Countermeasures and Suggestions on Solving the Talent Shortage of Manufacturing Industry with Vocational Education Innovation in Wenzhou

Xiqian Yu1,2
1University of Baguio, Baguio, Phillipines
2Wenzhou Polytechnic, Zhejiang, China

Abstract

The proposal of "Made in China 2025" strategy points out the direction for the transformation of China's manufacturing industry. The implementation of the National Vocational Education Reform Implementation Plan provides intellectual support and talent guarantee for the realization of the strategic goal of "Made in China 2025". In this context, this paper analyzes the five characteristics of talent demand of Wenzhou manufacturing enterprises, and finds out the four core problems of talent shortage board covering imbalance between supply and demand, internal talents flow outward, difficult to attract outside talents, and lack of talents in transformation and upgrading. Then, this paper puts forward eight paths for accurate implementation, which are innovating the integrated training mode of "enrollment-training-employment", implementing the strategy of "moving schools into the industry district" and creating a number of county industrial colleges, establishing a Wenzhou Sino-German vocational education and collaborative innovation development demonstration base, establishing a training center for skilled workers or a continuing education base for employees, introducing enterprises into the university to jointly build a productive training base in the university, implementing professional optimization strategy and closely connect with pillar industries, exploring subversive changes in campus form and forming the conditions for the integration of industry and education, promoting the reform of the school running system linking secondary and higher vocational education. Solve the shortage of manufacturing talents with vocational education innovation, and systematically build a new pattern of vocational education development in Wenzhou, so as to provide "Chinese Characteristics, Zhejiang Sample, Wenzhou Model" for the development of world vocational education, and boost the high-quality development of manufacturing industry.

Keywords

Vocational Education; Manufacturing; Talent; High Quality.

1. Introduction

Manufacturing industry is the main body of the national economy, the foundation of building a country, the instrument of national development and the foundation of a strong country. Over the past four decades of reform and opening up, more than 70 percent of new front-line employees in China's manufacturing, emerging industries and service sectors have come from vocational colleges. Facts have proved that Vocational education in China provides a strong support for the construction of socialism with Chinese characteristics. The Implementation Plan of National Vocational Education Reform (hereinafter referred to as Article 20 of Vocational Education) issued in 2019 marks the arrival of an opportunity period for the high-quality development of vocational education, and also endods vocational colleges with a historical
mission -- service manufacturing industry and high-quality development of students [1-2]. It has made a great breakthrough in a series of aspects such as status, standard and scope of vocational education, and clarified the direction and development goals of vocational education reform. Because manufacturing is our strong industry. We will implement the "Made in China 2025" strategy, pursue innovation-driven development, apply smart technologies, strengthen foundations, pursue green development, and move faster to transform China from a manufacturer of quality. [3-5]

Teaching into [2020] 7 issued by the "vocational education to improve the quality of training excellent action plan (2020-2023)" proposed through construction, so that vocational education and economic and social development needs more closely aligned with the people's expectations, with China's comprehensive national strength and international status more match. Modern vocational education system with Chinese characteristics is more complete, the system will be further improved, the standard will be improved, a sufficient condition is more and more scientific evaluation, the development of specialized subject in higher vocational education as the optimization of the structure of higher education and the important ways to develop power of craftsmen, artisans, a large number of regional development in urgent need of high quality technical skills. [6]

The Circular of the Ministry of Education on Learning, Publicity and Implementation of the Important Instructions of General Secretary Xi jinping and the Spirit of the National Vocational Education Conference (Qicheng (2021) No. 3) clearly points out that vocational education should be placed in a more prominent strategic position. Unswervingly adhere to the basic orientation, to improve the talent training type education system, deepening the reform of vocational education, the construction of technical development of social and strengthen security mechanism, under the strong leadership of the party, fully implement the party's education policy, to follow the law of development of vocational education and technical skills talents growth pattern. We will promote the high-quality development of vocational education and provide solid personnel and technical support for comprehensively building a modern socialist country. Vocational education is an important basis for training technical talents, promoting employment, entrepreneurship and innovation, and promoting the level of Chinese manufacturing and service [7]. Therefore, without the modernization of vocational education, there would be no education modernization, and without the modernization of education, there would be no high-quality development of Chinese manufacturing. In the future, we should focus on technological change and industrial upgrading, promote integration of industry and education and cooperation between schools and enterprises, attract more young people to receive vocational education, and effectively link the education chain, talent chain with the industrial chain and innovation chain.

