

Research on School Enterprise Collaborative Education Mode of Software Technology Specialty under the Background of Enhancing the Adaptability of Vocational Education

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Abstract: The rapid development of China's digital economy puts forward higher requirements for the cultivation of software technology talents. In view of the problems existing in the talent cultivation process of software technology major in higher vocational colleges, such as the teaching content can't fully adapt to the requirements of industrial technology, the teaching process can't adapt to students' diversified learning demands, and the evaluation mode can't adapt to students' sustainable growth needs in the future, we cooperated with industry leading enterprises to build the curriculum chain and classroom link of real projects of enterprises, "1+n" double classroom skill acquisition group and "three-dimensional simultaneous" skill acquisition evaluation mode, carried out the reform of school enterprise collaborative education mode, and practiced and explored in the software technology major of Wenzhou Polytechnic, and achieved good results.

Keywords: Educational Adaptability; Software Technology; Integration of Production and Education; Educational Mode.

1. Introduction

With the vigorous development of China's digital economy, the scale of software industry continues to grow rapidly, and has entered a critical period of development of "intelligence, networking and localization". Software is the soul of the new generation of information technology, the foundation of the development of the digital economy, and the key support for the construction of a manufacturing power, a network power, and a digital China [1]. The development of software and information technology services is of great significance for accelerating the construction of a modern industrial system. In recent years, China's software industry has always maintained high-speed growth. The rapid development of the industry will also greatly increase the demand for software talents. It is estimated that the total demand for talents in the software industry will reach 8.9 million in 2025, and the new talent gap will reach 1.92 million. Especially in the key software field, the new talent gap will reach 830000. This trend shows that the demand for high-quality software talents will be more urgent in the future.

In 2021, the general office of the CPC Central Committee and the general office of the State Council issued the opinions on promoting the high-quality development of modern vocational education, which pointed out in the guiding ideology to effectively enhance the adaptability of vocational education [2]. Enhancing the adaptability and attractiveness of vocational education is also mentioned in the key tasks of education in 2024 deployed by the Ministry of education [3]. Enhancing the adaptability of vocational education has become an important breakthrough in promoting social and economic development and realizing the strategy of strengthening the country with talents in the new era [4].

Many scholars have conducted in-depth analysis on enhancing the adaptability of vocational education. Qi Zhanyong has studied the scientific connotation and the

source of power of enhancing the adaptability of vocational education, and thus proposed the implementation path from multiple perspectives [5]. An Pei analyzed the element framework of enhancing the adaptability of vocational education based on "who adapts what adapts how", and put forward countermeasures [6]. From the perspective of the new vocational education law, Liu Ying and others studied the value orientation and practice direction of enhancing the adaptability of vocational education [7].

Under the dual background of industrial development and change and the promotion of high-quality development and reform of vocational education, higher vocational education must take the initiative to meet the new demand of new posts for talent quality, and carry out innovation and Reform in talent training, so as to adapt to regional industrial development. This paper takes adapting to the rules of skill acquisition, adapting to the needs of students' personality, and adapting to the needs of social development as the breakthrough point, carries out the reform from three aspects of teaching content, learning process, and learning evaluation, and puts forward a more adaptable mode of school enterprise collaborative education.

2. Problems Existing in the Process of Training Software Talents

Higher vocational colleges have made bold explorations and attempts in the training of software technology talents [8][9], but from the results of talent training in recent years and the relevant research results of many industry enterprises, it is found that there are still the following deficiencies in the talent training of software technology majors in higher vocational colleges:

(1) The teaching content cannot fully meet the requirements of industrial technology. Enterprise positions require talents to have strong practical ability, but the practical projects of students' study in school are somewhat out of line

with the practical projects of their jobs, resulting in the inability to fully adapt. Enterprise real projects can best reflect the working process and technical system of software development, and enterprise projects will also be integrated into the current teaching process. However, limited by class hours, teachers will reconstruct and simplify the project to reduce the difficulty, which often turns the enterprise project back into a simulation project, losing the teaching characteristics and significance with enterprise projects as the carrier. In addition, software development is a complex and rigorous process. The projects integrated into the current course are relatively independent, which will lead to students' inability to fully understand the overall picture of the project, and it is difficult to understand the whole process of enterprise project development, resulting in poor learning effect.

(2) The teaching process cannot adapt to students' diversified learning demands. Students have different foundations, different interests and preferences, and the learning situation is more complex, but classroom teaching is limited by time and organizational form, so it is difficult to carry out hierarchical teaching well, and it is unable to take into account each student. The employment direction of software technology specialty includes UI design, front-end development, software testing, etc. How to cultivate students' interests and specialties to get employment in appropriate positions is a difficulty. In addition, learning and mastering software development skills requires more time, especially the practical training process that pays attention to skills, but the time in class is limited, and students are very loose outside class, lack of learning motivation, and poor time utilization. Therefore, there is a contradiction between the complexity of skill acquisition and the limited length of schooling.

