

# Reform of Curriculum System for Medium Vocational Skill Personnel Training Based on Deep Integration of Mechanical and Artificial Intelligence

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## Abstract

**With the advances in science and technology, and soaring for demand for smart products, Industry 4.0 is coming. Firstly, the manufacturing and information industries are deeply integrated. And then new industrial forms and business models are continually emerging. Finally, the mode of production changed accordingly, and the demand of technical change to talent ability changes ceaselessly. Aiming at the change of the ability demand of processing and manufacturing talents in the era of artificial intelligence, the vocational colleges which are regarded as a main position of the training line of skilled technical personnel, have an urgent need to continue to reform the curriculum system, personnel training model and training methods. In this paper, by the comparative analysis of the status quo, existing problems and existing curriculum system for processing and manufacturing specialty in secondary vocational colleges, it is proposed that the curriculum reform measures of skilled personnel training are adapted to the era of artificial intelligence, and the results could provide reference for the reform of the curriculum system of processing and manufacturing specialty in secondary vocational colleges and universities.**

## Keywords

**Intelligent, Medium career education, Manufacturing, Curriculum reform.**

## 1. Introduction

With the continuous progress of the society and the continuous development of the industrial revolution, people are enjoying a lot of convenience and fun brought by the era of artificial intelligence, such as intelligent robot, smart home and intelligent car, no need to buy food to cook, moving the mouse in hand, food to the table, etc. General Secretary Xi Jinping stressed that the fundamental problem of education is "who to train, how to train and for whom to train". And the report of the 19th CPC national congress especially pointed out that vocational education and training system must be improved by deepening the integration of industry and education and school-enterprise cooperation. Therefore, the General Office of the State Council has issued "several opinions on deepening the integration of education ([2017] No. 95)", and proposed that the supply and demand of vocational education talents should converge in structure, quality and level in about 10 years. Vocational education personnel training mode reform is imperative, and the curriculum system as one of the key content of personnel training mode reform must be reformed [1]. The integration of artificial intelligence and manufacturing industry is an important feature of the future industry. The development history of Britain, the United States, Germany, Japan and other developed countries has confirmed that the intelligent

level of manufacturing industry is the main symbol of a country's comprehensive competitive strength and international core competitiveness. The industrial society is from the industrial 3.0 to industrial 4.0, the whole production process become more intelligent, artificial intelligence has permeated into the processing manufacturing industry each link, Social and economic development is in urgent need of a large number of skilled personnel who master intelligent manufacturing technology, curriculum system reform on "mechanical, industry and artificial intelligence" is imperative.

## **2. Problems in the Curriculum System of Manufacturing Mayors in Secondary Vocational and Technical Schools**

Along with the deep integration of artificial intelligence and manufacturing industry, traditional manufacturing engineering course system in secondary vocational and technical schools already can't satisfy the demand of the business enterprise for the talents who grasp the intelligent manufacturing skills and innovative skills. So, subject system must be updated to cultivate the talents with intelligent manufacturing skills for the transformation and upgrading of manufacturing industry, and the related teaching method reform also should be synchronized. However, at present, the curriculum system update and teaching method reform in secondary vocational and technical schools can't meet the needs of training the ability of talents in intelligent manufacturing technology, which is embodied in the following aspects.

### **2.1. The Curriculum System Is Unitary and the Content of Interdisciplinary Courses Is Deficient**

Curriculum implementation is the basis of talent training goal, but they focus on too urgent and popular major in the secondary vocational and technical schools [2], a single professional course teaching, so that the students knowledge narrow, limited thinking, the overlapping of the domain knowledge of related disciplines, osmosis, few supplement, ignoring the long-term economic development demand for skilled talents.

### **2.2. Subject Setting and Course Content Pay Too Much Attention to the Cultivation of Skills but Weaken Professional Quality and Humanistic Quality**

At present, secondary vocational and technical schools are seriously weakening the basic courses of culture and increasing the courses of professional courses, which is very unfavorable to professional quality and humanistic quality.

### **2.3. The Phenomenon of "Double Weakness" of Teachers Is Serious**

Secondary vocational and technical schools require double-qualified and dual-ability teachers, that is, teachers should have both the quality of theoretical teaching and the quality of practical teaching [3]. Now the teachers of the secondary vocational and technical school, mostly from higher normal colleges and universities graduate, whose theoretical knowledge is relatively rich, but the practical experience is relatively lack of graduates, integration, production and education enterprises after entering school, hiring senior technician for the school teaching, has a wealth of practical experience, but lack of profound theoretical knowledge, lack of teaching some skills, thus the phenomenon of "double weakness" of the teachers.

### **2.4. Too Little Time to Directly Participate in Enterprises and Internship and Training Bases**

The theoretical knowledge of students in secondary vocational and technical schools is weak, and their ability to learn theoretical knowledge is not strong. It is hard to learn for them. There are few opportunities to practice in enterprises or training bases [4], and the advantages of students' hands-on ability cannot be demonstrated.