Wenzhou, as an important birthplace of China's reform and opening up, has created the world-renowned "Wenzhou manufacturing" of low-voltage electrical, auto and motorcycle parts, pumps and valves, shoe leather, textile and clothing, machinery and equipment and other industries [8]. The new era is a new period of automation, informatization, digitalization and intelligence in manufacturing industry. Faced with the new situation of continuous optimization and upgrading of industrial structure and accelerating updating of technical skills, talent advantage has become the main winning factor in the game of manufacturing industry [9]. Therefore, the high-quality development of Wenzhou manufacturing industry not only needs the elite of manufacturing technology and management talents and upgrading increment, but also needs to cultivate high-quality skilled talents and optimize the stock. It is urgent to solve the talent shortage of manufacturing industry with vocational education innovation, so as to provide strong talent support for the high-quality development of Wenzhou manufacturing industry [10].
2. Characteristics of Talent Demand in Wenzhou Manufacturing Enterprises

Through visiting 103 enterprises in Wenzhou, involving Wenzhou's key traditional manufacturing industries such as low-voltage electrical, automobile and motorcycle parts, pumps and valves, machinery and equipment, textile and clothing, the focus of the research on the demand for talents in enterprises. The research shows that the talent demand of manufacturing enterprises is seriously insufficient, and the talent demand presents five characteristics.

First, hierarchical demand -- diversification. The high-quality development and reform of the manufacturing industry has put forward new and high requirements on the skill structure, knowledge structure and intelligence structure of workers, and promoted the diversified demands of workers at different levels. Since the 21st century, Wenzhou's manufacturing industry has been developing steadily and steadily, its strength has been gradually enhanced, and its development has been generally good. However, the phenomenon of low technological content, lack of independent intellectual property rights and low level of skilled personnel has become increasingly prominent. In the interview survey, it can be found that the current manufacturing industry is in urgent need of vocational talents. Nearly 95% of the surveyed manufacturing enterprises believe that more than 75% of vocational talents are needed. In view of the traditional enterprise's three-level classification of engineering talents, technical talents and skilled talents, higher vocational colleges set corresponding talent training objectives, thus developing different levels of talent training mode. However, the reality of high quality development of benchmarking manufacturing industry requires that industrial workers not only have the ability of first-line skill operation, but also have the ability of applying technical guidance and improving skill operation. To put it simply, high-quality development in manufacturing promotes a more diverse talent demand.

Second, professional demand -- refinement. The specialization, specialization and refinement of work are the inevitable requirements of reform and opening up and socialist modernization construction, which makes the division of labor of human society more and more fine, and social production highly specialized, and then puts forward specific requirements for the specialization and refinement matching of skilled talents. According to the survey, the satisfaction degree of professional talents matched with the enterprise industry is less than 48%, which shows that the structural contradiction of talent specialty is prominent at present. The professional setting of traditional vocational education will not be suitable for the high quality development of manufacturing industry. Based on this, vocational education colleges should have more detailed and clear requirements for the professional classification of highly skilled talents. It is urgent to build the curriculum system of "practical application", construct the curriculum system of professional education, and realize the perfect fit between professional ability and industry demand.

Third, the demand of appraising land -- gradually weakened. Talent is the primary factor in promoting economic and social development and a strong support for the sustained and steady development of industries. The 103 manufacturing enterprises generally reported the lack of registered talents in their respective regions and adjacent regions, and the supply of localized talents weakened. With the rapid development of China's economy, the forms of employment, employment concept, interest pattern and other increasingly diversified, people's employment due to the national policy, personal experience, their own ability and values and many other factors, the trend of diversification. At present, more and more Wenzhou people go out for employment, resulting in the local talent "can not stay", foreign talent "can not be introduced into the new plight of talent is the manufacturing enterprise benefit creation directly bear, is the key force to transform scientific and technological achievements into real productivity.
Therefore, the quality development of Wenzhou manufacturing industry must solve the first problem is the localization of talent.

