

# Reform and Research on Talent Training for Artificial Intelligence Major Under the Background of 1+X Certificate

Desheng Zeng<sup>1,\*</sup>, Shuanglong Pang<sup>1</sup>, Lihua Chen<sup>1</sup>, Xiaodan Chen<sup>1</sup>, Pinzhang Xie<sup>2</sup>  
Yufang Tang<sup>3</sup>, Cui Shao<sup>1</sup>, Jianhua Fang<sup>1</sup>, Huahai Chen<sup>1</sup>

<sup>1</sup> Information Engineering Institute, Guangdong Innovative Technical College, Dongguan, China

<sup>2</sup> Department of Intelligent Manufacturing, Zhanjiang University of Science and Technology, Zhanjiang, China

<sup>3</sup> School of Pharmacy Engineering, Guangdong Food and Drug Vocational College, Guangzhou, China

\*Corresponding author. Email: zengdesheng@vclimbers.org

## ABSTRACT

With the implementation of the "National Vocational Education Reform Implementation Plan", our school took the implementation of the "1+X" certificate system pilot as an opportunity to carry out in-depth construction and reform of the artificial intelligence technology application major and build a platform for ICT talent training and employment in conjunction with enterprises. In the design of the curriculum system, the main line is the vocational skills level certificate of "intelligent computing platform application development", and the structure of the professional curriculum is divided into sections and layers. In the process of teaching and learning, we adopt the process of process and process of teaching. In the teaching and learning implementation process, process assessment methods and credit recognition interchange are used to improve students' learning effectiveness and practical ability in multiple ways, actively explore ways to improve the quality of education, make use of the hierarchical certification system to clarify the career development path for students, and achieve the purpose of training AI computing application professionals for the Guangdong-Hong Kong-Macao Greater Bay Area.

**Keywords:** Vocational Education, Artificial Intelligence Talent Training, 1+X Certificate, Integration of academic certificates and vocational skills certificates.

## 1. INTRODUCTION

### 1.1. Background

At present, China's economy has shifted from a stage of rapid growth to a stage of high-quality development, and new industries and fields have put forward new requirements on the scientific and cultural quality and competence level of practitioners. With the transformation and upgrading of the industrial structure, new high-end professional and technical occupations are constantly being created, the upgrading of the level of science and technology has also triggered changes in traditional occupations, and the widespread use of information technology is constantly generating new occupations and types of work<sup>[1]</sup>.

In the field of information technology, with the widespread use of artificial intelligence, the Internet of Things, big data and cloud computing in China, the related high-tech industries have become a new growth point for China's economy. The demand for practitioners has grown significantly, creating a relatively stable population of practitioners. New occupations related to the new generation of information technology, such as artificial intelligence, the Internet of Things, big data and cloud computing, have emerged. These new occupations are high-tech industries, which require a high level of professional and technical knowledge and ability, and generally require a high level of education and ability<sup>[2]</sup>.

Therefore, in April 2019, the Ministry of Human Resources and Social Security and other departments released information on 13 new occupations, including artificial intelligence engineering technicians, big data engineering technicians, cloud computing engineering

technicians and others, to keep up with the changes in the development of new technologies and occupations, establish a dynamic adjustment mechanism for occupational classifications, accelerate the development of relevant occupational standards, and build a modern occupational classification system that is in line with national conditions and in line with international standards. The system is in line with national conditions and in line with international standards<sup>[3]</sup>.

## ***1.2. The current situation of training skilled talents***

In the process of talent training, classified by the main body of talent training program development, there are mainly two ways, one is the construction method led by the institution and assisted through the professional construction committee. The second is the way of joint schooling or co-construction of majors carried out, where the formulation of talent training programs is the responsibility of multiple parties, and the curriculum at each stage is the responsibility of different subjects, in the form of building the curriculum system in stages.

At present, in the process of training skilled personnel, these two approaches fail to take into account the coherence of talent training, and do not have a good grasp of the characteristics of talent training and the law of talent growth, and inevitably have their own perspective. There is a gap between the training objectives and training specifications and the talents required by the industry. At the same time, the training programmes are not flexible enough to adapt to the rapid changes in the industry<sup>[4]</sup>.