### **3. Current Situations of Manufacturing Curriculums in Secondary Vocational and Technical Schools**

For many years, experts and scholars at home and abroad have been studying the curriculums of manufacturing skilled personnel training. Their research serves the economy with education, combines with current development needs and long-term goals, promotes social progress and economic development, and forms a lot of valuable research literature and achievements. In recent years, in the context of vocational education reform, in order to adapt to the change of production mode and provide effective human resources upgrading service, the curriculum system reform ideas of various middle and higher education institutions have been in full bloom. In conclusion, it is mainly reflected in the following aspects.

#### **3.1. Specialty Setting and Curriculum System with Local Characteristics Based on National Policies and Market Demands**

Secondary vocational and technical schools should closely follow the national strategy and social and economic development needs, combined with their own advantages and characteristics, cultivate highly qualified and skilled personnel urgently needed by the society, promote and promote economic and social development [5]. Therefore, the setting of major, the setting of training objectives and the setting of course subjects should be oriented by the market demand, that is, the requirements of the employer for the required talents. Manufacturing majors in secondary vocational and technical schools mainly cultivate the first-line skilled workers required by manufacturing enterprises. Their majors and courses must be closely related to the needs of enterprises, and the curriculum system should be constructed by combining the ability structure of the skilled personnel required by enterprises [4]. Secondary vocational and technical schools can be combined with the regional characteristic industry talent demand to set up the talent training curriculum system with local characteristics. For example, Zigong Sichuan is famous for its lanterns, Zigong Secondary Vocational and Technical Schools could set some majors on lanterns technology, establish reasonable lanterns skill talents course system, and cultivate high-quality technical personnel for Zigong lantern industry.

#### **3.2. Skill-Based Curriculum Content Setting**

Skilled talents cultivated by secondary vocational and technical schools must have strong operational ability, which is an important feature of secondary vocational and technical schools' talent cultivation [6]. Around the training center of operational skills, the teachers of secondary vocational and technical school must often go to the enterprise research, timely obtain the needs of the enterprise, collect typical cases and extract typical tasks of each position, analyze, timely screen and update the curriculum content, and a more scientific and reasonable system of curriculum knowledge and skills.

#### **3.3. Attaching Equal Importance to Professional and Cultural Quality Education and Training Skilled Personnel with A Sense of Social Responsibility and A Sense of National Mission**

With the development of the society, the middle-level professional talents not only need to master professional skills, but also have certain humanistic feelings. Therefore, the curriculum setting should take into account the proportion of professional skills and cultural literacy courses to enrich students' reading, enhance humanistic feelings, strengthen national spirit education, stimulate their interest in traditional Chinese culture and national culture, and cultivate their sense of social responsibility and national mission.

### **3.4. Innovating Teaching Methods to Combine Theory Teaching with Practice Teaching**

Secondary vocational and technical schools need to teach students not only "how to operate" but also "why to operate". Therefore, in terms of teaching methods, it is necessary to focus on typical cases, project teaching method and task-driven method, and integrate theoretical teaching into practical teaching. This requires teachers to make use of holidays or spare time to investigate enterprises, extract typical cases, sort them out, apply them in the teaching process, update the old cases in the textbooks, make the textbooks more innovative, and make the contents of professors keep pace with enterprises.

## **4. Reform Measures for Curriculum Setting of Processing and Manufacturing Majors in Secondary Vocational and Technical Schools in the Era of Artificial Intelligence**

It is an important part of human education activities for vocational education. The development course of vocational education is as follows: industry 1.0 mechanization era is mainly the form of vocational training schools; industry 2.0 electrification is vocational school education; industry 3.0 automation era is the vocational education of school-enterprise cooperation; the coming industry 4.0 intelligent era is mass customization production mode. Industry 4.0 intelligent era is characterized by mass customization production mode, intelligent robot, digital factory, intelligent processing technology and 3D printing technology [7]. Such characteristics of The Times will force the transformation and upgrading of talent training, secondary vocational and technical schools are main training base of technology-oriented and service-oriented talent training, the mode and content of talent training must be reformed and upgraded, so as to make the trained skilled talents meet the social needs seamlessly. Technical and service talents are needed in all walks of life, so the curriculum reform of processing and manufacturing in secondary vocational and technical schools is particularly important. In combination with the characteristics of the industry 4.0 intelligent era, the following are some thoughts on the course reform of processing and manufacturing.

### **4.1. Keep Pace With the Times to Expand Students' Professional Knowledge and Related Professional Modern Information Technology**

With the coming of industry 4.0 era, the education of secondary vocational and technical schools is set up with compound and advantageous majors, which cultivates compound and innovative talents. Processing and manufacturing training talent in secondary vocational and technical schools is a strong ability to operate the first line of technical workers, only can operate is not enough, but also should know the operating principle. In the era of intelligent manufacturing, it is suggested that the content of the curriculum system should be extensive, the knowledge of related disciplines should be intersected, and the professional content should be profound, so as to broaden students' knowledge field and stimulate their divergent thinking. In the era of information explosion, new posts keep emerging, replacing traditional posts, and the broad knowledge cluster can adapt to new posts more quickly.

