International Journal of Education and Humanities
ISSN: 2770-6702 | Vol. 8, No. 2, 2023

Research on Innovation of Electronic information engineering Talents Training Mode from the Perspective of Integration of Industry and Education

Zuoli Zhang[1], Yisen Yu[1] and Xinfei Liao[2,*]

[1]The Department of Intelligent Manufacturing, Wenzhou Polytechnic, Wenzhou 325035, China
[2]Human Resources Office, Wenzhou Polytechnic, Wenzhou 325035, China
[*]xinfeiliaowz@126.com

Abstract: The launch of "1+X certificate" aims to solve the problem of disconnection between vocational education, talent and society. It is an innovative product of vocational education talent training, which can improve the connotation of vocational education and provide technical and skilled talent support for the transformation and upgrading of the country. In the context of integration of industry and education, the electronic information engineering technology specialty has built a pilot "1+X" certificate for sensor network application development, To meet the assessment requirements of the "1+X" certificate for vocational skills in sensor network application development, and to explore and research the innovation and practice of talent cultivation models for electronic information professionals from the perspective of industry education integration, guided by collaborative education implementation, through the construction of teaching staff, teaching facilities, teaching resources, curriculum system revision, teaching method improvement, and evaluation system development, The electronic information engineering technology specialty will be built on the industrial chain and demand chain, so that the talent training of the physical and electronic information engineering technology specialty will be integrated with technological innovation, employment and entrepreneurship. The school enterprise interaction will deepen the integration of industry and education, build a "1+X" practical teaching system, and further handle the relationship between industry and education cooperation.

Keywords: Integration of industry and education, Integration of courses and certificates, Curriculum system, School enterprise cooperation, Teaching reform.

1. Introduction

In recent years, with the high attention and policy support of the Central Committee of the Communist Party of China and the State Council, China's vocational education industry integration has achieved in-depth development. Since the issuance of the "Several Opinions on Deepening the Integration of Industry and Education" by the State Council in 2017, the integration of industry and education has been officially promoted to a national level education and industry policy. The report of the 19th National Congress of the Communist Party of China also proposed "improving the vocational education and training system, deepening the integration of industry and education, and promoting school-enterprise cooperation". In January 2019, the "National Vocational Education Reform Implementation Plan" was released, which directly pointed out that "in the new era, as China's industrial upgrading and economic restructuring accelerate, the important status and role of vocational education are increasingly prominent." In October 2019, with the approval of the State Council, the National Development and Reform Commission, the Ministry of Education, and six other departments issued the "National Pilot Implementation Plan for Industry-Education Integration Construction". The integration of industry and education has become a consistent national strategy for China's vocational education[1].

1.1. 1+X Certificate

The Implementation Plan for National Vocational Education Reform ("20 Articles for Vocational Education") proposed the pilot work of the "1+X Certificate" system, which combines academic diplomas with several vocational skill level certificates. In April 2019, the Ministry of Education and four other departments issued a notice on the pilot scheme for implementing the "1+X Certificate" system in colleges and universities. The notice emphasized that the implementation of the "1+X Certificate" system should be closely integrated with professional and curriculum development, the construction of practical teaching bases and the training of teachers, to promote the organic connection between the "1" and "X". 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 encouraged schools to actively participate in the pilot of the "1+X" certificate system, and to organically integrate the relevant content and requirements of vocational skill level standards into professional course teaching, optimizing the professional talent training programs.

1.2. Cultivation of versatile talents

"1+X certificate" is a new opportunity and a new challenge for vocational colleges. It can deepen the reform of the talent cultivation mode of vocational colleges, promote the connection and integration between academic credentials and vocational skill level certificates, and also promote the benign interaction and effective cooperation between schools and enterprises. This can improve the system of talent co-cultivation, process co-management, result sharing, and responsibility sharing, fully reflecting the essential characteristics of vocational education[2]. Under the mode of integration of production and education, the requirements and

standards of vocational skill level certificates are formulated by enterprises and industries. Enterprises and industries can accumulate the characteristics of this profession during their development and better connect with new trends in technological and social development, new trends in process development, production and service lines, and employment demand for job positions, making up for the deficiencies of academic education in terms of students' employment and entrepreneurship abilities. This is a complement, strengthening, and expansion of vocational education certificates in terms of vocational ability education.

