Research on the reform of integrated talent cultivation of middle and high school undergraduate in the context of 1+X certificate

Desheng Zeng¹, Xiaodan Chen¹, Shuanglong Pang¹, *, Xue Jiang², Chunyang Chen² and Jun Nie³

¹Guangdong Innovative Technical College, School of Information Engineering, 523960 Dongguan, China
²Guangdong Innovative Technical College, Middle Vocational Department, 523960 Dongguan, China
³Guangdong University of Science & Technology, School of Computer Science, 523083 Dongguan, China

Abstract. With the deepening of industrial transformation and upgrading and reform of vocational education, the demand of society for high-level vocational technicians has increased. Combining with the "20 articles of vocational education" and "1+X" certificate system pilot project, based on the existing system of secondary and higher vocational education in our college, we jointly carry out the reform of "integration of courses and certificates" with Guangdong University Of Science & Technology. According to the characteristics of the school's majors, the vocational skill level certificate of "intelligent computing platform application development" was selected as a pilot reform, and the X certificate was fully utilized as the basic measure and standard for practitioners to measure their competence, so as to build an integrated talent training system of middle and high school, and to realize the organic connection between the curriculum systems of middle school, high school and undergraduate levels. This will help cultivate more excellent technical skills talents for the Guangdong-Hong Kong-Macao Greater Bay Area and is expected to provide a reference for building a perfect vocational education system.

1 Introduction

1.1. Background

With the industrial transformation and upgrading, the development of digital economy, the increased use of automation and intelligence in industry and other kinds of industries, the demand for low-level skilled workers is decreasing year by year, and the demand for high-level technical skilled personnel is rising year by year. The demand for technically skilled personnel in various industries is becoming more and more urgent, and the important status and role of vocational education is becoming more and more prominent. However, compared with developed countries, China's vocational education still has a system construction is not perfect, the system is not sound enough, the participation of enterprises in the school is small, and the supporting policies for the growth of technical and skilled personnel are not perfect, and the quality of schooling and talent training varies across the country, and the actual situation in Guangdong Province, the level of talent training in vocational institutions in the Pearl River Delta region is much higher than that in eastern Guangdong and northwestern Guangdong, etc. The actual situation in Guangdong Province is that the level of talent training in vocational institutions in the PRD region is much higher than that in the eastern and northwestern Guangdong regions[1,2].

At the same time, as Guangdong Province is pushing forward the reform of classified examination, the policy of "separation of general high school and secondary vocational school" at the secondary school level is gradually implemented, and more and more students will be trained by secondary vocational education. Higher vocational and undergraduate education has become a clear pathway for these students to advance in their studies. In the existing vocational and technical education system, an integrated pattern of progression of qualifications is built to meet the urgent needs of society and parents for the career development of secondary vocational school students[3].

1.2. Significance

(1) Take the theme of building a digital economy in the Greater Bay Area as a research opportunity. In recent years, the national, Guangdong, Hong Kong and Macao governments at all levels have continued to formulate and improve the policy framework for the construction of the Greater Bay Area, while the rise of the digital economy has brought new growth points for the development of the Greater Bay Area in Guangdong, Hong Kong and Macao. Technology and industrial innovation in many fields, such as big data, artificial intelligence, intelligent manufacturing, and financial technology, will become an important driving force and strategic support for the construction of the Greater Bay Area. Based on the demand for talents in the economic
and social construction of the Guangdong-Hong Kong-Macao Greater Bay Area, this study fits the demand for ICT talents in the digital transformation of the Greater Bay Area, with the main goal of cultivating high-quality talents in the application development of intelligent computing platforms, which helps to provide important support and talent guarantee for the development of the digital economy in the Greater Bay Area[4].

(2) Build a segmented integrated talent training system of "integration of courses and certificates". Fully reflecting the concept of "X certificate", we adopt segmentation to build the curriculum system of middle and senior vocational level, and integrate the content of primary, intermediate and senior certification syllabus, core courses and practical training courses into the professional curriculum system according to the requirements of "X certificate" in the talent training target. In this paper, we have taken a look at the curriculum system of Guangdong, Hong Kong, Macao and Taiwan, which has been integrated into the professional curriculum system to obtain skill level certificates in phases.

