



Research on the Development Path of Information Vocational Education for Intelligent Manufacturing Specialty Under the Background of “5G+ Industrial Internet” Era

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Abstract. With the transformation and upgrading of intelligent manufacturing technology under the background of “5G+ industrial Internet”, great changes have taken place in industry, production mode and talent demand. Cultivating intelligent manufacturing high-skilled talents adapted to The Times has become the primary task of higher vocational education. By analyzing the impact of the coming of the era of “5G+ Industrial Internet” on the intelligent manufacturing industry, this paper explores the development path of information vocational education for intelligent manufacturing majors under the background of “5G+ Industrial Internet”.

Keywords: 5G era · Industrial Internet · Intelligent manufacturing · Vocational education · Informationized teaching

1 Foreword

“Developing an industrial Internet platform” has been written into the Chinese government work report for four consecutive years. 5G has the traits of high speed, low delay and interconnection of everything, which can make different devices become intelligent and build a bridge between different industries. With the advent of the 5G era, the industrial Internet has gained considerable development. 5G is used to promote the development of manufacturing enterprises toward the direction of “Internet of everything and control of everything”. A total of 1,500 5G+ industrial Internet projects are under construction, which will strongly promote the upgrading of traditional manufacturing to networking, technologies and digitalization.

With the development of vocational education to a high level, it is urgent to train all kinds of high-level technical talents. With the arrival of “5G+ Industrial Internet”, the transformation of enterprise industrial structure also puts forward new demands for the knowledge, skills and personal qualities of manufacturing talents in different fields. The demand of single operation skilled talents turns to the demand of technical skill

complex talents. Under the personalized market demand, applied talents need to have the ability of innovative thinking, digitalization and information technology. “5G”, “Internet plus”, information technology and “artificial intelligence plus” provide important carriers for cultivating interdisciplinary talents. It is necessary to grasp the multi-disciplinary knowledge efficiently and quickly [1].

2 New Development of Intelligent Manufacturing Under the Background of “5G+ Industrial Internet”

With the explosive growth of information, the emergence of new technologies such as industry 4.0, “Internet plus” and “manufacturing” is being transformed into “intelligent manufacturing”. Skilled application of 5G technology provides a reliable platform and innovation impetus for the upgrading of China’s manufacturing industry. 5G technology is promoting the in-depth development of digital, green and intelligent manufacturing industry.

2.1 Industrial Convergence

The scale of China’s manufacturing industry is huge, and it needs the participation of multiple industries no matter it is transformation, renewal or upgrading. In order to adapt to intellectual technology, traditional machines and equipment need to integrate digital twinning, innovative human-computer interaction, 3D printing, intelligent maintenance and other intelligent technologies. Intelligent manufacturing is connected by manufacturing management (MES), supply chain management (SCM), enterprise resource planning (ERP), product life cycle management (PLM), customer relationship management (CRM) and other systems [2]. The advantages of 5G and industrial Internet information technology will be utilized to promote the combination of manufacturing and other industries to form a series of emerging sectors, such as design, research and development, experiment and other departments dedicated to providing R&D services for the manufacturing industry and adapting to the development needs of industrial Internet; And testing, maintenance, component customization, third-party logistics, supply chain management optimization and other industrial sectors that use 5G technology to provide professional services for the development of the manufacturing industry [3]. In order to adapt to the interconnection of all things in the whole society driven by 5G, product innovation in the manufacturing industry can be promoted, and more intelligent and networked products will appear. More and more industries are integrated around intelligent manufacturing through the industrial Internet, and more emerging industries are derived.

2.2 Transformation of Manufacturing Mode

“Industry 4.0” and digital twinning have made it possible for China’s intelligent manufacturing to overtake at corners. The simulation process of digital twin technology is completed in the virtual space to map the entity equipment cycle process. By collecting

customers' personalized needs and matching the best design, technology and production with the industrial Internet platform, products can be quickly launched and captured in the market. Intelligent manufacturing is transforming from production-oriented to service-oriented, and standardized production is transforming to personalized customization. Vocational education and training should be adjusted in time to the change of manufacturing mode.

2.3 Demand for Intelligent Manufacturing Talents

The accelerated development of information technology has led the human society to the era of industrial Internet. The industrial economic model has been transformed from scale economy emphasizing scale and standardization to flexible economy emphasizing value-added and individualization. The personnel, organizations and posts of enterprises have undergone great changes. First of all, intelligent equipment replaces traditional processing equipment, simple and repetitive front-line operators are replaced by industrial robots, high-end management talents are replaced by big data and some powerful APP and management software, but the design, maintenance and project management talent will be increased. Second, job task complicated, intelligent devices is all sorts of information technology and the integration of machinery and equipment, machinery industry has gradually become smarter, flexibility, networked, motors, globalization, at the same time, the change of production pattern, product specifications and more and more single batch quantity is small, more personalized requirements, higher to the requirement of process, technology and customer service. The industrial transformation and upgrading and the arrival of 5G+ Internet era have a fundamental change in the demand for talents. The employees in the intelligent manufacturing industry must master the digital ability, innovative thinking ability and information technology ability, and can participate in on-site debugging and solve substantive problems with complex technical skills [4].