Under the background of "double high construction", how to deepen the integration of production and education, how to implement the "1+X" reform plan, and how to actively explore the path and method of new talent training for the electronic information engineering technology (hereinafter referred to as the electronic information specialty) specialty in vocational colleges are the needs of improving the quality of discipline teaching, and also the guarantee of ensuring the quality of talent training. As the backbone of our college's dual high construction motor and electrical technology professional group, the electronic information major has become more important and practical with the formation of the second batch of "1+X" pilot projects - sensor network application development and other professional knowledge structures.

This paper studies the application of the mode of integration of production and teaching in the cultivation of innovative talents in the electronic information specialty, which is of great significance for improving students' professional practice ability and promoting the good connection between students' professional quality and the needs of social enterprises. Therefore, colleges and universities need to establish long-term and stable cooperation with enterprises in the cultivation of innovative talents in the electronic information specialty, improve the overall quality of the teaching staff Perfect the innovative talent training mode and practical teaching system, so as to lay a good foundation for the full play of the advantages of the integration of production and education mode.

2. Analysis of Current Situation

2.1. Insufficient depth of integration between industry and education

The proactive participation of enterprises in formulating talent cultivation plans and practical teaching content is not high, and there is a lack of timely and effective response to the call for integration of industry and education. Formal and phased participation in the process of technical and skilled talent cultivation, especially in specific aspects of talent cultivation such as courses, textbooks, and teaching, is seriously insufficient. There are socialization issues with the integration of industry and education, such as a single cooperation content and insufficient support for cooperation funds. These problems are fundamentally influenced by factors such as system, funding, and government support. Specifically, there are two main points: (1) The technological level of vocational colleges is not good, the scientific research and innovation strength is insufficient, it is difficult for both schools and enterprises to find common interests, and the willingness to cooperate is not high. (2) According to the model of deep integration between schools and enterprises, enterprises need to invest a certain amount of manpower and resources, especially in experimental and training venues. However, due to the low output ratio of enterprises in school enterprise cooperation, they lack enthusiasm [3].

2.2. Lagging teaching content

The characteristics of the electronic information major are fast-paced knowledge updates and rigorous logical thinking, even requiring a combination of software and hardware knowledge, which poses higher demands on students' learning. The main problem in the current talent cultivation of this major is that the knowledge learned by students cannot meet the needs of society, and they are unable to find suitable positions or jobs that match their majors after graduation. Therefore, in response to the needs of society, it is necessary to reform the existing teaching content in order to cultivate composite talents that meet social needs[4].

2.3. Course development lags behind

The implementation of the "1+X" certificate system lacks course support for the "X" component, and the development of relevant courses lags behind. The existing curriculum system for electronic information majors is reasonable but dissects professional knowledge, making it difficult for students to construct a systematic body of knowledge. Although new courses have been introduced, they are disjointed from the systematic knowledge and do not integrate well with the "X" component. Therefore, there are certain obstacles to the implementation of the "X" pilot, and students find it difficult to achieve practical job readiness.

2.4. Practical teaching floating on the surface

The goal of talent cultivation is to produce frontline artisans who meet the needs of society, particularly in the field of electronic information, which places greater emphasis on students' practical abilities. However, in the existing practical teaching system for electronic information majors, most of the courses are accompanied by practical teaching courses that do not use real projects. As a result, teachers do not design the teaching content in accordance with the requirements of real projects, and cannot use engineering standards to regulate students' professional qualities and skills[5].

3. Design of Teaching Mode

This article explores and investigates the innovation and practice of the talent cultivation model in the field of electronic information from the perspective of integration of industry and education, under the background of the "1+X" certification system for the development of sensor network applications. With the support of the provincial and municipal level 3 R&D platforms, the integrated practice platform for intelligent manufacturing training and research, and the integration of industry and education with companies such as Beijing Newland, Zhejiang Creativity Electronic and Wenzhou Moshang Microelectronics, this research aims to cultivate talents in the field of electronic information with the ability of application programming and engineering operation in the field of IoT application technology.

The article focuses on the construction of the talent training system for electronic information major that integrates course certification and reform of talent cultivation system through the pilot construction of the occupational skill level assessment of sensor network application development. It

promotes the organic connection between the "1" and "X" talents of electronic information major and incorporates the content and requirements of the occupational skill level standards of sensor network application development into the talent cultivation program, further optimizing the course setting and teaching content, strengthening the construction of professional teaching teams, and promoting the quality improvement of the professional connotation.