This paper conducts a study on the demand for technically skilled personnel in the social development and economic construction of the Guangdong-Hong Kong-Macao Bay Area, based on the development needs of the Dongguan regional economy and society, and in line with the current national policy of vigorously developing vocational education. Combined with the construction plan of our school, we make full use of the specialized curriculum system of "1+X" certificate to gradually build the characteristics of the vocational education system of intermediate, higher vocational and local vocational through training, and form a competitive brand of vocational education.

2 Problems of the current vocational education system of middle and high school

2.1. Inadequate articulation between major levels

At present, in the integration cultivation process of secondary school, higher vocational school and undergraduate school, the articulation of majors is a crucial part, and it is necessary to do a good job of stage articulation of majors in order to realize the organic articulation between each level, otherwise students cannot study the same majors coherently, which is easy to cause the fault of knowledge and skills. Secondly, there are certain differences in the training objectives and orientation of students due to the differences in the corresponding school orientation and school foundation of different segments.

2.2 Inadequate curriculum articulation

Due to the lack of unified combing of curriculum system among current secondary, higher vocational and undergraduate institutions, institutions work separately and do not pay attention to the organic docking of curriculum. In the process of student training, there are often problems such as repeated learning of certain knowledge, or a certain course repeatedly appearing, and even some knowledge or skills have a discontinuous phenomenon. The effect of technical skills training is far from the expected effect [5].

2.3 Lack of mechanism system

At present, among the three types of institutions, there is still an obvious problem that our country lacks guarantee mechanism for the articulation of middle and high school, and the governments in different places also lack the support policy for the articulation of middle and high school, and lack the motivation for the articulation, and the perfection of the work in all aspects is different, and there is great resistance from all aspects, and there is no way to form a synergy to promote the articulation of middle school, high school and undergraduate[5-6].

3 Integrated talent training reform ideas

3.1 Sorting out the knowledge points in the X-certificate standard

Led by the school, the X-certificate standard analysis team is formed by the front-line technical backbone of industry and enterprises, professional leaders and key teachers to analyze the "intelligent computing platform application development vocational skill level standard", decompose all the knowledge points covered by the skill requirements in the vocational skill level standard, and sort all the knowledge points by the principle of similarity. All the knowledge points are classified and sorted by the principle of similarity, and the same category is sorted by the progressive relationship of the difficulty of knowledge points, and the knowledge points are improved by the pre-paving knowledge and the subsequent extended knowledge settings. In addition, the transitional knowledge should be added when the knowledge before and after is connected, so as to form a knowledge system that can be studied by students at all stages[1,2].

3.2 Restructuring of talent training plans at each level

With the document "Guiding Opinions on the Formulation and Implementation of Professional Talent Training Programs in Vocational Colleges and Universities" (No. 13 of Education Vocational Training [2019]) issued by the Ministry of Education, the talent training program is a normative document for institutions to organize teaching activities and arrange teaching tasks, as well as the basic basis and implementation carrier of talent training, which also makes the important position of the talent training program in the process of talent training clearer. In each
academic year, the professional leader should organize the front-line technical backbone of industries and enterprises and professional backbone teachers to adjust the professional talent training program based on the established professional training objectives and the overall requirements of the state for vocational education talent training, combined with the newly constructed curriculum system, so as to achieve the optimization of the dual participation of schools and enterprises in the talent training process.

3.3 Restructuring the curriculum

Curriculum system is the most important carrier to achieve the goal of talent training, and it is the key to guarantee and improve the quality of education. The curriculum system is mainly composed of specific course objectives, course contents, course structure and course activities. As a type of employment-oriented education, vocational education has a comprehensive implementation of the concept of technical skills training, each major should be based on professional training objectives, service orientation and employment orientation, to build a curriculum system suitable for serving the needs of students to grow and become successful[1,3].

3.4 Clarify the main occupational job groups and job responsibilities

Intelligent computing platform application development occupational skill level is divided into three levels: primary, intermediate and advanced, and the three levels are progressive. Through research and analysis, as well as reference to the relevant specifications of the intelligent computing platform application development vocational skill level standard, we clarify the main job groups and job responsibilities as follows: infrastructure management, IDE integrated development environment management, application software and artificial intelligence application product development and testing departments for IT Internet enterprises, traditional enterprises and institutions of digital transformation, and government, etc., engaged in intelligent computing platform Build, platform management, IDE integrated development environment deployment and system testing, data management and analysis processing, basic function application development and artificial intelligence application product development testing, etc., according to business needs to complete offline online integrated development environment deployment, management, system testing, as well as data analysis and processing, artificial intelligence algorithm optimization and implementation, artificial intelligence application product development testing the job tasks include[7].