## ***1.3. Significance of the reform***

### ***1.3.1. Fitting the needs of the country***

In January 2019, the State Council issued the Implementation Plan for National Vocational Education Reform, proposing to draw on the common practices of international vocational education and training, deepen the reform of the training model for the cultivation of complex technical and skilled personnel, enhance the modernization of vocational education in the new era, and provide support for high-quality human resources to promote economic and social development and improve national competitiveness. The Ministry of Education and four other departments issued a notice on the implementation of the "academic certificate + several vocational skills level certificates" system in institutions, focusing on serving the needs of the country, market demand and enhancing students' employability, and launched the pilot work of the 1+X certificate system<sup>[5]</sup>.

With the rapid development of new technology fields such as "cloud computing", "big data" and "artificial intelligence", the demand for engineering technicians has

become broader. With the transformation and upgrading of the industrial structure and industrial changes, new technologies bring about changes in business models and work scenarios, making various industries put forward higher requirements for composite and technically skilled talents. From the perspective of employers and practitioners, there is an urgent need for an evaluation and recognition system to make a fair and reasonable assessment and recognition of the abilities of social workers and school students<sup>[6]</sup>.

### ***1.3.2. The recognition of X certificates is increasing year by year***

#### ***1.3.2.1. Gradual increase in recognition of the admission examination system***

In Guangdong Province, in order to implement the "Notice of the State Council on the Issuance of the Implementation Plan for National Vocational Education Reform" and the "Notice of the Ministry of Education and Other Four Departments on the Implementation of the "Academic Certificate + Several Vocational Skill Level Certificates" System in Institutions" and other documents. From 2020 onwards, some universities in Guangdong Province, such as South China Normal University and Guangdong Technical Teachers' University, will require candidates to possess vocational skills certificates in the admission process for their professional education, and the "1+X certificate" has been officially entered into the certificate catalogue for candidates of vocational education teacher-related majors. From 2022 onwards, the Guangdong Provincial Education Examination Authority will also formally incorporate the 1+X Certificate into the catalogue of skills examinations for admission to the unified examination for secondary vocational school graduates by ordinary higher education institutions, and the X Certificate will gradually be integrated into the vocational education system at all levels.

#### ***1.3.2.2. Implementation of Double certificate in one examination***

In recent years, the Shenzhen Human Resources Security Bureau and Huawei Technologies Co., Ltd. have been cooperating in the training and evaluation of skilled personnel, and have achieved some milestones. Since July 2021, the relevant certification has been implemented as "one test, two certificates", i.e. the direct connection between Huawei certification and vocational skills level recognition. Candidates who pass the Huawei certification examination in the specified direction can obtain both the Huawei certification certificate and the corresponding vocational skills level certificate. After the vocational skills level certificate is recorded by the Shenzhen Human Resources and Social Security Bureau, it will be included in the statistics of skilled talents,

dovetailed with public policies for skilled talents and enjoy subsidies for vocational skills upgrading.

## **2. STRATEGIES FOR THE DEVELOPMENT OF TALENT TRAINING PROGRAMMES**

### ***2.1. Carrying out reform practices based on the concept of engineering education***

The major of artificial intelligence technology application belongs to a typical science and technology major, therefore, in the cultivation process of students of artificial intelligence technology application, the concept of engineering education is integrated from the perspective of students, teachers, majors, enterprises and school stakeholders. In the whole process of talent cultivation, the standards of CDIO engineering education are used to provide systematic and comprehensive guidelines for the implementation and testing of the whole talent cultivation process, so that students can carry out learning in an active, practical and organically linked way between courses.

### ***2.2. Constructing a flexible curriculum system***

Usually, the training cycle for technically skilled personnel is long, with the complete training process taking six years for secondary school students entering higher education institutions, for example. With the emergence and maturity of new technologies, many new tools, methods and models will emerge, and tasks that can only be completed by senior graduates may be completed by secondary school graduates with the help of new tools in the future. Therefore, the curriculum should not only take into account the current specifications of the industry's demand for talents, but also consider the changes in the next 3-5 years. The talent training programme should be able to adjust quickly with the changes in the industry's demand for talents, and should be dynamic, open and easy to deconstruct and reconstruct.

