

# Research on Training Mode of Electronic Information Engineering Technology Major in Higher Vocational Colleges under "1+X" Certificate System

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## Abstract

The "1 + X" certificate system is a major reform in the design of China's vocational education system. This paper fully considers the career development path and growth path of the employees of sensor network application development, takes the professional quality, professional skills and knowledge level as the main framework structure, connects and serves the implementation of "X" in our school, realizes the "integration of courses and certificates", and organically integrates the professional skill level standard of sensor network application development into the professional talent training scheme and curriculum system, Through the implementation of teaching reform, the curriculum has been optimized, the innovative training mode of applied talents with compound skills has been deepened, and the quality of talent training has been improved.

## Keywords

Electronic Information Engineering Technology; Integration of Courses and Certificates; Teaching Reform; Talent Training.

## 1. Introduction

In June 2019, the Ministry of Education issued the Guiding Opinions on the Formulation and Implementation of Professional Talent Training Programs in Vocational Colleges, which clearly proposed that schools should be encouraged to actively participate in the implementation of the "1+X" certificate pilot program, organically integrate the content and requirements of vocational skill level standards into professional curriculum teaching, and optimize professional talent training programs [1].

This paper responds to the requirements of National Vocational Education Reform Implementation Plan to launch the pilot system of "diploma certificate + several vocational skill level certificates" in vocational colleges and application-oriented universities, help to promote our school will pilot certificate system and professional construction, course construction, teachers team construction and so on together, promoting a "1" and "X" in the organic link, Improve the quality of vocational education and employability of students majoring in electronic information.

## 2. Analysis of Current Situation

### 2.1. Lagging Teaching Content

Electronic information major is characterized by fast update of knowledge, rigorous logical thinking, and even requires both hardware and software knowledge, which puts forward higher requirements for students' learning [2]. The main problem in the current talent training of this major is that the knowledge learned by students cannot adapt to the needs of the society, and

they cannot use the knowledge they have learned to find a suitable post or a job in their major after graduation. To meet the needs of the society, we must reform the existing teaching content in order to cultivate interdisciplinary talents in line with the needs of the society.

### 2.2. Lagging Curriculum Development

In the implementation of "1+X" certificate system, "X" lacks course support and the development of relevant courses lags behind [3]. The existing curriculum system of electronic information specialty is reasonable, but it disintegrates professional knowledge and makes it difficult for students to construct a system of professional knowledge. Although some new courses are offered, the system of knowledge is separated and the integration of courses and "X" is not well achieved. Therefore, the implementation of "X" pilot has certain obstacles, and it is difficult for students to form the docking degree of actual positions.

### 2.3. Practical Teaching is Superficial

The goal of talent training is to meet the needs of the society, especially the electronic information major, more emphasis on the practical ability of students [4]. And existing electronic information professional practice teaching system, most of the major courses in the relevant practice teaching, but the practice teaching content is not a real project. So the teacher didn't strictly according to the actual project requirements to design the teaching contents, also won't be able to use the engineering implementation standards to regulate the student's professional quality and professional skills.

## 3. Design of Teaching Mode

In sensor network application development appraisal pilot construction as the foothold, professional skill level to realize electronic information talent cultivation system reform, characterized by the integration of professional course certificate to promote electronic information professional talents cultivation "1" and "X" organic link, the sensor network application development professional skill level standard content and requirements of organic blend in professional talent training scheme, further optimize the curriculum and teaching content, strengthen the construction of professional teaching team, the construction of teachers to promote the quality of professional connotation [5]. As shown in Figure 1, the research of course certificate integration of electronic information major is of positive significance. The main research content includes the following aspects, redefine the goal of talent training, implement the "1+X" certificate system, construct a curriculum system that integrates courses and certificates, build a team of "Double-qualified" teachers, Strengthen School-enterprise cooperation, establish and perfect incentive mechanism and evaluation mechanism.