Fourth, the need for literacy -- integration. At the National Education Conference, General Secretary Xi Jinping pointed out that education is an important cornerstone of national rejuvenation and social progress, and that education plays a decisive role in "improving the overall quality of the people, promoting human development, enhancing the creativity and creativity of the Chinese nation, and realizing the great rejuvenation of the Chinese nation."

Undoubtedly, the cultivation of professional quality is of great significance to realize the high-quality development of manufacturing industry, realize the fundamental function of education and realize the great rejuvenation of the Chinese nation. It has become an important responsibility of higher education in the new era to cultivate comprehensive technical talents with high quality. From the perspective of the talents entering in recent years, especially the new college students, there is a widespread lack of professionalism and composite ability. With the optimization and upgrading of the manufacturing industry structure and high-quality development, the manufacturing industry will have higher and higher requirements for the comprehensive professional quality of skilled talents. Therefore, vocational colleges should cultivate college students' recessive and comprehensive professional qualities besides professional knowledge from the basic values, professional ethics and professional behaviors in their career, so as to cultivate college students into high-quality compound talents in line with the needs of enterprises.

Fifth, the demand for skills -- high-end. The intelligent production of manufacturing industry is not simple and crude de-artificial, but puts forward higher requirements for operators, which require operators to have strong subjective initiative and high-end skills to match the intelligent production system of manufacturing industry. The traditional weakened manufacturing personnel can not keep up with the change of skill demand, and the practical skills of the new college students are seriously insufficient, which can not meet the requirements of the enterprise, and it is difficult to achieve the old to lead the new, with the new to promote the old skills to produce high-quality product output.

It can be seen that the talent shortage is the most prominent core problem facing the high-quality development of Wenzhou manufacturing, especially the lack of localized high-quality skilled personnel.

3. Analysis of Reasons for Insufficient Supply of Manufacturing Talents in Wenzhou

Through the interview and investigation of 103 Wenzhou key traditional manufacturing industries, such as low-voltage electrical, automobile and motorcycle parts, pumps and valves, machinery and equipment, textile and clothing, the matching degree of professional talents in manufacturing enterprises is less than 48%, and the required type of higher vocational talents accounts for more than 75%, and the structural contradiction of talent specialty is prominent.

First, the imbalance between supply and demand. Wenzhou vocational education system, which consists of 6 higher vocational colleges (including technical colleges) and 39 secondary vocational schools (including technical schools), is the backbone force for the training of technical talents at the front line. However, due to the specialty setting that does not match the needs of manufacturing industry, few practical teaching hours, and no systematic training system of professional quality, etc. As a result, the supply of talents in the number of talents, practical skills, professional quality can not fully meet the needs of manufacturing enterprises.

Second, "intra-regional outflow". Because Wenzhou has many disadvantages in geographical location, ecological environment, development space and other aspects, the return rate of Wenzhou students studying abroad is low, which indirectly leads to the brain drain. At the same
time, due to the rapid development of the manufacturing industry in central China, the cost of nearby employment is low, conducive to family care and other factors, leading to the original Wenzhou front-line skilled new people in the manufacturing industry to return to their hometown to start their own businesses and employment, aggravating the loss of manufacturing talent.

Third, "It is difficult to induce foreign countries". In recent years, although the municipal government has issued "40 new policies" for talents, it pays more attention to the introduction of high-end talents. As for the large number of middle-end talents required by traditional manufacturing industry, the policy benefits are not obvious. At the same time, compared with first-tier cities in China such as Shanghai, Hangzhou, Guangzhou and Shenzhen, Wenzhou’s talent attraction index is a little lower, and the actual number of talents is less, especially the attracting effect of middle-end design, manufacturing and management talents urgently needed by the local manufacturing industry is not good.