### ***2.3. Integrating X book certificates and reconstructing talent training programs***

In accordance with the requirements of the Ministry of Education's "Guidance on the Development and Implementation of Professional Talent Training Programmes in Vocational Colleges and Universities", institutions implementing the 1+X certificate system should organically integrate the relevant contents and requirements of vocational skill level standards with professional talent training programmes, and revise a series of teaching standards consistent with the talent training programmes to apply the 1+X book and certificate integration requirements. Therefore, the launch of the pilot 1+X certificate system is an important

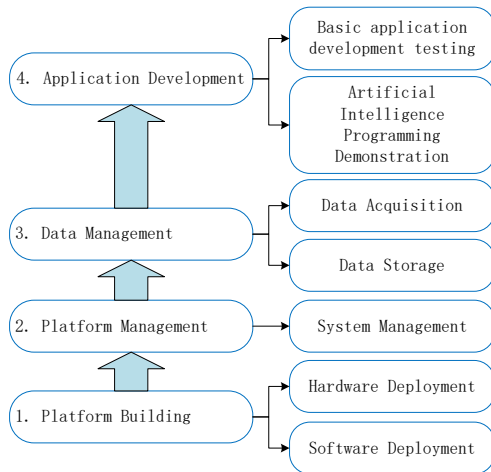
initiative to promote the reform of the training mode and evaluation mode of technical skills training and improve the quality of talent training. 1+X is implemented by vocational colleges and universities, which will adjust their professional talent training programmes in a timely manner according to the relevant contents and requirements of vocational skills levels, so as to achieve the effective connection between the education and talent chains and the industrial and innovation chains.

In the talent training process of our AI technology application major, we mainly cultivate ideologically and politically firm, comprehensive development, adapt to the needs of the regional economic development of the Pearl River Delta and Dongguan City, have a correct world view, outlook on life and values, have a certain international vision, innovation consciousness, entrepreneurial spirit, good professional ethical quality, on the basis of having the necessary basic theoretical knowledge and professional knowledge, focus on mastering Basic ability and basic skills to engage in practical work in this professional field, familiar with national information industry policies and regulations, good professional ethics, dedication and innovation, familiar with basic computer knowledge, skilled application of data thinking, data product tools, existing artificial intelligence platforms, system testing, system maintenance and other technologies to solve practical problems, able to engage in intelligent product maintenance, intelligent system testing, artificial intelligence Highly qualified technical skills personnel who are able to work in the maintenance of intelligent products, testing of intelligent systems, pre-sales and post-sales, and the use of intelligent system tools, and who can adapt to the needs of the first line of production, construction, management and service.

The main responsibilities of the certificate include the deployment of intelligent computing hardware and software platforms and development environments, as well as the daily management of the development platform and the development and testing of basic application functions according to business configuration requirements. Learning modules mainly include, as shown in Figure 1 blow.

Therefore, in the process of reconstructing the talent training programme, the syllabus of the X Certificate examination is fully considered and the various learning and practical modules, integrated into the curriculum system. After completing the corresponding courses, graduates will be able to engage in intelligent computing platform construction, platform management, deployment and system testing of IDE integrated development environment, data management and analysis processing, basic functional application development and product development and testing of artificial intelligence applications, etc. They will be able to complete the deployment, management and system

testing of offline and online integrated development environment, as well as the analysis and processing of data, according to the needs of business. They are able to complete the deployment of offline and online integrated development environments, management, system testing, analysis and processing of data, optimisation and implementation of artificial intelligence algorithms, and development and testing of artificial intelligence products.



**Figure 1** Competency requirements for vocational skills level certificate (junior)

### 3. DESIGN OF THE CURRICULUM SYSTEM FOR THE APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGY

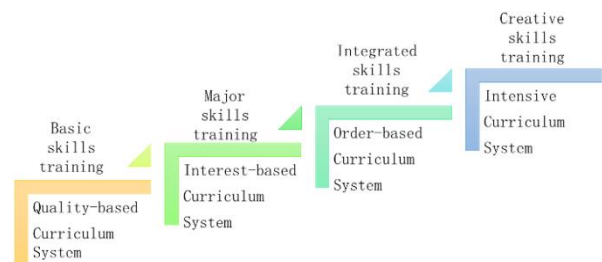
#### 3.1 Adopt a gradual curriculum system by means of stratification and segmentation

First of all, the curriculum of the AI technology application major should be adapted to the talent training objectives and training specifications, the content of the curriculum should be closely related to the actual production and labor and social practice, and the professional curriculum should be set to cultivate students' professional knowledge, technology and skills, and in the process of developing the talent training program of the AI technology application major of our university, the examination of the integration of intelligent computing platform application development and Huawei professional certification In the process of developing our AI technology application talent training program, we integrate the examination of intelligent computing platform application development and Huawei professional certification, highlighting the applicability and practicality, and also focusing on the comprehensive cultivation of students' professional ability and professional spirit.