The article constructs a "course certification integration, three-in-one, four-degree unification" integration practice teaching system. While ensuring the organic connection and integration of course certification, it also focuses on the development of innovative talents with job competency as the guiding principle and integration of "employment, innovation, and learning ability". It meets the "four-degree unification" requirements, which include ensuring the adaptability of practical teaching goals to the needs of enterprise job competency, matching practical teaching with theoretical teaching, guaranteeing the practical teaching resources for teaching courses, and ensuring the completion of practical teaching goals. The main research contents include the construction of teaching teams, teaching facilities, teaching resources, curriculum system revision, teaching method improvement, and evaluation system formulation, as shown in Figure 1.

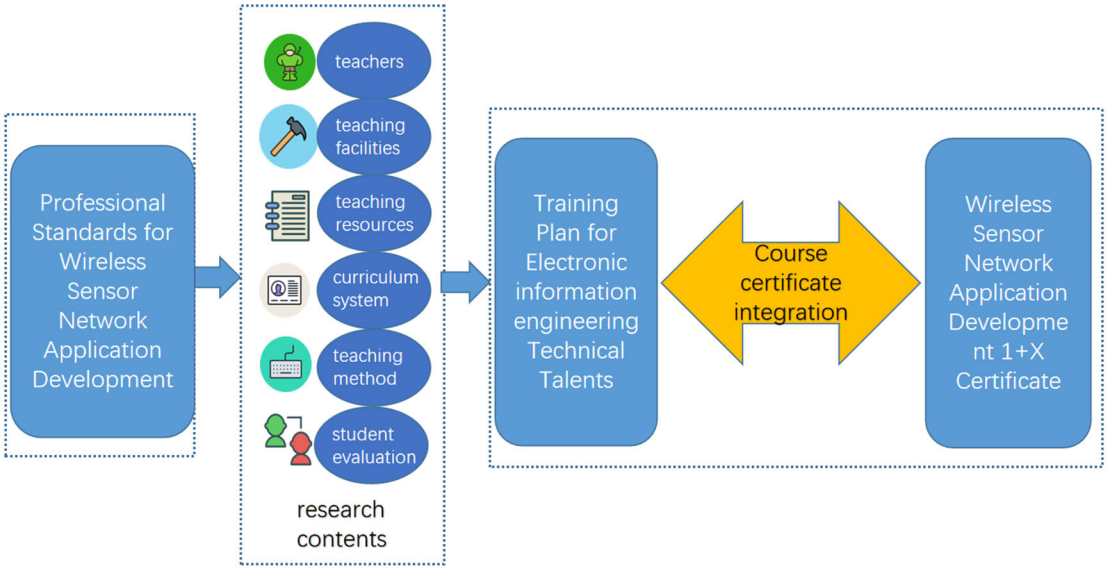

Figure 1. Research contents

3.1. Accurate positioning of employment positions

The first step in the reform of the talent training program is to have a precise positioning of the training objectives. To this end, we need to analyze the industry chain and job recruitment data, understand the work processes and content of relevant positions, and ultimately determine the talent training objectives of this major based on the data analysis. The employment positions for the electronic information major are mainly in the fields of electronics technology, information technology, and the integration of electronics and information. By collecting and analyzing data on the electronic information industry chain and job positions in Wenzhou or the province, visiting sister schools in the province to investigate the talent training programs for electronic information majors, and analyzing and positioning the employment positions for electronic information majors, we can redefine the talent training objectives.

3.2. Implement the "1+X" certificate system

Establish the practical training conditions related to the training, examination, and appraisal required for the pilot of the vocational skill level certificate system, optimize the practical training conditions for the electronic information profession, improve the vocational skill teaching conditions and training resources based on the occupational standards for the development of the sensing network applications. In accordance with the transformation of teaching methods, achieve the integration of knowledge and action, and build a high-level practical teaching base that integrates "teaching, training, and services".