Fourth, "upgrade lack of talent". Under the new situation, in the transformation and upgrading of manufacturing enterprises in Wenzhou are changing into the equipment, machine substitution, transformation and upgrading, such as hot flashes, digital management in the production of intelligence and technology content, the technical skill to improve the line workers, lead to the original line producers cannot adapt to new technology, especially the lack of a group of the pursuit of excellence, exquisite workmanship, master craftsman type. With the deepening of supply-side structural reform, the demand for complex high-tech talents is bound to be more vigorous.

4. Innovate Wenzhou Vocational Education Model, Speed up the Crack of Manufacturing Talent Shortcomings of Countermeasures and Suggestions

With "made in Wenzhou" as the core, focusing on five traditional manufacturing industry to upgrade and five emerging industries of strategic importance to foster the skills of talent demand, outstanding talent localization and the lean, the label "vocational education article 20", the top vocational education as a whole to design, take effective policy measures, the introduction of Germany "dual system" localization and innovation practice, To mobilize the enthusiasm of political schools, enterprises and enterprises to integrate, educate and share education, promote the high-quality development of Vocational education in Wenzhou, and build the Wenzhou model of vocational education with Chinese characteristics in the new era.

(1) Innovate the integrated training mode of "enrollment - cultivation - employment". As the first project school in the field of vocational education cooperated with Germany by the Ministry of Education, Nanjing Higher Vocational and Technical School took the lead in implementing the "dual system" in 1982, exploring the path of "copy-transfer-migration-innovation" and forming the talent training mode of "government support, school main body, school and enterprise dual center". At the same time, Jiangsu province took the lead in introducing the international general vocational qualification certificate examination. Upon graduation, students can obtain the HWK and AHK certificates of German Handicraft Guild and the professional skill grade certificate of Municipal Labor Bureau, realizing the "double certificate" integration of academic certificate and vocational qualification certificate. After nearly 40 years of exploration and practice, a number of "dual-system" Sino-German colleges have been established in various parts of the country and achieved outstanding results. Therefore, in Wenzhou vocational &technical college take the lead in establish a sino-german college, introduced advanced German "dual system" vocational education standards (as shown in figure 1), using the German vocational education training mode, idea, standard and curriculum, and actively promote German teaching integration of theory and practice in
Wenzhou local application, integrated innovation "admission - culture - employment" teaching mode, Efforts should be made to construct a professional education system integrating industry and education with Wenzhou characteristics and a modern vocational talent training program. The training mode for German "dual system", combining with local realities, government and enterprises in the university, students and parents signed the "dual orientation" training agreement, on the basis of the proposed framework + enterprise "campus training" between produced the talent training scheme, guide enterprises to participate in the student's career planning and vocational skills training, Integrate the professional qualities and skills required by the post into the whole process of talent training.

At the same time, the training mode has been constantly improved and optimized in practice. Since 2017, Rui'an College of Wenzhou Vocational and Technical College has actively explored the school-enterprise collaborative education mode of "dual yuan, nine total, targeted employment". This mode relies on the dual main body of school and enterprise, implementing the joint development of training programs, joint development of curriculum system, joint compilation of textbooks, joint construction of bases, joint assessment of ability, sharing of school and enterprise teachers, sharing of training and practice facilities, sharing of research and innovation resources, joint recruitment of students, and promoting targeted employment. The first set of "Ruili integration class, after the establishment of automotive and motorcycle integration class, mechanical and electronic integration class, by the open area technology marketing integration class. Participated in the students' practice and employment in the enterprise, and obtained high recognition and unanimous praise from the enterprise. Some students have become the technical backbone of enterprises.