Secondly, according to the idea of systematic orientation based on work process, the course system is

improved by deconstructing the required knowledge, technology, skills and literacy elements based on the work process requirements of the job. The project course of typical work tasks is a course that starts from the work tasks of real occupational positions, cultivating students' comprehensive vocational abilities and levels of jobs in the work tasks, integrating the work process of enterprise positions and students' learning process at school with students' learning abilities and personalised professional development, and students' comprehensive abilities with the demands of occupational positions through teaching courses such as learning-by-doing, engineering integration and on-the-job practice The curriculum is designed to ensure that students' comprehensive abilities are aligned with the needs of their vocational positions through learning by doing, work integration and on-the-job practice, highlighting the cultivation of vocational skills training, job adaptability, technological application and innovation, and throughout the teaching process.

Finally, in the teaching process, each training model has a specific combination of forms and objectives, and there is no universal training model. Therefore, the examination syllabus of Huawei professional certification can be implemented into the whole process of talent training, and the characteristics of students in different grades, different learning levels and different levels can be fully considered, different teaching methods can be adopted, different teaching objectives can be set on the basis of ensuring students' professional core courses, appropriate adjustment of course evaluation standards, and a curriculum system of curriculum integration with tiered sectional teaching can be established to improve students' Learning initiative and enthusiasm, to achieve progressive talent training, as shown in Figure 2.



**Figure 2** Progressive Course System Design Concept

#### 3.2 Integrating certificate syllabus to realize classification training

By analyzing the characteristics of higher vocational students, combining the relevant standards of the Vocational Skill Level Certificate for Intelligent Computing Platform Application Development, and also making full use of the high-quality curriculum resources of Huawei Information and Network Technology Institute's vocational certification, and taking the vocational competence cultivation needs of "AI

engineers" as the core, the Vocational Skill Level Certificate for Intelligent Computing Platform Application Development is integrated into the professional curriculum system. The course outline is integrated into the professional curriculum system, and a professional curriculum system that integrates courses and certificates is constructed in a tiered and segmented manner.

According to the requirements of the training specification, the public quality courses and some professional foundation courses are completed in the first two semesters, the professional foundation courses are completed in the second three semesters, the professional core courses are completed in the third four semesters, the professional development courses are completed in the fifth semester, and the pre-job comprehensive training, graduation design and final internship are completed in the sixth semester.

## **4. IMPLEMENTATION GUARANTEES**

### **4.1 Construction of "Dual-qualification teacher" team**

#### *4.1.1. Cooperation between schools and enterprises to jointly improve the teaching ability of professional teachers*

First of all, starting from the basic skills of teachers, combining the training objectives, curriculum system, course contents, teaching methods and evaluation methods of AI technology application majors, regular seminars on teaching methods, lecture competitions and teaching ability competitions are held to explore and improve the basic teaching ability of teachers.

The School of Information Engineering holds the "Science and Technology Innovation Activity Month" every year, inviting experts from enterprises, Huawei ICT Academy experts and experts from the X-Certificate Training and Evaluation Organization, etc. to conduct teacher skills training and improve the professional practice ability of front-line teachers in multiple aspects. Batches of professional teachers were arranged to go to partner enterprises for on-site practice to learn about different IT technologies and new technical hotspots in artificial intelligence, strengthen professional skills and understand corporate culture, so as to lay a solid foundation for talent training.

#### *4.1.2. Using the 1+X teacher training system*

According to the requirements related to the 1+X certificate system, the teachers of the corresponding courses are arranged to attend the official training during the winter and summer vacations every year, so as to fully understand and apply the design structure system and

implementation operation procedures of the vocational skills level standards, with the aim of improving the teaching professional ability and vocational skills training methods, and helping the School of Information Engineering to further understand the objectives, requirements, operation procedures and assessment methods of the vocational skills level practical training instruction training and assessment program. The aim is to help the School of Information Engineering to better understand the objectives, requirements, operational procedures and assessment methods of the vocational skills level practical training and assessment programme. The teachers who participated in the training obtained the vocational skills level certificate of the corresponding level and the corresponding assessor certificate at the same time, so as to ultimately achieve the purpose of improving the professional and technical abilities of key teachers and optimizing the teaching staff.

