

## Exploration of "1 + X" Talent Training Mode in Higher Vocational Colleges for "Intelligent Manufacturing in the New Era"

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### Abstract

*In the post epidemic era, restarting the economic and social development of all countries is to give full play to the comprehensive leading role of "talents". Nowadays, there is a shortage of the technical and skilled talents in our country has reached 20 million. It is urgent to alleviate the structural contradiction of technical and skilled talents and improve the quality of technical and skilled talents training according to the standard industry, industry and occupation standards. In order to improve the training quality of skilled talents and adapt to the development requirements of "intelligent manufacturing in the new era", based on literature analysis and experience observation, this paper deeply interprets the connotation of "1 + X" vocational skill level system, analyzes the pain points of traditional vocational education talent training mode, and creatively puts forward the 1 + X talent training mode in higher vocational colleges. Besides it elaborates the establishment of the curriculum system training room, the cultivation of teachers, the evaluation of students' learning achievements, etc.*

**Keywords:** "1 + X certificate" system, higher vocational colleges, personnel training mode, "intelligent manufacturing in the new era"

### I. Introduction

The novel coronavirus pneumonia brought unprecedented challenges at the beginning of the new year in 2020. Not only did the global public health system face great challenges, but also under the background of deep degree of globalization, the disruption of the global supply chain and industrial chain greatly impacted the development of the world economy. In March 2020, IMF predicted that the world economy might have a recession with a negative growth of 1.5 percent. According to China's National Statistics, from January to April, the total profits of industrial enterprises above designated size nationwide reached 1259.79 billion yuan, a year-on-year decrease of 27.4% (calculated on a comparable basis). However, in the fully controlled January to February (which can increase the data of March to May), China's "new economy" has taken this opportunity to continue to grow. The data shows that from January to February, China's online consumption and intelligent economy grew significantly. The online retail sales of physical goods in China reached 1123.3 billion yuan, a year-on-year increase of 3%, and the production index of information transmission, software and information technology services increased by 3.8%. Under the superposition of the epidemic situation traditional industries is forced to accelarte upgradaton and transformation (industries). The external environment also increased the demand for high-level technical and skilled talents. In the future, "new economy" will require a large number of compound and innovative technical and skilled talents. According to McKinsey's 2017 Global Research Report, AI will replace 400 million jobs in the world in 2030, and about 100 million people in China will face unemployment. According to the analysis report in terms of the employment situation of artificial intelligence engineering and technical personnel issued by the Ministry of human resources and social security in 2020, the current gap of artificial intelligence talents in China is more than 5 million, and the domestic supply and demand ratio is 1:10. In order to meet the challenges brought by technological progress and seize the opportunities brought by the fourth industrial revolution, higher vocational education shoulders the task of training high-quality industrial workers and high-level workers.

On February 13, 2019, the State Council issued *The Implementation Plan of National Vocational Education Reform* (known as the plan), which included vocational education into the national economic system strategy for the first time [1]. The plan puts forward a series of innovative systems for further promoting the integration of industry and education. The pilot work of launching the 1 + X certificate system is one of them. On April 16, 2019, the Ministry of Education, the National Development and Reform Commission, the Ministry of Finance and the State Administration of Market Supervision jointly issued *The Pilot Scheme for Implementing the System of "Diploma + Several vocational Skill Level Certificates" in Colleges and universities*, and officially launched the pilot system of "diploma + several vocational skill level certificates" (hereinafter referred to as "1 + X certificate") [2]. The system focuses on the development of skill level certificates, provides standards for the cultivation of skilled personnel, breaks the concept of "education background" as ability, provides basis for skill evaluation, improves the level of standardization construction of high-level technical and skilled personnel training, and speeds up the innovation and reform of talent training mode in higher vocational colleges. Therefore, it is of great theoretical and practical significance to interpret the connotation of "1 + X certificate" system, break the drawbacks of traditional vocational education personnel training mode, and innovate the personnel training mode of higher vocational colleges.

## II. The Connotation of 1 + X Vocational Skill Grade System

1 + X certificate system develop the skill level certificate by making a breakthrough of promoting the professional construction of vocational education, personnel training and industry, industry and the joint of enterprise. Its essence is to take the construction of vocational skill level standardization as the medium. We will pay attention to not only the basic role of academic education personnel training, but also to the comprehensive ability of training compound technical skill personnel. It embodies the integration of education chain and industry chain in "range (width) and level".

