousness, meet the needs of the industry development, a multidisciplinary integration of high technology skills talents.

6. focus on the quality of talent training, build a solid teaching quality monitoring, quality evaluation and continuous improvement system

The quality assurance system of "5 parties' participation, 4 mechanisms, 3 kinds of evaluation and 2 improvements" has been established to form a teaching closed-loop of "quality evaluation - timely feedback - continuous improvement".

5 parties: students, teachers, supervisors, enterprises (industries), professional organizations (MyCos, etc.).

4 mechanisms: quality monitoring mechanism of personnel training process, post skill achievement evaluation mechanism, post practice tracking feedback mechanism and social evaluation mechanism.

3 kinds of evaluation: occupational quality (vision + craftsman spirit), knowledge ability (Internet + advanced manufacturing), and technical skills (innovation + practice).

2 improvements: spiral improvement, closed - loop improvement.

3. Results and Achievements

3.1. Cultivate a Group of Students with Cross-Border Data Integration Ability, Innovative Spirit and Craftsman Spirit.

Through participating in corporate projects, teachers' research projects, various design and professional competitions, students have significantly improved their professional skills and practical abilities. In recent 4 years, students have participated in international and domestic skills competitions and won 45 awards, including 7 first prizes. The employment rate of graduates has been above 99.15 for four consecutive years, which is highly praised by employers. Among them, the number of people entering the cooperative enterprises and their upstream and downstream enterprises is large, which has a strong competitive advantage in the industry.

3.2. We have Achieved Fruitful Results in the Integration of Industry and Education

Four national training projects in the field of industrial Internet technology were approved by the provincial Education Department; In 2019, the "Industrial Internet Double teacher training base" was established. In 2019, "Industrial Internet Application Scientific Research and Technical Service

Team" was approved by the university. In 2020, it successfully declared and established Guangdong Provincial Industrial Internet Technology Application Engineering Center. In 2021, it will cooperate with China Industrial Internet Research Institute to apply for the professional construction standard of industrial Internet technology. The overall level of professional teaching continues to improve. In 2021, we won the first prize of university-level teaching achievements and recommended provincial evaluation.

3.3. Cultivated a Batch of "Double-Division" School-Enterprise Mixed Team

It has cultivated 2 provincial-level teaching masters, 4 of them, including 9 professors and 6 doctors, forming a provincial-level teaching team with provincial-level teaching masters as the core. Team members won one special prize of Guangdong Teaching Achievement Award in 2020, one second prize of National Industrial and Information Vocational Education Teaching Achievement Award in 2018, one training target of provincial leading professional talent, one training target of provincial excellent youth, and two provincial and municipal science and technology and information experts.

3.4. Fruitful Social Training Results have been Achieved.

In the past three years, the annual training amount has been more than 4,000 person-times, annual training income is more than 1 million yuan, and more than 30 intellectual property rights are authorized.

4. Experience Summary

4.1. Take the Industrial Talent Demand as the Guidance, Clarify the Industrial Internet Double High Talent Training Objectives

It is necessary to conduct in-depth research in the industry enterprises, determine the orientation of talent training based on the industrial talent demand and the post ability requirements, cooperate deeply with local enterprises to meet the needs of industrial development, and determine the goal of talent training.

4.2. With the Integration of Industry and Education as the Core, Explore Diversified Collaborative Education of "Government, Schools, Enterprises and Research"

Industrial Internet personnel training to have a new model, a new path. Talent training is a common problem faced by the government, society, schools and enterprises, and no single institution can independently achieve the new requirements of talent training. The multi-linkage between government schools, enterprises and research institutes is beneficial to the development of students, teachers, and vocational education, as well as local economic development. To train industrial elites and industrial workers for local economy, truly solve the problem of talent training and students' ability.

4.3. With Double-High Talent Training as the Goal, Implement Multi-Level Talent Training Path

Industrial Internet is the product of a new generation of information technology and manufacturing integration, not only need OT and IT compound talents, but also need enterprise management talents, industry leaders, professional and technical talents, industrial workers and other multidimensional, multi-level talents. Closely connect with the urgency and diversity of regional industrial needs, implement classified training of skilled talents and r&d application-oriented technical talents at different levels of the industrial chain, and meet the multi-layer talent needs of the industry with the goal of double-high talent training.

5. Promotion and Application

First, it has achieved comprehensive promotion and application in the school. To build provincial high-level professional group and provincial Industrial Internet Engineering Center; The team members have won the provincial famous teaching teachers and the training objects of provincial leading professional talents. They have won the first prize of provincial vocational college teaching Ability and informatization Teaching Competition for three times. Students have won 2 international awards, 7 national awards and 52 provincial awards. The industry certification rate of 100 %, the employment rate of 96.85%, employer satisfaction rate of 90%. Some excellent graduates work as technical backbone and management staff, with an annual salary of 100,000-200,000 yuan.

Secondly, it has been promoted in some colleges and universities nationwide. Held for the first time in the national industrial countries Internet culture projects, has host culture, provincial culture in class 6, held for the first time the industrial Internet fusion research China "education teachers' workshop, digital technology for the disabled employment base in Guangzhou first set up the Internet industry and training for the disabled, held" area "pre-season training and the brics industrial Internet innovation technology, Expanded its influence. Team members have exchanged speeches in the national and provincial Industrial Internet Conference for many times. Professor Zhai Hongyan made a keynote speech of "Exploration and Thinking of cultivating industrial Internet talents accurately" in the "2021 China Internet Conference Sub-Forum". Team members participate in the formulation of national industrial Internet technology professional standards and teaching standards; Many of them are special experts of enterprises.

In addition, the results of more than 30 domestic vocational colleges to learn from, Shunde vocational and technical college, Ali Cloud and other more than 50 enterprises and institutions to visit the study of experts, and give praise. Lu Xin, former Vice Minister of The Ministry of Education and president of China Association of Vocational and Technical Education, and leaders from government departments and industries such as Vocational and technical Education Center of the Ministry of Education, Information and Software Department of the Ministry of Industry and Information Technology, Education Department of Guangdong Province and Guangdong Internet of Things Association visited the school to guide the work of industrial Internet, and affirmed the achievements achieved. People's Daily, Xinhuanet.com, Nanfang Daily, New Express, Guangzhou Daily, and other media or clients to report or reprint.

This case is applicable to higher vocational colleges or higher vocational colleges, especially those with high-quality industrial Internet leading enterprises. It is mainly applied to the integration of industry and education in higher vocational colleges, such as the construction of industrial Internet specialty group, professional course system, talent training mode, school-enterprise cooperation, and education. It is worth noting that the training of industrial Internet talents starts from typical positions and post ability requirements, combined with the actual situation of colleges and universities, in line with regional economic development. The construction of professional group should start from the overall situation of cultivating talents in the whole industrial chain of the industrial Internet, break through the barriers between disciplines and specialties, and integrate multi-disciplines and specialties.

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