3 The Dilemma of Information Vocational Education

With the rapid development of "5G+ Industrial Internet", intelligent manufacturing expands from traditional and narrow manufacturing process upgrading to broader process reengineering. Low-end vocational education disconnects the quality of talent supply and industrial development. Industrial hollowing leads to a widening gap between existing labor force technology and high-end industry requirements, and existing talents cannot meet the demand for intelligent manufacturing positions in the industrial Internet era. Vocational education informatization reform is the key to cultivate technical talents suitable for the current labor market demand of manufacturing industry. In essence, there are many difficulties in the development of vocational education informatization, which are embodied in the following aspects:

3.1 Smart Campus is Taking Shape

Smart campus is the extension and expansion of digital campus. As the core content of university informatization construction, smart campus fully integrates scientific research,

management, teaching and campus life based on the Internet of Things and the application service system as the carrier [5]. The smart campus aims to create an intelligent, open, convenient and comfortable working, learning and living environment for teachers and students. After more than ten years of construction, in terms of life services, the smart campus has basically achieved complete informatization of consumption and borrowing. However, the construction of course informatization is still an isolated island, which involves property rights and copyright protection, campus network restrictions, the information course platform between universities cannot be shared, and high-quality course resources cannot be fully utilized. The campus platform also lacks the function of online live broadcasting. Its main function is tutoring and teaching, which does not play a leading role in information-based teaching. Offline teaching is still based on PPT teaching, supplemented by other information means. Without a unified course information platform, teachers' online information teaching channels are diversified and data are scattered. Students in the same class install different APPS to attend classes, which is not only inconvenient for school teaching management, but also easy to cause confusion in students' learning.

3.2 The Rate of High-Quality Shared Courses is Low

It is the inherent law of education that informatization drives modernization, and excellent open online courses are powerful measures to promote education informatization [6, 7]. Exquisite online courses show the characteristics of openness and sharing, break the restrictions of traditional course teaching, and establish a knowledge sharing and learning platform for vocational education [8]. To build high-quality online open and exquisite courses, it is necessary to excavate high-quality course content resources and make full use of information means to create high-level teaching materials, teaching videos, animation and other teaching resources. This requires teachers not only have excellent professional knowledge, but also need to be able to skillfully use a variety of information technology as a blessing. Moocs(Massive Open Online Courses) and online shared courses are the most frequently used platforms., for example, super Star learning, Blue 'Moyun' class, Mushroom nail, 'Weizhi' Library, vocational education cloud, rain class. In the special period of epidemic, almost all teachers of online courses will use these platforms to assist teaching. Although there are many high-quality courses, there are few high-quality open courses that can be directly used, and most of them are carried out in the way of live teaching.

3.3 Lack of Training Equipment Management and Simplification of Training Course Information

“The Circular of The State Council on the Implementation Plan of The National Vocational Education Reform” points out that “in principle, the practical teaching hours of vocational colleges account for more than half of the total hours”. The implementation of the policy and the cultivation of qualified personnel in urgent need of enterprises need to build and plan the practical construction of higher vocational education, including the construction of practical training equipment and practical training courses. The information management of most training rooms and bases still needs to be improved and

strengthened. The existing training rooms are mostly managed in the form of record books, relying on experimentalists to inspect and find problems, or teachers to inform problems, and there is no effective supervision system to ensure the normal operation of the training rooms. The integration of information technology and practical training courses is widely applied in the design of courses. Practical training courses that need to operate machines are usually in the mode of teacher demonstration. Video demonstration is the most commonly used information application of practical training courses, because of the lack of information technology means, students are not interested in learning and lack of enthusiasm.

4 Development Strategies of Informatization of Vocational Education and Teaching for Intelligent Manufacturing Majors

We will develop modern vocational education to ensure that talents in 360 fields gather and shine in the stars. Vocational education is employment-oriented and market-oriented, and our mission is to provide much-needed talents for society. In November 2021, Xi Jinping pointed out that the integration of “5G+ Industrial Internet” will speed up the construction of a digital China, a smart society and China’s new industrialization process. We will build a “green campus” based on 5G communication technology and provide an environment for “smart learning”. Accelerate the higher and faster development of teaching informatization, so that students can master the multidisciplinary integration knowledge as soon as possible, and prepare knowledge and skills for intelligent manufacturing.

