**Journal of Education and Educational Research**
ISSN: 2957-9465 | Vol. 1, No. 2, 2022

# Exploration and practice of the pilot reform of vocational education at the undergraduate level

**Suyu Zhang ***

College of Artificial Intelligence, Wenzhou Polytechnic, Wenzhou 325035, China
* **Corresponding author**: Email: 23209695@qq.com.

**Abstract:** In order to actively adapt to the needs of the development of the software industry in southern Zhejiang province, Cooperate with the first-class enterprises in the software technology field, Schools and enterprises to jointly formulate professional talent training programs, Promote the reform of talent training mode and curriculum system of vocational education at the undergraduate level, Building a quality assurance system for talent training, Explore the training path and law of high-level technical skills personnel with the deep integration of industry and education, Strive to achieve coordinated development in personnel training, scientific research and academic team building, To build a high-quality software technology application of high-level technical skills personnel training highland, Serving the economic transformation and upgrading in southern Zhejiang province, Lead the demonstration, software technology professionals training.

**Keywords:** Talent training; Integration of industry and education; Vocational education; School-enterprise cooperation.

## 1. Analysis of Necessity

### 1.1. Software technology is a strategic technology leading the future, which governments at all levels attach great importance to

As the most disruptive and transformative technology, software technology is constantly infiltrating into all aspects of social production and life, and bringing a very far-reaching influence on national politics, economy and culture [1].

China attaches great importance to the development of the software technology industry, and has been written into the work report of the Chinese government for three consecutive years. In his report to the 19th National Congress of the CPC, General Secretary Xi Jinping said that we need to "promote the deep integration of the Internet, big data, artificial intelligence and the real economy. “Software technology has become an important national strategy, but also an important direction of China's industrial transformation [2,3].

### 1.2. The training of high-level technical talents in software technology application lags behind, and the demand for talents is huge

According to the 2017 White Paper on Global Artificial Intelligence Talents published by Tencent Research Institute, about 300,000 talents in 2017 were available worldwide, including about 100,000 in universities and about 200,000 in the industry, and the real market demand for software technology talents was in millions. In recent years, China's software industry is extremely urgent in demand for high-quality talents. At present, China's talent reserve scale in the field of software technology has just exceeded 50,000, ranking the seventh in the world, with a huge gap, which cannot meet the social demand for software technology talents in [4,5].

## 2. Analysis of the Research Status Quo

Compared with the general undergraduate software engineering majors and the software technology majors of vocational education specialized majors, the main differences between the pilot undergraduate majors and them are shown in Table 1.

**Table 1.** Main differences between the pilot undergraduate majors and the general undergraduate majors and the vocational education junior colleges

| name of major | Ordinary undergraduate course (Software Engineering) | Pilot Specialty (Software Engineering Technology) | Vocational Education College (Software Technology) |
|---|---|---|---|
| **train objective** | Cultivate AI professional skills and literacy, and build professional thinking, professional methods and professional smell to solve scientific research and practical engineering problems | Cultivate high-level technical skills talents who can be engaged in AI application system design and development, AI model training, AI product deployment and testing, etc | To train high-quality technical skills personnel engaged in AI-related application development, system integration and operation and maintenance, product sales and consulting, pre-sales and after-sales technical support and other work |
| **Professional core courses** | Machine learning, pattern recognition, knowledge representation, optimization methods, natural language processing, complex | Machine learning and application, deep learning and application, big data technology principle and application, natural language | Artificial intelligence dataset processing, Distributed computing and storage technology, machine learning, deep learning, Intelligent |

| | | | |
|---|---|---|---|
| | network analysis and representation, computer vision and image processing, intelligent chip, intelligent algorithm design and analysis | processing technology and application, computer vision technology and application, speech recognition technology and application | Perception and Understanding, natural language processing, intelligent product marketing and services |
| **Corresponding occupational position group** | Scientific research, system development, technology application, and teaching and management of AI key technologies | AI Application Engineer, AI Model Training Engineer, Computer Vision Processing Engineer, Natural Language Processing Engineer, python Engineer | AI technology application and development, system operation and maintenance, product marketing, technical support |

# 3. Construction Target

Actively adapt to the development needs of software technology industry in southern Zhejiang region, Cooperate with the first-class enterprises in the software technology field, Schools and enterprises to jointly formulate professional talent training programs, Promote the reform of talent training mode and curriculum system of vocational education at the undergraduate level [6,7], Building a quality assurance system for talent training, Explore the training path and law of high-level technical skills personnel with the deep integration of industry and education, Strive to achieve coordinated development in personnel training, scientific research and academic team building, To build a high-quality, software technology application of high-level technical skills personnel training highland, Serving the economic transformation and upgrading in southern Zhejiang province, Lead the demonstration, software technology professionals training [8,9].