3.3. Constructing a curriculum system that integrates course certification

By locating job positions for talent cultivation, analyzing the vocational skills required for each position, and determining the corresponding certification content for each profession, the standards and content of skills for sensor network application development are analyzed. Combining the skill requirements for each job position with guidance on certification integration, the goal is to cultivate compound technical talent with a focus on education and quality assurance for students, while providing support for their knowledge, skill expansion, and lifelong learning. This is achieved through the creation of a professional core curriculum system suitable for the growth of compound technical talent. After years of exploration and refinement, the electronic information profession has identified IoT application technology as the main direction for talent cultivation. The curriculum system is decomposed into professional foundational and core courses such as "Circuit and Electrical Technology", "C Language Programming", "Analog Electronic Technology and Applications", "Digital Electronic Technology and Applications", "Single-Chip Microcomputer Application Technology", "Wireless Sensing

Technology", "IoT Network Access Technology", and "IoT Technology Applications".

3.4. Improving the level of teaching staff

A good teaching staff is the key to cultivating high-quality talents. Faced with the demand for versatile talents in society, it is necessary to make efforts to improve the level of the teaching staff in order to keep up with the pace of talent development. To establish a pilot test for the skill level assessment of sensor network application development, it is necessary to build a teaching staff that can accurately grasp the relevant concepts of the sensor network application development certification system, master the organic fusion of teaching and certification with dual standards, and meet the needs of new technology and skill training. On the one hand, full-time teachers are selected to receive training on the theoretical and practical knowledge required for the standard and certification assessment of sensor network application development at the New Continent Technology Group. On the other hand, teachers are encouraged to participate in the production practice of college-industry integration enterprise projects, improve their practical and innovative abilities, optimize the quality of professional teachers, and further enhance the proportion of "double-teacher" teachers and enrich their connotation. In addition, a modular teaching mode is introduced to design teaching and training content in a modular way, combine theoretical knowledge with practical activities, and combine the learning process with the production process. Team members cooperate with each other based on their own strengths and advantages, and carry out modular teaching through division of labor and cooperation. The teaching staff conducts in-depth research in the relevant sensor network application development certification course system, and cooperates in a division of labor on sensor technology, CC2530 wireless sensing technology, STM32 embedded system application, short-range wireless communication (ZigBee/Wi-Fi/BLE), and low-power narrowband (NB-IoT/LoRa) communication, forming distinctive module research directions to continuously improve the quality and effectiveness of teaching.

3.5. Deepen the integration of industry and education

Co-construction of school-enterprise training base, establishment of certificate pilot and assessment sites, and implementation of the "1+X" certificate system to improve students' practical abilities. The implementation of the "1+X" certificate system further promotes the integration of school-enterprise education model. Through deep integration with enterprises, students are systematically trained from basic application knowledge to practical project engineering. They can experience the real work environment, feel the corporate culture, and learn the professional skills of the position during their regular training process. Based on this, the organic connection between "1" and "X" is effectively promoted, and the quality of vocational education and students' employment ability are enhanced through professional skill level certificate assessment.

Close cooperation with electronic information enterprises in the Wenzhou region to improve the breadth and flexibility of student employment. Through professional cooperation, social practice, and on-the-job training with enterprises, cooperation has been carried out with companies such as Wenzhou Moshang Microelectronics Co., Ltd. and Zhejiang Chuangli Electronics Co., Ltd. Resources from these enterprises are used to train students' practical abilities, effectively improving their practical skills and employment breadth and flexibility.

Taking advantage of the "dual-high" advantages of the school, competitions are used to promote practice and advance the integration of certification and competition. In the newly developed vocational college skills competition plan, vocational colleges jointly apply with enterprises to hold vocational college skills competitions. By strengthening school-enterprise cooperation and joining forces with domestic leading Internet of Things technology 1+X evaluation organizations such as Newland Technology Group, the "dual-high" advantages of the school are leveraged, and related enterprises are united to actively apply for or participate in the vocational college skills competition in the field of IoT technology. Through skill competition exchanges, practice is promoted, and students' practical abilities are fully improved. Based on the integration of certification and competition, personalized development paths are provided for some excellent students. By using skill competitions to raise students' academic levels, the integration of certification and competition is further promoted, providing higher heights for students' employment.