4.1 Increase Investment in and Upgrade of Smart Devices

To cultivate interdisciplinary talents in programming, assembly and adjustment, maintenance and repair of intelligent manufacturing and production, transformation, design and technical service of intelligent production line. Intelligent manufacturing major is mainly composed of four parts of the course: The first part is the basic ability of mechanical and electrical products, mainly around the mechanical ontology in intelligent manufacturing, electrical foundation related courses; The second part is the electromechanical integration module of intelligent equipment, which mainly focuses on the courses of frequency conversion speed regulation, gas and hydraulic drive, electromechanical drive, servo control, PLC control and so on; The third part is the industrial robot system, which focuses on the programming control, visual color intelligent sensing, bus communication and other courses related to the industrial robot application system. The fourth part of the intelligent production line system integration programming, debugging, combined with intelligent sensing, frequency conversion, industrial bus, AGV, RFID technology, pneumatic hydraulic technology, servo, man-machine interface and other integrated programming, debugging, can use the MES management system to issue task orders. There are many intelligent devices involved and the investment is large. Higher vocational colleges should increase the support for the application of intelligent manufacturing equipment by means of special funds and purchase of services. Give play to the role of the market and let enterprises participate in the construction of vocational education

informatization. The government establishes the management mechanism of information products and services, and mobilizes social resources to build the training room of intelligent manufacturing [9].

4.2 Promote the Co-construction and Sharing of High-Quality Digital Education Resources

Higher vocational teachers have heavy teaching tasks, but also need to undertake the task of scientific research and teaching reform, and the intelligent manufacturing industry upgrading and upgrading fast, the course reform is also changing with each passing day, it is unrealistic to teach subjects into high-quality digital teaching resources. Building and sharing high-quality resources can reduce the repetitive construction of courses, improve the resource certification standards and trading mechanism of the sharing platform, network the teaching resource database of vocational education majors, and build digital teaching resources of vocational colleges according to regional and industrial characteristics. Industry, enterprises and vocational colleges jointly build digital information resources.

4.3 Information Management of Training Base and Curriculum Information Construction

In the construction of training base information management, the establishment of the base cloud platform, the collection of equipment information data from procurement - use - maintenance - scrap, experimental managers and teachers timely understand the equipment, can effectively ensure the safety and normal operation of the training base. Virtual simulation courses and training bases are constructed to make up for difficult training projects that are costly, invisible and dangerous in practical training. With manufacturing technology “intelligent design, virtual manufacturing, information management, intelligent Internet of Things” four links as the main line, the development of rich virtual simulation experimental teaching resources, the formation of ability training as the core of the teaching system. For example, CAD courses use three-dimensional software such as Solid Works or ‘ZW3D(Software developed by a Chinese company)’ and related “advanced simulation” function modules to complete typical mechanism modeling, assembly and motion simulation and dynamic analysis from simple to complex. Social training talents make full use of cross-professional cross-training. With the help of intelligent equipment and AR and VR technology, AR and VR courses can also be opened, and “cloud classroom” can be developed in cooperation with enterprises to build a trinity of mixed teaching in the online front-line and next-training room.

4.4 Enhance the Information Literacy of Teachers, Students and Managers

Vocational education focuses on practice and operation. The national policy clearly states that vocational school teachers should have working experience in enterprises in the future, that is, vocational teachers themselves must be able to understand theories and be able to operate. Under the information technology, teachers of vocational

education should keep pace with The Times, improve their knowledge of information technology, and improve their application ability of “5G+ Internet” information technology. Teachers should strengthen the communication of teaching ability and enhance the level of information technology in mutual learning with their peers. Students are the main body of learning, with the application of information technology, students should build independent use of existing information technology to consult data, show, discuss, and answer questions. Endow students with new roles and reconstruct the interaction mode between teachers and students. The comprehensive application training of information technology should be strengthened to improve students’ professional ability of information technology. Meanwhile, information training should be carried out for school administrators to enhance administrators’ awareness of information technology and improve their planning, execution and evaluation abilities [10].

5 Commissioning and Conclusion

This article discusses the transformation and upgrading of intelligent manufacturing technology under the background of “5G+ industrial Internet”, the industry, production mode and talent demand have changed greatly, and the primary task of higher vocational education is to cultivate intelligent manufacturing high-skilled talents to adapt to The Times. By analyzing the influence of the coming of “5G+ Industrial Internet” era on intelligent manufacturing industry, the development path of intelligent manufacturing professional information vocational education under the background of “5G+ Industrial Internet” is explored, the predicament of current information vocational education is discussed, and several ideas to solve the difficulties are put forward. Under the background of “5G+ Industrial Internet” intelligent manufacturing technology, information education should increase the investment and upgrade of intelligent equipment, promote the co-construction and sharing of high-quality digital education resources, change the information management of training bases and the information construction of courses, and improve the information literacy of teachers and students and managers.

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