In the "1 + X certificate" system, "1" represents the education chain and refers to the integration of width and depth in a certain professional field. The so-called width refers to the horizontal expansion of the key competencies and majors involved in the professional field which gradually blurs the professional boundaries and improves the students' cross professional learning ability. The so-called depth requires the key professional abilities with the same connotation of the previous level of academic education to be appropriately moved down and to improve the depth of the next level of professional training with the development of technology and the upgradation of the industry. X represents the industrial chain, the horizontal and vertical integration of industrial fields. "X" emphasizes both "multi quantity" and "multi category". The so-called "multi type" mainly refers to the deep integration of vocational education and industrial chain. In terms of training students' vocational ability and skills, it not only focuses on the expansion of vocational ability brought about by the horizontal connection of industrial chain, but also focuses on the vertical deepening of vocational ability brought about by the vertical extension of industrial chain. Taking marketing as an example, students can not only obtain the professional ability of marketing, business planning, advertising planning and other horizontal industrial chain involved in the process of receiving vocational education, but also obtain the logistics service and management professional ability of logistics teachers at the downstream of the industrial chain.

Under the coordination and coordination of the national level, the 1 + X certificate system will be integrated from point to surface. Through the development of skill level certificates, the national qualification framework will be built, and the "ability" as the standard, so as to realize the equal exchange and connection of all kinds of qualifications and learning achievements in the whole society. Finally, the education chain, industry chain and talent chain are organically combined.

## III. "Pain Point" of Traditional Vocational Education Talent Training Mode

### 3.1 Discipline system orientation hinders the integration and cross-border of knowledge application

Vocational education is the product of industrial revolution. The essence of industrial revolution is the progress and application of technology. The essence of technology lies in the innovation of knowledge processing mode. The knowledge system of vocational education should take technology and work behaviour as logic, recognize knowledge characteristics in the process of post work, and form knowledge characteristics detection group through scene transformation, screening and induction known as working pattern recognition. Finally, it is innovative to combining knowledge by deductive thinking pattern. However, the core of the traditional subject oriented vocational education personnel training mode lies in the inheritance, accumulation and innovation of knowledge, emphasizing the division of knowledge modules according to the logic between concepts, ignoring the logic of technology and work behaviour, and updating the knowledge content according to the professional characteristics and the trend of industry and industry development. From the perspective of curriculum system, the curriculum of discipline system is divided into units according to the basic concepts, basic principles and scientific laws of scientific knowledge, ignoring the relationship between knowledge and application. Under the development trend of industrial integration and boundary fuzziness, over-fragmented professional knowledge hinders the integration and cross-border knowledge application.

### 3.2 Taking school as the leading factor limits the professional adaptability of talent training program

Vocational education is the type of education that is most closely related to the industrial economy and social development. The essence of its talent training mode lies in the collaborative participation of multiple subjects, the promotion of the integration of education chain and industrial chain, and the establishment of the linkage mechanism between education and industry, industry and occupation. The so-called "integration of industry and education, school enterprise cooperation, and integration of engineering and learning" shares the same meaning. Vocational education personnel training program is the general requirements of the school for the cultivation of composite technical and applied talents. And the most important basis for the school is to carry out talent education and quality evaluation. For a long time, educational reform and industrial reform have been carried out separately. Due to the imperfection of system and mechanism, the participation of enterprises in school running and personnel training is underpowered. with and the dominant position of schools in the formulation of vocational education personnel training programs in China, the insufficient docking of "curriculum content and vocational standards, teaching process and production process" finally affects the vocational adaptability of vocational education personnel training, resulting in the waste of educational resources [3].

### 3.3 The structure of academic teachers affects the sustainability of vocational personnel training

Scale of Vocational Education in China has expanded rapidly since the reform and opening-up, a large number of academic teachers and college graduates have been occupied in the ranks of vocational education teachers. According to the 2018 annual report on the quality of Higher Vocational Education in China, the average proportion of full-time teachers with dual quality in universities in 31 provinces and cities is 55.35%, among which the proportion of full-time teachers with dual quality in 8 provinces and regions is still less than 50%. In addition, due to the lack of evaluation standard of "double qualification" teachers, "Double qualification" teachers (with academic certificate and professional qualification certificate) gives away to "double qualification" teachers in some colleges, it has become the magic weapon to protect the structure of academic teachers in higher vocational colleges. However, some teachers' Teaching Majors and professional qualification certificates are inconsistent, resulting educational resources and talent resources waste. Due to the lack of practical work experience in enterprises, it is difficult for academic teachers to have a timely insight into the changing trend of industry and profession. Theoretical teaching has become the leading role in professional teaching, and practical teaching is inevitable to "miscarry". Due to the lack of occupation and post adaptability, the "theoretical" graduates are unable to meet the post demand, leading to the structural unemployment of vocational education graduates. The latest employment report released by Max Research Institute shows that the professional matching rate of 2018 national junior college graduates is only 62%. Therefore, the structure of academic teachers affects the sustainability of vocational training.