During the construction period, the construction objectives of the pilot specialty are as follows:

(1) Fully docking with Huawei technical standards, implement the reform of "classified and precise talent training", build a project-based and modular curriculum system, and establish a series of professional teaching standards and curriculum standards.

(2) Invite and flexibly introduce 3 to 5 high-level talents, train 1 to 2 high-level talents at the provincial level or above, the proportion of double-teacher teachers reaches 100%, and establish a teaching and research team led by high-end talents to comprehensively improve the teachers' scientific research and achievement transformation ability.

(3) School and enterprises jointly build 1 national online course, jointly develop 9 high-quality curriculum standards and school-based "golden courses", and build a perfect professional basic curriculum resource system. Jointly develop project teaching standards, and create a project resource base that closely connects with work tasks.

(4) Education results have been achieved. The employment rate of students has reached over 90%, and the average employment salary has reached or exceeded that of ordinary undergraduate majors.

# 4. Constructing Assignment

## 4.1. Talent Training

### 4.1.1. Establish an organizational mechanism for asynchronous teaching

This pilot major implements the asynchronous teaching organization.

(1) Semester 1 to 3. Learn professional basic theory courses and public basic courses of the whole university, master the general core knowledge in the field of professional technology, and lay a good professional theoretical foundation. Before the end of the third semester, students will be transferred to different post classes based on their personal basis, interests, learning ability and development potential, and each student can only choose one post class.

(2) Semester 4 to 5. According to the target employment positions of professional docking, set up multiple post classes, such as software technology development and intelligent terminal application development. Then take the post class as the unit, the classification training, with the typical work tasks of each post as the carrier, to train students to master the core professional knowledge and skills required by the employment position. Before the end of the fifth semester, students will choose to enter different project classes (teams) according to their own academic background promotion, employment, innovation and entrepreneurship needs.

(3) Semester 6 to 7. A large number of cooperative enterprises related to the field of artificial intelligence will be introduced. According to the real project research and development needs of each cooperative enterprise, students from each post class will be selected between students and enterprises into several project classes (teams) inside and outside the school. Then to project class (team) as the unit, relying on the enterprise to build "integration" platform, in the real enterprise working environment, guided by professional backbone teachers and enterprise engineers, through the enterprise real project research and development, innovation, professional skills research project, etc., collaboration, precision cultivate personalized talents, help students accumulate project experience, improve project development ability and comprehensive professional quality, enhance employment competitiveness.

(4) Semester 8. Mainly based on the way that the students independently contact the enterprises in the field of software technology, they will enter the enterprises for the on-the-job internship, sign the internship agreements with the enterprises, complete the internship tasks, and realize the transformation from the internship to the employment. After the internship, I will summarize the internship content and write the graduation thesis.

### 4.1.2. Build a modular curriculum system

Starting from the training of high-level technical skills personnel and vocational education teaching law, according to the broad foundation, heavy practice, student development as the center, ability training as the fundamental, employment as the guidance, introduce "1+X", Huawei and other certification standards, to build a modular curriculum system composed of "professional foundation, post core, personalized development" [10].

Professional basic course module. Adhere to the moral education, morality and technology and training, set up a

comprehensive quality education platform course based on the integration of "morality, intelligence, physique, beauty and labor", set up the courses of software technology basic theory and algorithm design courses, strengthen the foundation of life (personality quality) and work (professional ability), to lay a solid foundation for the training of classified talents [11,12].

Post course module. According to the connected employment position group, dynamically set up the target employment positions. According to the ability and knowledge required by the job task and work process, each post course module integrates the certification standards of "1+X" and Huawei enterprise, and sets up 4 post core courses.

Personality Development course module. According to the student employment, entrepreneurship, college personality development needs, set up enterprise real project research, research projects, innovation, business incubation, "1+X" certificate or high-end vocational skills certificate courses, degree promotion, skills competition, vocational skills research to support the development of students personalized comprehensive project practice course, promote students' personalized training.