3.5 Clarify occupational skills requirements

Through the above analysis of the main professional job groups and job responsibilities, and with reference to the grade standard, we divide the vocational skills related to "intelligent computing platform application development" into four modules: platform construction, platform management, data management and application development.

The following is a typical "platform management" as an example, the main vocational skills for the three levels, mainly as follows:

1) In the primary certificate, for the "platform management" module, the main task is "system management". Firstly, they can independently complete the daily operation and maintenance management operations of the storage system of the intelligent computing platform using the equipment operation and maintenance management tools provided by the vendor, such as: system status monitoring, log collection, daily inspection, etc. Secondly, the vendor's equipment operation and maintenance management tools can be used to independently complete the daily maintenance and management operations of the artificial intelligence dedicated servers (such as GPU accelerated servers, Kunpeng general-purpose computing servers, and Sunrise heterogeneous computing servers) of the intelligent computing platform, such as: equipment inspection, log collection, and equipment status indicator identification, etc. Finally, you will be able to apply the specifications and skills of writing system operation and maintenance management documents to assist senior technical support staff to sort out and improve the network topology diagram, system operation and maintenance management and other related documents of intelligent computing platform system.

2) In the intermediate certificate, for the "platform management" module, the two main tasks are "system management" and "system testing".

In the task of "system management", firstly, according to the design requirements of the business, you can use the system management tools provided by the product vendor to independently complete the operation of storage resource expansion and upgrade of the intelligent computing platform. Secondly, according to the design requirements of the business, you can use the system management tools provided by the product manufacturer to independently complete the system operation status monitoring and inspection, performance analysis and optimization, security reinforcement, and fault analysis of the artificial intelligence dedicated servers (such as GPU accelerated servers, Kunpeng series servers, and Rising series servers, etc.). Finally, you will be able to use project documentation tools and templates to independently organize and write O&M reports and technical support documents for intelligent computing platform systems.

In the task of "system testing", first, be able to use the common methods and tools for system troubleshooting, independently analyze the causes of common failures, and put forward improvement suggestions and methods and measures. Secondly, according to the system troubleshooting manual provided by the vendor, use troubleshooting tools or the system's own troubleshooting commands or functions to deal with system emergencies and ensure the stable operation of the system.
(3) In the advanced certificate, the "platform management" module also contains two tasks: "system management" and "system tuning".

In the task of "system management", firstly, according to the requirements of business design, you can use the system management tools provided by the product vendors to realize the overall status monitoring, resource management and system tuning of the intelligent computing platform. Second, according to the project change guidance, you can participate in and complete some of the intelligent computing system changes related to the implementation of operations. Finally, you can use document development tools or templates to independently complete the preparation, optimization and archiving of documents related to the operation and maintenance management of the intelligent computing platform system.

In the task of "system testing", firstly, you can use problem management tools to track and solve the problems of business-related systems and realize the closed-loop management of problems. Secondly, to provide technical support for major incidents, emergencies and major changes according to the emergency handling process and specifications for major incidents. Lastly, the ability to use documentation development tools or templates to independently complete the preparation, optimization and archiving of routine documentation for system tuning and testing.

4 Building an integrated talent training system

Due to the differences in the orientation and infrastructure of secondary, higher vocational and undergraduate institutions, there are problems of knowledge and skills discontinuity and repetition of teaching contents in the cultivation of secondary and higher education talents. In this paper, based on the rules of talent cultivation and teaching, we adopt a segmented approach to integrate the requirements of the corresponding "X-certificate" examination syllabus for primary, intermediate and advanced levels into the curriculum system of each stage, and design the following way to build an integrated training system. Firstly, in the intermediate stage, the study and certification of the primary "X certificate" will be completed; secondly, in the senior stage, the study and certification of the intermediate "X certificate" course will be completed; finally, in the undergraduate stage, the study and certification of the senior "X certificate" course will be completed. Finally, at the bachelor's degree stage, we will complete the study and certification of the advanced "X Certificate" course. Take "Intelligent Computing Platform Application Development Vocational Skill Level Standard" as an example, its main applicable professional situation.