#### IV. Conclusion Construction Background of "1 + X" Talent Training Mode

Vocational education has the dual attributes of education and economy, and it naturally has a cross-border nature. The key to the success of vocational education is to establish a link between education and employment, supply and demand. The "1 + X" talent training mode takes the establishment of "1 + X certificate" system as an opportunity to respond to the docking of production and teaching supply and demand, to break the traditional concept of education as ability, to promote the construction of a lifelong education system and the cultivation of high-quality composite technical and technical talents, which is also the practical need for vocational schools to connect with the vocational and technical standards.

##### 4.1 Promote the construction of lifelong education system

In China, under the influence of traditional culture, the thought of education representing ability has always been dominant. In the wave of globalization, a series of problems, such as the dilution of "academic qualifications" and the decline of personnel training quality, caused by the rapid scale expansion of higher education, have aroused people's reflection. At present, the ability-based vocational education has become a breakthrough for countries to maintain competitiveness in the new era of technological revolution. The '1 + X' talent training mode aims at the promotion of "comprehensive ability". It emphasizes to maintain long-term competitiveness through the cumulative effect of the learning process of continuous education and training, and to cultivate talents in the way of integration of academic education and non academic education. "X" multiple vocational skill level certificate is an affirmation of people's multiple intelligences, and also an important part of promoting life-long education, so that the educated, the trainer and the society can clearly realize that the diploma is only a proof of the level of education of an individual in the academic education system, and is the embodiment of part of learning ability which does not represent all the abilities of an individual. Therefore, 1 + X relieves the pressure of "education arms race" from the time dimension, expands the scope of personal ability development from the space dimension, and provides more opportunities for "outstanding talents who fail in the examination", which fundamentally breaks the concept of degree representing ability, and promotes the construction of a lifelong education system.

##### 4.2 Docking "1 + X" planning system of made in China 2025

The issuance of *Manufacturing Talent Development Planning Guide* on February 14, 2017 marks the basic completion of the top-level design of '1 + X' planning system of *Made in China 2025*, whose core is to meet the needs of big data, Internet of things, intelligent manufacturing under 5G technology, green manufacturing, etc., and to cultivate "cross-border, innovative and compound" manufacturing talents good at ten key areas of manufacturing industry and with craftsmanship spirit System [4]. In 2019, *The implementation Plan of National Vocational Education Reform* and *National Pilot Implementation Plan for The Integration of Industry and Education* highlighted the practical needs of the overall integration of the supply side of vocational education talent training and the demand side of industry, industry and enterprise talent with purpose of solving the major structural contradiction between talent supply and demand. In this context, the "1 + X" talent training mode, as the operation mode and organizational style of the talent training process, responds to the real demand for talent ability improvement from a manufacturing country to a manufacturing country, and cultivates "1 + X" talent team system with "specialty + technical skills + innovation ability...".

##### 4.3 Promote the cultivation of high-quality compound technical and technical talents

First of all, the "1 + X" talent training model needs to integrate various resources of schools, enterprises and governments. On the basis of correctly interpreting the skills assessment standards provided by the "1 + X" certificate system for the training of technical and skilled talents in higher vocational colleges, the problems of evaluation contents, standards and training methods of "composite talents" are solved. From the aspect of training content, the "1 + X" talent training mode is under the background of the organic combination of education chain and industry chain, the higher vocational colleges cooperate with the industry education integration enterprise,

analyse the knowledge, skills and quality involved in the post, post group, occupation and occupation group by multiple subjects, and combine them organically to form the vocational skill system and curriculum system, so as to solve the problems in content and form how to "compound" the problem. At the same time, the 1 + X talent training mode, with the help of the credit mutual recognition system, enables the vocational skill level certificate to be connected with the academic certificate, and solves the problem of how to "compound" multiple types of talents and their multiple abilities from the school system. Therefore, under the framework of clear professional competence level certificate, "1+ X" breaks through the professional boundary and solves the problem of how to "compound" from the perspective of individual competence structure. It provides a wider path for the expansion of students' professional ability, increases the combination form of "range and level" of ability, and makes full response to the transformation and upgrading of industry.