(2) Implement the strategy of "moving schools into districts" and create a batch of industrial colleges in counties. In 2016, Rui'an Municipal Government and Wenzhou Vocational And Technical College established Rui'an College, an industrial college with the pillar industry of automobile and motorcycle parts as the core. Rui'an College took the lead in the practice of "school moving into the district", built the school in the industrial agglomeration area, established the major on the industrial chain, and jointly carried out "integration" and "pre-employment" dual-directional talent training. It has been fully recognized by Rui’an Enterprise and highly recognized by the government. In 2020, Yongjia County government and Wenzhou
Vocational and technical College will establish Yongjia College featuring pump valve and culture and tourism pillar industries. In 2021, ouhai District government will cooperate with Wenzhou Vocational and technical College to establish Wenzhou Design College featuring glasses and shoes and clothing pillar industries. In view of the characteristics of Wenzhou's massive economy, the city's six vocational colleges and some secondary vocational schools make use of high-quality educational resources, give full play to the advantages of professional characteristics, according to the future development needs of emerging strategic industries, arrange the construction of supporting industrial colleges in advance, and cultivate the skills and practical talents needed in the future.

At the same time, combined with the strategy of "moving to the district", the implementation of pre-employment talent training. Pre-employment talent training is mainly for freshmen and sophomores in school. They can book employment in advance and become prospective employees of enterprises to achieve accurate co-education between schools and enterprises. The early stage of the school organization leaders visit companies, professional, head teachers, through "three see a talk about" understanding of enterprise, a talk with manager or personnel manager talk about enterprise development planning, human resource planning and job requirements, etc., three is a look at workshop, dormitory, three second looking at canteen, finally selected to participate in the enterprise employment, The school and the enterprise signed the Agreement on the establishment of pre-employment classes. The enterprise releases the job demand table, initiates the student to carry on the forecast name, the on-site consultation, then arranges the student to visit the corresponding enterprise. Then, the student formally sign up, the enterprise comes to the school to arrange the interview, the student, the enterprise two-way choice, agree after the enterprise, the school, the student and the parent sign "pre-employment orientation training agreement", the student becomes the enterprise "quasi-employee", the organization is not teaching period enters the enterprise practice work. In 2018, Rui'an College of Wenzhou Vocational and Technical College established a pre-employment class with 24 leading enterprises in Rui'an city, and 132 students became prospective employees. In 2019 and 2020, we established pre-employment classes with 45 enterprises, and 300 students became prospective employees, realizing university-enterprise oriented co-education and effectively serving the economic development of the county.

(3) Establish Wenzhou Sino-German Vocational Education and Collaborative Innovation Development Demonstration Base. Promote vocational education alliance with Germany and China southern of cooperation alliance, Zhejiang China-Germany intelligent manufacturing innovation research cooperation, Wenzhou vocational and technical college, Wenzhou technician college, Wenzhou Binhai vocational education center and five billions of grade industry representative enterprise (Chint, Rayleigh, Yalong, Changjiang electronics, etc.) as the main body, guided by the demands of manufacturing application, in university-enterprise cooperation as the carrier, We will establish an international cooperation mechanism for industry, education and research, and jointly build a China-Germany demonstration base for education and collaborative innovation development that integrates the functions of talent training, advanced technology transfer, and industrial transformation and upgrading. About 10 china-Germany cooperation projects will be agreed in the first batch, and new models of whole-chain cooperation between governments, schools, industries, capital and enterprises will be explored.

(4) Support the establishment of training centers for skilled workers or continuing education bases for workers. Taicang, Jiangsu province, known as the "hometown of German enterprises in China", has established a Training center for professional and technical workers of German-funded enterprises since 2001. Relying on vocational colleges, taicang has established a school-enterprise joint training center that serves the local area and radiation the surrounding areas. It has increased financial subsidies for self-built training centers of enterprises in accordance
with regulations. The practice of school-enterprise joint training center cultivates thousands of "technical blue-collar workers" for Taicang every year, solving the problem of technical personnel shortage in a number of enterprises. To this end, relying on Wenzhou high and vocational schools, industry associations and industrial backbone enterprises, the city's human social security, economic and information technology departments to coordinate and guide the construction of a number of manufacturing skilled workers training centers or workers continuing education base, innovation online and offline hybrid talent training mode. Special training shall be conducted for professional and technical personnel in key industries, key links and high-end product manufacturing as well as industrial workers with high loyalty.