### **4.2. Subject Setting and Course Content Should Not Only Emphasize the Cultivation of Skills, but Also Not Neglect Professional Quality and Humanistic Quality**

Secondary vocational and technical schools mainly cultivate skilled personnel, most of them focus on explicit skills and light recessive skills personnel training. Professional quality and humanistic quality are hidden skills, which are extremely important for the long-term development of society and personal career development. As the saying goes, "Ceremony to set people, arts to foster, line to adult". It can be seen that the formation of behavioral habits, as

well as the formation of professional quality, is of great importance to people's life and social progress and civilization. Secondary vocational and technical schools can set up some elective courses that can enhance students' humanistic quality and professional quality, such as some courses on patriotism, traditional virtue and cultivating aesthetic sentiment. Students can choose the accomplishment courses they are interested in, so as to "moisten things silently".

#### **4.3. Cultivate Dual-Qualified Teachers**

Secondary vocational and technical schools are short of teachers, and dual-qualified teachers are even more scarce. In order to change the status quo, secondary vocational and technical schools and enterprises should try their best to cultivate dual-qualified teachers. Senior technicians in enterprises are encouraged to learn theoretical knowledge and teaching skills in their spare time. Teachers in secondary vocational and technical schools with rich theories can use their holidays to conduct research in enterprises and learn from senior technicians in enterprises. Through mutual learning and communication, we can carry out some teaching and practical operation contests and give spiritual and material rewards. Qualified schools or enterprises may send some competent teachers or senior technicians to advanced countries to study and exchange experience [8].

#### **4.4. Increase the Number of Hours of Practical Training Courses**

Although the theoretical knowledge of students in secondary vocational and technical schools is not very rich, they have strong practical ability and active thinking, which enable them to practice in enterprises and carry out practical operations. At the same time, the teacher can explain some relevant theoretical knowledge and operating principles to them, so that they can have a sense of achievement and become interested in the knowledge they have learned [9]. As the saying goes "Interest is the best teacher".

#### **4.5. Establish Curriculum System Evaluation Mechanism**

For the reform of course system of secondary vocational and technical schools, not only need to study secondary vocational institutions of experts and scholars and teachers to participate in class, should also be invited to have studied the course of the outstanding student representatives and enterprise managers to participate in, listen to their learning of the course of feeling, harvest, the evaluation of enterprise managers to the workers, publish their views, suggestions [10]. Multi-participation, the reform of the course is more reasonable, more effective.

### **5. Conclusion**

In the era of intelligent manufacturing, made in China 2025 and industry 4.0, a large number of complex and innovative talents in intelligent manufacturing are urgently needed. Vocational education requires secondary vocational and technical schools to reform personnel training mode and carry out curriculum reform. The specialized curriculum system plays a decisive role in the ability cultivation and knowledge structure of students in secondary vocational and technical schools, and the curriculum reform plays a key role in the skill training and theoretical level improvement of students. Therefore, in order to cultivate qualified first-line skilled operators who can be "used" by manufacturing enterprises, it is imperative to reform the curriculum and curriculum contents of manufacturing majors in secondary vocational and technical schools.

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## References

- [1] Several opinions of the general office of the state council on deepening the integration of industry and education, guo ban fa [2017] no. 95.
- [2] Wang Yan. On the curriculum system reform of modern apprenticeship in secondary vocational schools [J]. Chinese off-campus education,2018(20):157-158
- [3] Wang Yaxi. Current situation of secondary vocational school curriculum setting and analysis of its causes [J]. Guide to science and education (upper ten-day),2018(05):121-122
- [4] Zhang Yuanbao, Shen Zonggen. Application-oriented talent training from the perspective of undergraduate vocational education [J]. Education and career,2018(13):57-62.
- [5] Huang Xiaoli, Ding Bin. Discussion on the curriculum system reform of secondary vocational schools under the modern vocational education system [J]. Journal of fujian institute of education, 2008,19(07):82-84
- [6] Evolution and reform of vocational education from industry 0.0 to industry 4.0. Vocational and technical education in China release date: October 08, 2018
- [7] Chen Shaofeng, Cao Xiaoyun. Humanistic quality education for college students from the perspective of the lack of traditional culture. Journal of chuzhou institute, 2017,2(3):13-17.
- [8] Zhang Lixin. Sharing experience of school-enterprise cooperation and discussing training mode of skilled personnel [J]. Career,2018(21):7-9.
- [9] Chen Mingjiang, Lin Xiaoya. Research on professional curriculum reform of secondary vocational schools -- taking numerical control technology application major as an example [J]. China high-tech zone,2018(07):91+93
- [10] Gao Hui, Zhao Mengcheng. Quality evaluation of production-education integration in higher vocational colleges from the perspective of stakeholders -- qualitative research report based on Nvivo [J]. Vocational education BBS,2018(08):39-43.