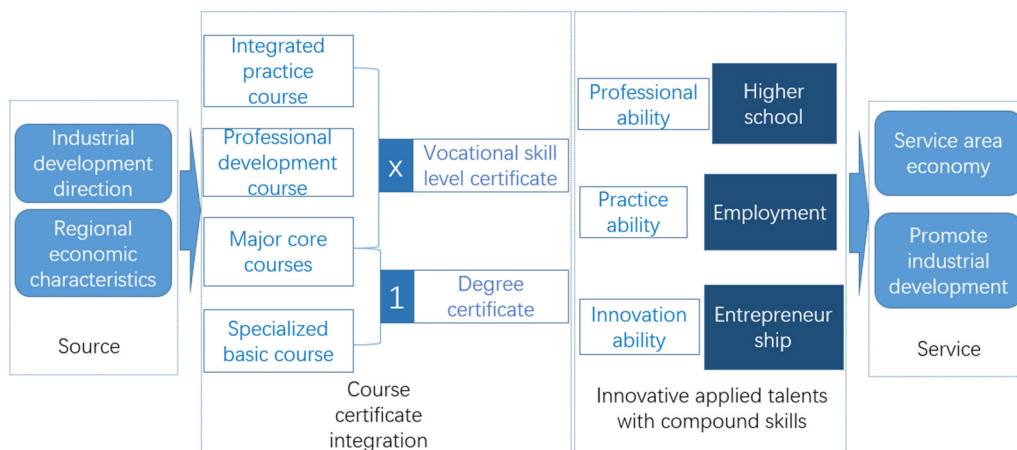


Figure 1. Research significance

### 3.1. Redefine the Goal of Talent Training

The first step in the reform of talent training program is to have a precise positioning of professional talent training objectives. For the society, through understanding and analyzing the industrial chain of the industry, combined with the job recruitment data of the industry, analyze the work process and work content of relevant posts. And finally, according to the data analysis of the survey, get the talent training goal of this major. Electronic information professional jobs for electronic technology, information technology and electronics and information industry field of combination, in WenZhou region or province of electronic information industry chain and industry jobs data collection, analysis, research and visit other universities in the province of electronic information professional talent training scheme, the analysis of positioning of electronic information professional jobs and redefine the goal of talent training.

### 3.2. Implement the "1+X" Certificate System

The construction of vocational skills certification system pilot training assessment related to training conditions, optimization of electronic information professional training conditions. According to the sensor network application to develop vocational standards, improve vocational skills teaching conditions and training teaching resources. According to the transformation of teaching mode, realize the integration of knowledge and action, and build a high-level practice teaching base integrating "teaching, training and service".

### 3.3. Reconstructing the Curriculum System

Through positioning the job position of talent training, and then analyze the professional skills of the job, and determine the corresponding professional certification content. Standard of sensor network application development professional skill level and content analysis, combined with the corresponding skills required, under the guidance of curriculum and certificate integration, with the goal of training compound technical skills talents, on the basis of consolidating students' academic education ability and quality, to provide support for students' knowledge, ability development and lifelong learning, to create a professional core curriculum system suitable for the growth of compound technical skills talents. After years of exploration and sorting, the electronic information major has determined the Internet of Things application technology as the main talent training direction. Curriculum system break down to form the Circuit and Electrotechnics, C Language Program Design, Analog Electronic Technology and Application, Digital Electronic Technology and Application, the Single-Chip Computer Application Technology, Wireless Sensor Technology, the Internet of Things Access Technology, the Application of Internet of Things technology and other professional basic and professional core courses.

The professional skill level standard for sensor network application development involves four work areas, namely data acquisition, master controller, communication mode and communication protocol application, as shown in Figure 5. For each field of work, the curriculum standards of the existing courses are analyzed, and the integration of the curriculum knowledge points and vocational skill level standards can be realized in two ways. The first way is to revise the curriculum standards and introduce the professional knowledge points of the vocational skill level standards into the curriculum with the application of sensor network. The second way is to add courses and set new course standards, such as the latest low-power narrowband NB-IoT and LoRa networking technology. Students are required to be able to program and configure the NB-IoT module working mode (Active mode, Idle mode, PSM mode) to realize data collection and transmission of nodes. The course Internet of Things Communication Technology must be added to support it.

Therefore, in addition to revise the Single-Chip Computer Application Technology, Wireless Sensor Technology and the Internet of Things Access Technology such as curriculum standards of the course, you also need to develop more courses to support sensor network application development standard professional skill level and content, such as the Introduction to the Internet of Things, the Sensor Technology, Internet of Things Communication Technology, IoT System Integration and Maintenance etc, through the revision of talent training program, the above courses are organically integrated, so as to realize the integration of electronic information curriculum and sensor network application development vocational skill level standard.