(5) Support the introduction of enterprises to the university to build a productive training base on campus. We should guide and support middle and higher vocational schools to open part of the site, recommend high-quality enterprises to join the school to build productive training bases, and the enterprises will provide equipment and part of the funds. The whole process of school and enterprise joint management will realize the exchange of production and training, cultural integration and resource sharing between school and enterprise, which can not only meet the production function, but also meet the teaching function. At present, as wen yuan Ryan college cooperate with Rui’an city business bureau, guide enterprises enrolled has been built to learn while doing two production bases of campus, a suitcase and Macao electricity, located enterprises normal operation at the same time in the school, turn electricity business activities for the students practice post, and sign up students become professional "prospective employees", assume the incubation function in training. FIG. 2 creates an overview diagram for the conditions of integrating production and education in the new campus.

![Figure 2. Overview of the creation of the conditions for the integration of production and education in the new campus](image)

(6) Implement professional optimization strategies to closely connect pillar industries. It is necessary to investigate, analyze, adjust and optimize the specialty setting of middle and higher vocational schools so that it can be closely combined with regional industries. At the same time, it is suggested to revise the Evaluation Standard of Middle and higher Vocational Manufacturing Specialty, and formulate the training program and curriculum of middle and higher vocational manufacturing according to the standard. Outstanding professional Settings and industrial demand docking, the course content and post demand docking, teaching process and docking of the production process, the school recruitment of students and enterprises hire docking,
work employment and jobs docking, professionalism and corporate culture docking, graduation certificate and qualification standard docking "seven dimensions of effective docking", and as an important content examination.

(7) Explore subversive change of campus form to create educational conditions. "Vocational education article 20" puts forward practical teaching class accounts for more than half of the total teaching hours required, therefore, higher vocational colleges should take the lead to disruptive change of campus form, by teaching, training area, living area, movement area, administrative region based on the traditional campus composed of increase parish, training, research and development, production in accordance with the "government guidance, industry guidance, build between colleges, "Market operation" train of thought, referring to the German "dual system" training mode, to build a three-level training practice system of on-campus basic training + school-enterprise joint production training and production training + off-campus on-the-job training, to create a new form of production education and shared campus conditions of integration and co-education.

We will reform the system for connecting middle and higher vocational schools. Secondary vocational education is an important link in the chain of talent training, which is not only the fundamental basis of high-quality talent training, but also an important path of talent localization supply. Therefore, it is necessary to formulate the reform plan and outline of middle vocational management, try first, and solve the integration problem of middle and higher vocational talents training. Cancel the enrollment examination of technical secondary school, high school examination system at the beginning of specification school recruitment of students to take on the basis of the study results of registration system, focus on exploring the higher of the "3 + 2" dual directional cultivation between colleges recruit students, university-enterprise joint interview, synergy with appropriate skills of satisfy the business enterprise needs skills and career interests of students, improve people post match degree effectively. At the same time, with the support of the provincial government, we will expand the 3+2 plan for the connection between middle and higher vocational schools, so that the 3+2 plan of each higher vocational school will reach a certain proportion of the overall plan of the year, and be moderately inclined to manufacturing majors, so as to create conditions for the localization of manufacturing talents.

5. Summary

With the continuous advancement of the transformation and upgrading of China's manufacturing industry, there has been a great change in the quantity and quality of the corresponding talent demand. Under the background of such great development and reform, vocational education has much to do and should achieve great achievements through its own efforts. Based on current situation of the development of Wenzhou manufacturing industry as an example, this paper analysis the five characteristics of Wenzhou manufacturing enterprise talent demand in their clinging to the talented person short four core problem, put forward eight paths for accurate implementation, multidimensional vocational education innovation, talent demand is short board manufacturing problems, and the related major of Wenzhou vocational and technical college to carry out theoretical research and practical exploration, To construct a new pattern of Wenzhou vocational education development systematically, boost the high-quality development of manufacturing industry, and provide a systematic, coordinated and feasible new idea for vocational education to serve regional economic development.
References