#### *4.1.3. Participation in Huawei's official teacher certification*

The school has completed the construction of Huawei Information and Network Technology Institute, and can repeat the official teacher training service provided by Huawei every year during the winter and summer holidays, namely: Huawei Certified Academy Instructor (HCAI), which is based on professional certification and focuses on examining the engineering practice ability of teachers. The corresponding teachers of AI technology application can make full use of the training opportunity to actively prompt the level of professional teachers and help improve the quality of talent cultivation.

## **4.2 Evaluation and assessment mechanisms**

### *4.2.1 Process assessment and evaluation*

In the process of training professional talents in artificial intelligence technology application, the assessment and evaluation of the course breaks the traditional assessment and evaluation method, takes the "vocational ability" demand as the core, and adopts the process assessment method to carry out reform practice. According to the characteristics and nature of the course, the teaching team of the course jointly draws up the assessment content, adopts the practical-oriented assessment content, and designs the "N+1" process assessment and evaluation method, where "N" is the number of assessments in the teaching process, and "1" is the final examination. "1" is the final examination. "The number of assessments in the "N+1" mode is set at  $3 \leq N \leq 5$  according to the credit and credit hour arrangement of the course, to examine the students' hands-on practical ability. The results of "N" process examinations in the course, in appropriate proportion with other contents such as class tests and attendance rates, constitute the "ordinary grade" part, and the results

of "1" final examination constitute the "final grade" part, and in the final overall assessment grade the proportion of the stage The percentage of the examinations in the overall final assessment grade is appropriately increased, generally set at 50%-60%, and can be increased to a maximum of 70% if the number of hours arranged for the course is high.

#### 4.2.2 Credit recognition and replacement

In the professional curriculum system, the certification syllabus related to "Intelligent Computing Platform Application Development" and "Huawei Professional Certification" is integrated, and the courses that are integrated with the curriculum and certification take various ways to identify the course results and convert the credits. At the end of the related courses, students can apply for exemption from the assessment of the corresponding courses if they have already obtained the corresponding certificates.

### 5. CONCLUSION

In the context of "1+X certificate", the reform practice of professional talents cultivation is in line with the national concept of reforming vocational education talents cultivation, which is conducive to promoting the reform of technical skills talents cultivation mode and talents evaluation mode, improving the quality of talents cultivation, realizing the match between education and labour, and making the certificate recognized by education, enterprises and industries. enterprises and the industry.

The reform and practice of professional construction can allow vocational colleges to take the initiative to dovetail with the needs of local industries, and majors to dovetail with vocational positions, to realise the mode of new curriculum to dovetail with new technologies, and to realise the integration of industry and education, which is more conducive to improving the level of vocational colleges in serving local economic development, and such experience can provide good reference for the professional reform and construction of other similar institutions.

### ACKNOWLEDGMENTS

This article was funded by Guangdong Education Science Planning Project (No. 2020GXJK271, 2020GXJK310, 2021GXJK157, 2021GXJK706).

### REFERENCES

[1] Desheng Z, Shuanglong P, Xiaodan C, Yufang T, Cui S. Research on the reform of talent training of higher vocational computer network technology in the context of 1+X certificate[J]. *Industrial and*

*Information Technology Education*,2021(04):1-7+13.

- [2] Tingmei W, Yanyan C, Fang Y. The construction method and key implementation strategies of the curriculum system for the through-training of high-end technical skills personnel[J]. *China Vocational and Technical Education*,2021(32):17-22+29.
- [3] Desheng Z, Pinzhang X, Shuanglong P, Xiaodan C, Yufang T, Cui S. The practice of cultivating big data talents in higher education based on "studio system"[J]. *Journal of Tianjin Sino-German University of Applied Sciences*,2021(02):62-66.
- [4] Xiongyin C, Yueliang Z, Junfeng L, Ying H. A study on the practice path of 1+X book and certificate integration in the context of skill-based society: an example of logistics management majors[J]. *China Vocational and Technical Education*,2021(26):12-17.
- [5] Desheng Z, Jinwei L, Qiaoling X, Shaoying W. A study on the practice of training big data talents in higher vocational institutions under the 1+X certificate system [J]. *Vocational Education Research*,2020(01):30-34.
- [6] Zongxiao Y, Ke Y. Exploration and practice of the construction of "dual system" teaching curriculum system through school-enterprise cooperation[J]. *China Vocational and Technical Education*, 2019(04):92-96.