Therefore, in the pilot process of integrated talent cultivation reform in our school, according to the existing professional construction of the school, the middle-level stage major is selected as: software and service; the senior-level stage is: computer application technology; the undergraduate stage is: software engineering. The process of building integrated talent training system is mainly divided into the following steps.

4.1 Clear training objectives

The main focus is on the infrastructure management, IDE integrated development environment management, application software and artificial intelligence application product development and testing departments of IT and Internet enterprises, traditional enterprises and institutions transforming to digitalization, and government, etc., to cultivate technical skills talents with good professional ethics and humanistic qualities, with enterprise employment as the guide and job skills and comprehensive quality as the core. The program aims to cultivate technical and skilled talents with good professional ethics and humanistic qualities.

4.2 Clarify the relationship between X-certificate in major, curriculum and credit

The development of X-certificate originates from the typical work tasks corresponding to vocational positions (groups), and the demand for knowledge and skill points of typical work tasks is closely related to the cultivation of corresponding professional core skills in schools, but there is not a unique correspondence between professional core skills and majors. In the design of our integrated talent training system for secondary, senior and undergraduate schools, X-certificate is used as the foundation for consolidating students' sustainable development, developing vocational skills level credentials for expanding employment and entrepreneurial skills and alleviating structural employment conflicts. For example, the knowledge and skills involved in the vocational skills level certificate of intelligent computing platform application development are embodied in the form of core skills for professional talent training in the relevant majors of middle-level, senior-level and bachelor's degree.

4.3 The study stage of secondary school

In the secondary stage, that is, in the learning stage of software information and service majors in our school, secondary school students are required to become junior technical skill talents of "intelligent computing platform application development" after completing the study and certification, master the basic knowledge of intelligent computing platform application development, and be able to complete intelligent computing hardware and software platform and development environment deployment, as well as daily management of the development platform and basic application function development test according to the business configuration requirements. They can complete the deployment of intelligent computing software and hardware platform and development environment, as well as the daily management of the development platform and the
development and testing of basic application functions according to the business configuration requirements.

4.4 The study stage of senior

In the senior-level stage, that is, the study stage of computer application technology in our school, senior-level students are required to become intermediate technical personnel of "intelligent computing platform application development" after completing the study and certification, and be able to complete the deployment and management of offline integrated development environment, as well as the basic processing of data, product development and testing of artificial intelligence primary applications according to the requirements of business management. They will be able to complete the deployment and management of offline integrated development environment, basic data processing, and product development and testing of artificial intelligence primary applications according to business management requirements.

4.5 The stage of undergraduate

In the undergraduate stage, that is, the students of computer application technology in our school, after completing their studies, they are promoted to Guangdong Institute of Science and Technology, and as students in the undergraduate stage, they are required to become advanced technical skills talents of "intelligent computing platform application development" after completing their studies and certification, and they can complete the tasks of cloud integration development environment. Students are required to complete the deployment, management and system testing of the cloud integration development environment, as well as the advanced processing of data, optimization of artificial intelligence algorithms and development and testing of advanced application products according to business needs.

5 Conclusion

Firstly, in the process of current VET talents cultivation, the principles of wholeness, standardization, practicality and operability of X-certificate related standards are used to carry out integrated cultivation of middle-grade, high-grade and undergraduate talents, avoiding the problems of non-connection of majors and non-connection of courses in the process of talents cultivation in each stage, avoiding repeatedly offering the same courses for many times, effectively using the learning time of each stage and cultivating qualified VET talents. The X-certificate system strengthens the training and evaluation of students' vocational ability and enhances students' vocational ability.

Secondly, in this paper, we try to explore the integrated talent training model based on X-certificate to build secondary, higher vocational and undergraduate education, which helps to establish a perfect vocational and technical education system, in meeting the increasing demand of enterprises for high-level talents, and also helps to provide the urgent demand of society and parents for vocational and technical talents to upgrade their qualifications.

Acknowledgments

This article was funded by the Provincial High-level Professional Construction Project of Guangdong Education Department: Computer Application Technology Major Group of Guangdong Innovative Technical College, No. GSPZYQ2021046 and Guangdong Provincial Education Science Planning Project: Research on Talent Training Mode of "Post-Course Competition Certificate" in Higher Vocational Internet of Things Application Technology, NO. 2022GXJK691.

References

1. Ding ZG & Guo YNA. (2020). The implementation path and guarantee of 1+X certificate system in higher vocational institutions. China Vocational and Technical Education (10), 53-56.