### **3.4. Build a Team of "Double-qualified" Teachers**

A good team of teachers is the key to cultivate high-quality talents. Facing the social demand for compound talents, we must strive to improve the level of teachers in order to keep up with the pace of talent development. In the construction of the sensor network application development skill level assessment pilot, whether from the perspective of training or evaluation, it is necessary to build a teacher team that can accurately grasp the relevant concepts of the sensor network application development certificate system, master the organic integration of courses and certificates, and meet the training needs of new technologies and new skills. On the one hand, full-time teachers were selected to Newland Technology Group to train the theoretical and practical knowledge needed for the sensor network application development vocational skill level standard and certificate examination; On the other hand, teachers are encouraged to participate in the production practice of enterprise projects combining production and education in the college, so as to improve their practical ability and innovation ability and realize the quality optimization of professional teachers. Through the development practice of enterprise real projects, the proportion of "Double-qualified" teachers is further increased and the connotation of "Double-qualified" teachers is enriched. In addition, the introduction of modular teaching mode, teaching, training content modular design, theoretical knowledge and practice are combined, learning process and production process are combined. Team members cooperate in teaching and training according to their own strengths and advantages, and carry out modular teaching through division of labor. Teachers conduct in-depth research in related sensor network application development certificate course system in different directions. In order to continuously improve the teaching quality and effect, the research directions of modules with their own characteristics are formed through the division of labor and cooperation in sensor technology, CC2530 wireless sensing technology, STM32 embedded system application, short range wireless (ZigBee\Wi-Fi\BLE) communication and low power narrowband (NB-IoT \LoRa) communication.

### **3.5. Strengthen School-enterprise Cooperation**

Schools and enterprises jointly build training bases, establish certificate pilot and assessment sites, implement the "1+X" certificate system, improve students' practical ability. "1 + X" on the implementation of certification system to further promote the integration between colleges of education mode, through profound fusion, cultivate students from the applied basic cognition to the actual project of systematic learning process, lets the student in peacetime training process can come into contact with the real working environment, feel the enterprise culture, learning skills, And on this basis, through the examination of vocational skills grade certificate, this will effectively promote the organic connection between "1" and "X", improve the quality of vocational education and students' employability.

Close contact with enterprises in the field of electronic information in Wenzhou to improve the width and flexibility of students' employment. Through professional cooperation with enterprises, social practice, on-the-job internship and other ways, at present, WenZhou MOSHANG micro-electronics Co., Ltd. and Zhejiang Makepower Electronics Co., INC. have been

cooperating with electronic information majors. They use enterprise resources to train students' practical ability, improve students' practical ability, and fully enhance the width and flexibility of students' employment.

Give full play to the advantages of "double high" school, promote training by competition, and promote course certificate-competition integration. In the newly formulated vocational college skills competition scheme, vocational colleges as the main body of the joint application of enterprises to hold vocational college skills competition, through strengthening School-enterprise cooperation, with the New Continent Technology Group and other domestic leading Internet of things technology 1+X evaluation organization, play the advantages of the "double high" school of our college, with related enterprises. Actively bid for or participate in the Internet of things technology vocational college skills competition, through the exchange of skills competition to promote training, fully improve the practical ability of students. On the basis of course certificate integration, personalized development path is provided for some outstanding students, and the academic level of students is raised through skill competition, so as to further promote course certificate-competition integration and provide higher height for students' employment.

Schools and enterprises jointly build teaching resources to promote the reform of "three education". Through the construction and operation of the pilot and the "1 + X", and explore the construction of "Double-qualified" teachers between colleges, promote in-depth cooperation between colleges and enterprises to participate in vocational education and personnel training mode, the advantage of operating experience, according to the enterprise actual production project introducing typical cases to teaching production, prepare the project of training notes (sheet material), further improve the teaching effect of integrating theory and practice, promote the reform of "teachers, textbooks and teaching methods" and improve the quality of vocational education through in-depth construction of School-enterprise cooperation teaching resources.

### **3.6. Improve Incentive and Evaluation Mechanisms**

In order to mobilize teachers' work enthusiasm and initiative, enhance the work sense of responsibility and sense of responsibility, raise awareness of the competition of full-time teachers and teaching quality, introduce appropriate incentives and safeguards, with rewards in the pilot work, the innovation education mode, the "1 + X" education to improve teaching quality and teaching staff construction have made outstanding contribution to the team and individual. In order to improve the students interest in learning of technical skills, to mobilize students to participate in the "1 + X" pilot's enthusiasm, the passing rate and improve the professional skills certificate, will encourage each major class training, according to the certificate in the form of hierarchical teaching meet the demand of students' skill training, with the help of science and technology innovation service platform to enhance students' practical experience in the Internet of things project, And docking to carry out all kinds of school skills competition activities, for outstanding students to carry out material and spiritual rewards.

## **4. Conclusion**

Through 2 years of practice, it has been proved that all the students participated in the national unified examination of "1+X" Sensor network Application Development Vocational Skill Level Certificate, and the passing rate is higher than 95%, far higher than the national average level of the same period. The above measures effectively realize the integration of courses and certificates, and the training content of "X" certificate is integrated with the curriculum content of professional talent training program. The training content is organically integrated into the professional talent training program of academic education, realizing the modular teaching of "X" certificate vocational skill assessment teacher team. Starting from the application of the



sensor network to develop the new technology and new process of vocational skill level standards, teachers' professional knowledge reserve and re-learning ability are strengthened. Through the implementation of "X" pilot, teachers are trained and exercised to fully improve the level of teachers.

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