Co-construction of teaching resources between schools and enterprises promotes the "three-education" reform. Through the construction and operation of the "1+X" pilot, as well as the exploration of the construction of school-enterprise "dual-teacher" teacher teams, school-enterprise cooperation is promoted, allowing enterprises to participate in vocational education and talent cultivation models. Based on the advantages of the actual production project operation experience of enterprises, typical production cases are introduced into teaching, and project-based training materials (loose-leaf textbooks) are compiled to further improve the effectiveness of teaching integration of theory and practice. Through in-depth cooperation in school-enterprise teaching resource construction, the reform of "teachers, textbooks, and teaching methods" is promoted, and the quality of vocational education is improved.

3.6. Improve the security mechanism

In order to motivate teachers to be more proactive and responsible in their work, enhance their sense of work responsibility and accountability, and improve the competitiveness and teaching quality of full-time teachers, relevant incentive measures and guarantee measures will be introduced to reward teams and individuals who have made outstanding contributions in pilot work, innovative training models, the improvement of "1+X" education and teaching quality, and the construction of teaching staff.

To increase students' interest in learning technical skills, motivate them to participate in the "1+X" pilot vocational skills certificate program, and effectively improve their pass rates, each major will be encouraged to adopt group training and hierarchical teaching methods based on certificate levels to meet students' skill training needs. The use of technology innovation service platforms will be employed to enhance students' practical experience in the Internet of Things projects, and various school skills competitions will be organized to provide material and spiritual rewards to students who perform outstandingly.

4. Conclusion

Through the implementation of front-end research work, a thorough integration of industry and education was fully carried out, and the innovative talent training program for the electronic information major was explored and practiced. The interim achievements obtained in the research project were carefully analyzed and summarized in research reports, and the research plan was comprehensively completed. Through the above program and practices, the following key problems were mainly solved:

(1) Conducting employment surveys to accurately position talent training goals and build an innovative talent model for the electronic information major that integrates "course certification, the trinity, and four degrees of unity."

(2) Realizing the integration of course certification, the training content of the "X" certificate is organically integrated with the curriculum of the professional talent training program, and its training content is incorporated into the professional talent training program for degree education.

(3) Realizing the modular teaching of the occupational skill assessment for the "X" certificate. Starting from the new technologies and processes of the occupational skill level standards for the development of sensor network applications, teachers need to strengthen their own professional knowledge reserves and learning abilities. Through the implementation of the "X" certificate pilot, teachers were trained and exercised, and their teaching abilities were significantly improved.

(4) Completing the construction of the sensor network application development occupational skill level assessment pilot and examination sites.

(5) Strengthening the cooperation between schools and enterprises, deepening the integration of industry and education, and building a "1+X" practical teaching system to further handle the relationship between industry and education cooperation.

Acknowledgment

This work was supported in part by the second phase of the Ministry of Education's supply and demand docking employment and education project under Grant 20230109404, in part by the first batch of teaching innovation teams for teachers in higher vocational colleges in Wenzhou under Grant NO.1, in part by Wenzhou Polytechnic curriculum ideological and political demonstration major construction project under Grant WZYSZZY2101, in part by the Zhejiang province higher education curriculum ideological and political demonstration course under Grant N0.6, in part by the second phase of the Ministry of Education's supply and demand docking employment and education project under Grant 20230112193, and in part by the first phase of the Ministry of Education's supply and demand docking employment and education project under Grant 20220101144.

References

[1] Y. Dai, Z. Zhang, and Q. Guo: Thoughts and measures of implementing 1+X certificate system in vocational colleges, Chinese Vocational and Technical Education, Vol.27(2019)No.10, p.29-32.

[2] Y. Cui, X. Z. Liu: The implementation path of "1+X" compound talent training by integrating industry and education in higher Vocational Colleges, Journal of Jiaozuo University, Vol.34(2020)No.6, p.112-114.

[3] Y. Y. Wang: A Study on the Cultivation Model of Innovative and Entrepreneurial Talents in Higher Vocational Colleges under the Background of the "Double High Plan", Journal of Hubei Open Vocational College, Vol.34(2021)No.20, p.5-6.

[4] B.L. Fu, B. Meng: Reform and Practice of Training Mode on Electronic Information Majors under the "1 + X" Certificate System in Higher Vocational Education , Journal of Liuzhou Vocational & Technical College, Vol.20(2020) No.2, p.72-76.

[5] H. L. Wang: Research on Talent Training Mode and Curriculum Construction of "1 + X" Certificate under the Mode of Production Education Integration, Journal of Hebei Software Institute, Vol.22(2020)No.4, p.47-50.