## V. Connotation and Composition of "1 + X" Talent Training Mode

### 5.1. Connotation of "1 + X" talent training mode

According to the theory of skills formation, the formation and development of skills is the purpose and substance of cooperation in the fields of education, economy and society. Different skills formation systems will also have an impact on macro social institutions and institutional arrangements [5]. The "1 + X" talent training mode is based on the 1 + X certificate system, which explores the integration of academic qualifications (learning ability) and professional comprehensive ability, integrates the upstream and downstream talents in the industrial chain, and uses data processing, intelligent terminals and practical training links, especially the modern apprenticeship system of intelligence to cultivate students' professional skills. In terms of content, the "1 + X" talent training model aims to complete the training of basic quality, basic vocational knowledge and vocational skills under the education for academic qualifications, with the training goal of senior professional talents. By using the horizontal correlation of occupational groups and post groups, as well as the vertical extension of the industrial chain, we can develop a variety of vocational skills training, and form a multidimensional spatial skill combination of horizontal and horizontal, horizontal and vertical, vertical and vertical [6]. From a formal point of view, it is a direct technical skill transferring between people, crossing professional boundaries, and taking technical skills as the center to form a flexible project learning or training organization. From the perspective of result transformation, the learning of technical skills must be applied immediately in the actual career, meeting the learning needs of students and stimulating long-term learning motivation.

The "1 + X" talent training model abandons the traditional education concept. It not only supports the acquisition of multiple vocational skill level certificates, but also combines the two-way academic education and non-academic education to achieve the in-depth improvement of education quality. In the process of academic education, students pay more attention to the inheritance and accumulation of knowledge and improve the cognitive ability of thinking, so that students can improve their professional skills, master basic professional knowledge and skills, and meet the basic needs of society. However, academic education requires the acquisition of vocational skill level certificate to be integrated into teaching content, curriculum module design, training room construction, practice and training. At the same time, the promotion of professional skills and post skills needs to rely on the implementation of non-academic education in colleges and universities, and through the whole process of career. With the acceleration of technological development and industrial transformation and upgrading, vocational skill training cannot ignore the training of basic quality of students by academic education, while the training of non-academic education at vocational skill level needs to be integrated into academic education. Therefore, the "1 + X" talent training model embodies the integration of two different concepts of academic education and non-academic education. As shown in Figure 1.