### 4.2. Building practical teaching bases for integrating industry and education

Continue to improve and improve the practice teaching system, attach great importance to the practice links, reform the form and content of practice teaching, build a "integration of industry and education" practice platform, improve students' practical ability. Form three training stages of professional foundation, professional post direction and personalized development, three levels of basic experiment, comprehensive experiment and innovative experiment, and a complete practical ability training system to cultivate professional basic ability, professional core ability and innovation ability [13,14].

### 4.3. School-enterprise cooperation

Cooperate with Huawei, China Soft International and other enterprises to jointly build majors and jointly develop curriculum resources. Cooperate with enterprises in southern Zhejiang and software technology industry to build an after-campus practice teaching base, in the form of project classes on campus, and jointly carry out the training of high-level technical skills personnel [15,16].

## 5. Quality Assurance

### 5.1. Build a big data platform to comprehensively monitor students' growth process

Relying on the professional group of "industry, professional, curriculum, classroom, teachers, students mutual finance" vocational education big data platform, comprehensive collection teaching process data (attendance, classroom teaching, course evaluation, course performance, project, performance, homework, development log, post, employment, consumption, personality and other software technology), build education big data, for the whole process of talent training software technology and intelligent management to provide data support.

### 5.2. Set up a professional personnel training standards and quality management Committee to improve the quality management system

Establish and improve the lectures, tour, evaluation, and evaluation system, establish linkage with the enterprise practice of teaching link supervision system, strengthen from the "professional teaching standards, curriculum standards, teachers, training standards, classroom teaching, teaching quality" and other full range of standard system construction and supervision patrol work, develop professional personnel training quality guarantee and evaluation system.

### 5.3. Establish a graduate tracking and feedback mechanism and social evaluation mechanism to evaluate the quality of talent training

Follow up and make statistics on the employment status of the graduates, understand the employment status of the graduates and the evaluation of the employing graduates, and regularly evaluate the quality of talent training and the achievement of the training objectives.

## 6. Characteristic Measures

### 6.1. Implement the reform of classified and precise education, and train marketable high-level technical and skilled personnel

Relying on our school professional group and soft international to build "letter and industry college", "teaching" fusion, accurate education platform, Wenzhou industry digital application technology collaborative innovation center, through the communication channel between professional and industry, real-time feeling the change of industry demand, industry standards and the latest technology and methods in enterprise production process, relying on the team, jointly timely adjust talent training plan, update course content and improve the teaching process, etc., the practice of vocational education "three docking", ensure that professional construction and development is always adapt to the development of the industry.

### 6.2. School-enterprise cooperation, the integration of industry and education, and the co-education of high-level technical and skilled personnel

Docking software technology field first-class enterprise standard, and Huawei, soft international software technology field enterprise cooperation, integration of enterprise talent training plan, project case, training platform, training room construction scheme and other high quality resources, build conform to the undergraduate level vocational education talent training education system, jointly write leaf type, project digital teaching materials, develop digital gold teaching resources, the construction of project education resources.

### 6.3. Docking with the standards of first-class enterprises, leading the reform of the three religions, and comprehensively improving the level of professional education

Connect first-class enterprise technical standards in the field of software technology, develop high-level teaching, curriculum, teachers and training conditions, connect professional standards, 1 + X and industry enterprise certification standards, develop three-dimensional digital "golden lesson" online resources; connect work tasks, develop project teaching standards and project resource base, and create first-class teaching standards and curriculum resources.

Introduction of IT enterprise typical project case, the IT industry new technology, new technology, new specification into the teaching material content, combined with professional teaching resources and high quality curriculum construction standard, write a batch of to adapt to the undergraduate level vocational education, convenient software technical teaching style, project new form integration characteristic teaching material, promote project oriented, modular, collaborative teaching method reform. Based on Huawei Cloud, we can build a "cloud classroom", realize real-time evaluation feedback, three-dimensional communication and interaction, intelligent resource push, accurate evaluation of big data, comprehensively improve the reform of teaching and learning methods, and effectively improve the effect and quality of classroom teaching.

## Acknowledgment

The paper is supported by Wenzhou Polytechnic named Research and Practice on the Construction Path of Undergraduate Vocational Education Major under the Background of the New Vocational Education Law--Take software engineering technology as an example (WZYBKZD202203). The author would like to thank the 10 experts for their contributions to this project and the former researchers.

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