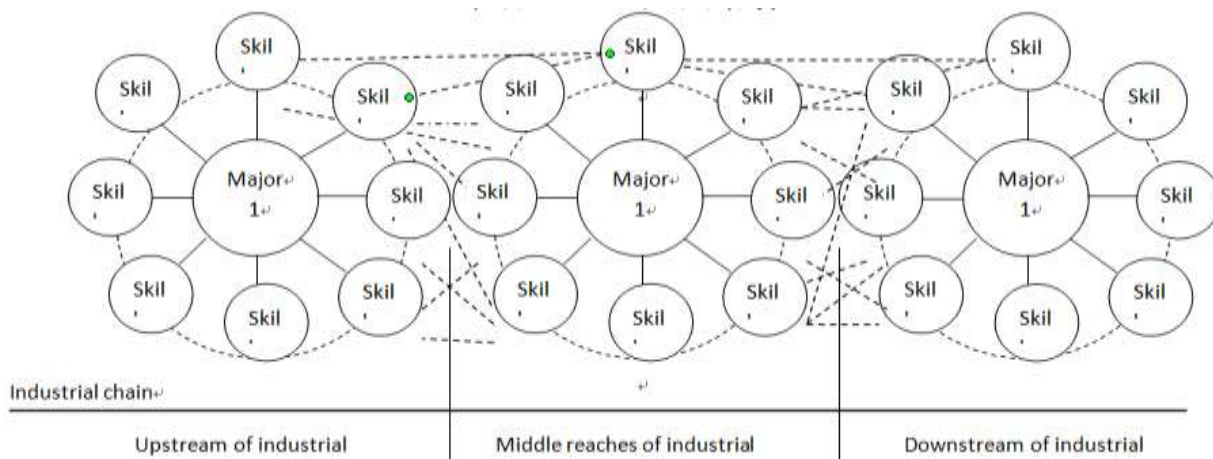


Figure 1. "1 + X" talent training model

## 5.2 Composition of "1 + X" talent training mode

### 5.2.1 Build "1 + X" modular curriculum structure system

"1+X" should be based on the analysis of the knowledge, skills and quality requirements of professional ability. The modular curriculum structure system should build "1" (professional basic curriculum module) according to the national and social requirements and professional training needs, including comprehensive quality and professional core competence. Under the premise of ensuring the basic specifications of professional training, it should attach importance to the combination of theory and practice, the application of perception, and the cultivation of innovative thinking and consciousness. The parallel course "X" module combination, according to the industrial demand analysis and market analysis, constructs a number of combinations that meet the requirements of vocational skills, and unites the strength of government, industry and enterprise, and plans the talent demand synchronously with the economic development planning, industry development trend and enterprise talent demand. On this basis, the introduction of industry standards and vocational skill level certificate requirements, the design has interdisciplinary and cross disciplinary. The curriculum system with the characteristics of specialty and cross field finally forms the "1 + X" modular curriculum structure system. Change the development path of discipline specialty curriculum that the construction of discipline curriculum system follows. The development path of forming ability curriculum specialty (Group) is based on the cultivation of comprehensive quality and thinking cognition, with the analysis of professional ability as the core. It not only attaches importance to the horizontal connection of professional group and post group, but also attaches importance to the expansion of professional ability in the vertical direction of industrial chain. For example, the logistics specialty is divided into five categories: supply logistics, production logistics, sales logistics, recycling logistics and waste logistics. According to the logistics function, it is divided into 5 aspects: the transportation, storage, loading and unloading, handling, packaging, circulation processing, distribution, information processing and other work processes involved in each category of logistics, forming an "X" course package and creating a "1 + X" of logistics specialty modular curriculum structure system.

### 5.2.2 Build "1 + X" three-dimensional training room of production, learning, research and marketing

The "1 + X" talent training mode focuses on the actual needs of economic development and industrial transformation and upgradation, and combines talent training with all links of the industrial chain, takes "production" as the basis, takes "education" as the core and "use" as the evaluation method. Based on this need, a training room integrating production, learning, research and marketing are established, as shown in Figure 2. Such training room integrates teaching design with architectural design by synchronously planning the construction conditions required for theoretical teaching, practical teaching and product production, so that the training room in architectural form meets the multi-function of teaching, training, production and sales. Its essence is to realize the circulation and sharing of heterogeneous resources including knowledge, skills, talents, management, etc. by reducing or eliminating the material space barrier, shorten the time interval between the combination of traditional

work and learning, the combination of science and practice learning, and the combination of science and practice learning. It is formed in classroom production, learning in production. It focuses on research and development design in learning and production, and through cross specialty Talents exchange between industry and field, tap new generation consumption demand and growth points, and finally put products on the market, so that students can participate in the whole process of product production combining virtual and reality, understand the value orientation and content of each link of the industrial chain, and cultivate innovation ability and cross-border integration ability.

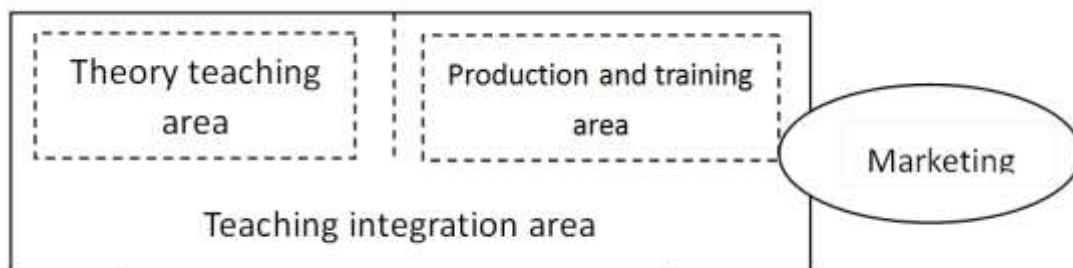


Figure 2. "1 + X" training room

### 5.2.3 Cultivate "1 + X" and "craftsman" mentors

According to the requirements of "1 + X" talent training mode, higher vocational education should cultivate students' comprehensive ability, and students should pass "1" The study of professional basic courses and public basic courses cultivate comprehensive basic quality and professional basic ability. At the same time, students need to choose many kinds of vocational skills to study through the "X" parallel course module. Besides, the learning of skills is different from the teaching learning of basic theory courses. The energy exchange of knowledge, skills and quality need teachers with skills need to pass on the integration of practical training courses and theoretical courses by hand. Therefore, the "1 + X" tutor group system is formed, which is also conducive to the sharing of teacher resources in the construction of professional groups. The "1 + X" tutor group includes full-time and part-time professional teachers, which is conducive to the development of teachers' professional skills. Meanwhile, it can obtain new career trends in the supplement of part-time teachers in enterprises, so that teachers can play their learning autonomy in the process of professional learning and skill learning, and work hard on the professional skills of interest, so as to cultivate the "working" ability. The master of craftsmanship and skill lay the foundation.

### 5.2.4. Build a new model of "1 + X" performance score evaluation

Vocational ability needs to be continuously exercised in the implementation of work tasks. Therefore, in the evaluation of learning achievements of students in higher vocational education, the key performance points or key achievement points should be determined by the decomposition of work tasks in combination with the performance evaluation methods of enterprises for employees, so as to score students [7]. The key performance point or key achievement point must meet the smart principle, i.e. s: (specific) --- clear and specific, the key performance point or key achievement point must be clear, which is the goal that can be accurately understood; m (measurable) quantifiable; a (attachable) achievable; R (realist) practical and realistic; t (time bound) time limited.

Under the new model of "1 + X" performance score evaluation, the students' performance score in each course is used to make comprehensive evaluation from the perspective of the course assessment and vocational skill assessment. Among them, the comprehensive evaluation includes the "1" score of the final final evaluation of the course, as well as the performance scores of multiple key performance points or key achievement points "X". Therefore, such a new "1 + X" performance score evaluation mode integrates the final evaluation and process evaluation, and also integrates multiple evaluation subjects in the "X" task evaluation results. That is to say, the completion of the task needs the joint efforts of the evaluated, task participants and task mentors. Task mentors should include enterprise mentors. These participants are also the raters of performance appraisal. "1 + X" performance score evaluation is conducive to the implementation of the credit bank system and the integration of academic certificates and professional skills.

## VI. Conclusion

The implementation of "1 + X" talent training mode needs to be integrated into professional talent training. Innovation should be made in the decomposition of talent training objectives, the construction of curriculum system, the teaching staff, and the evaluation of students' learning achievements. This is bound to promote the reform of the administrative departments of the government and higher vocational colleges in the aspects of specialty setting, talent training, evaluation mechanism, etc., and get through academic certificates and professional skills, etc. The bridge of the integration of the level certificate makes the vocational education change from the single emphasis on the acquisition of the vocational qualification certificate to the emphasis on the cultivation of the comprehensive ability of the future "professional" according to the standards of vocational skills and teaching.

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## References

- [1] "The central people's government of the people's republic of China," Circular of the State Council on Printing and Distributing the Implementation Plan of the National Vocational Education Reform, [http://www.gov.cn/zhengce/content/2019-02/13/content\\_5365341.htm](http://www.gov.cn/zhengce/content/2019-02/13/content_5365341.htm), Jan 24, 2019.
- [2] "Ministry of education of the people's republic of China," The Ministry of Education, the National Development and Reform Commission, the Ministry of Finance and the State Administration of Market Supervision Jointly Issued the Pilot Scheme for the Implementation of the System of "Diploma + Several Vocational Skill Level Certificates" in Colleges and Universities, [http://www.moe.gov.cn/jyb\\_xwfb/gzdt\\_gzdt/s5987/201904/t20190416\\_378206.html](http://www.moe.gov.cn/jyb_xwfb/gzdt_gzdt/s5987/201904/t20190416_378206.html), April 16, 2019.
- [3] Z Y. Yan, D. Y. Jiang, Q. Q. Wu, "Governance implications and error avoidance of 1 + X certificate system," *Education and Occupation*, no. 15, pp. 5-12, 2019.
- [4] "Circular of the ministry of education, the ministry of education, the ministry of human resources and social security and the Ministry of industry and information technology of the people's republic of China on printing and distributing the planning guide for the development of manufacturing talents," <http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757016/c5500114/content.html>, December 27, 2016.
- [5] W. B. Arthur, D. M. Cao J. Wang, "The essence of technology (classic edition)," Zhejiang People's Publishing House, vol. 2018, no. 06, pp. 102-104.
- [6] G. Q. Xu, M. Y. Fu, "'1 + X' is an important innovation of vocational education personnel training mode in the era of intelligence," *Education development research*, vol. 39, no. 07, pp. 21-26, 2019.
- [7] Z. F. Li, Q. L. Meng, "Building '1 + X' modular curriculum structure system with vocational ability as the center," *Vocational and technical education*, vol. 23, no. 25, pp. 39-42, 2002.