(3) The evaluation model cannot meet the needs of students' sustainable growth in the future. At present, the software technology professional courses mainly focus on the final examination, project examination and process evaluation, which is somewhat disconnected from the software project acceptance evaluation standards of enterprises, such as the evaluation of students' professional quality reflected through the development process and software quality. The evaluation mode is single, focusing on students' academic performance, but paying less attention to non-intelligent factors such as professional quality, learning ability and learning attitude. At the same time, most of the current evaluation is only an isolated scoring link, and does not use evaluation to guide students' learning diagnosis and improvement, so as to promote the sustainable development of students. Through the survey, it is also found that enterprises generally believe that higher vocational students' learning motivation and continuous learning ability are weak.

3. Reform and Practice of Education Mode

In view of the lack of adaptability in the current training process of software technology professionals in higher vocational colleges, Wenzhou Polytechnic and China Unicom, China soft international, Huawei and other leading enterprises in the software industry carried out in-depth integration of production and education. Under the background of enhancing the adaptability of vocational education, it carried out reform and innovation from the teaching content, teaching process, teaching evaluation and other aspects, and built a new school enterprise collaborative education mode.

3.1. Constructing the Curriculum Chain and Classroom Link Chain based on the Real Project and Working Process of the Enterprise

Aiming at the problem of poor adaptability of teaching content, using the resources of the College of industry jointly built by colleges and enterprises, the representative enterprise real software projects including new technologies, new processes, new specifications and new standards were selected as practical cases by the team of part-time teachers in enterprises. The real projects were decomposed and reconstructed by the team of teachers in Colleges and enterprises, and the project library and task library were jointly developed, as shown in Figure 1. On this basis, the double chain teaching was constructed.

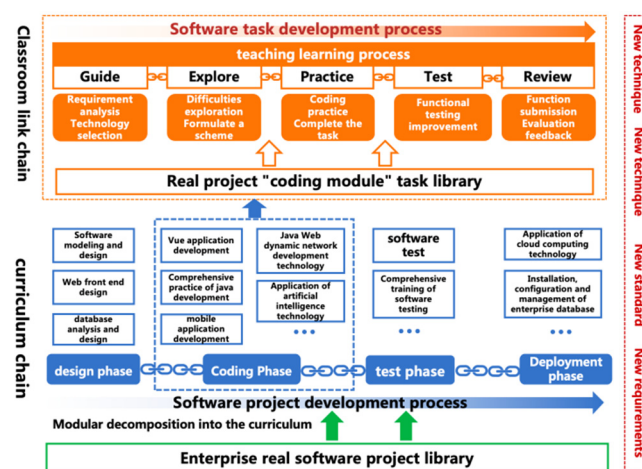


Figure 1. Curriculum chain and classroom link chain based on real projects and working processes of enterprises

The first is to build a curriculum chain based on the software development process. The development of enterprise real software projects can be divided into several stages: design, coding, testing and deployment. The basic courses, core courses and development courses of software technology specialty are divided into integrated course groups according to the different stages of software development. On this basis, the developed real project library is modularized, and the modules belonging to different stages are integrated into the corresponding course groups. Projects run through the course groups to build the course chain, that is, different courses are linked through projects, which can not only enable students to grasp the correlation between courses, but also fully restore the whole picture of the real project and improve the learning effect.

The second is to build a classroom link chain based on the software development process. The traditional task-based teaching pays more attention to the completion effect of tasks, so it will focus on students' programming ability, while the real development process of enterprise software project includes different stages such as requirement analysis, scheme formulation, difficulty solving, function coding, function testing and software release. Mastering the work content of each stage is a necessary requirement for the current software development engineer. Therefore, it is necessary to introduce the real project of the enterprise as the teaching content, and at the same time, bring the development process of the real project into the classroom, so that students

can simulate the real development environment of the enterprise while learning knowledge and completing practice. For the task of each class, according to the real development process of the task, the classroom is divided into five links of "guidance, exploration, practice, test and evaluation", so that students can complete the task in groups, simulating the development team of the enterprise. Manage and guide the whole process of students' projects according to the enterprise project management process, so as to improve students' theoretical knowledge, practical ability and development experience.

Through the construction of double chain curriculum and classroom teaching system, we can fully restore the real software development process and connect with the production scene of the enterprise, so that the teaching content can better adapt to the job requirements and industrial technical requirements of the enterprise.

3.2. Building a "1+n" Double Classroom Skill Acquisition Group

Aiming at the problems of students' complex learning situation and insufficient time for skill training, the "double classroom" integrated teaching mode was innovated. Follow the rules of students' skill acquisition and growth, and build a "1+n" skill acquisition group, that is, the first classroom+n second classrooms, as shown in Figure 2.

In the first classroom, taking the curriculum system of talent training scheme as the main line, the core skills of software technology are taught through compulsory courses, and the learning needs of different students are met through expanding courses. In the second classroom, N kinds of skill acquisition communities with full coverage are built, including various interest groups of interest selection type, various competition groups of skill sharpening type, various employment groups of career development type, and practice groups of skill improvement type. The school enterprise tutors are jointly responsible for the student management, teaching content design and activity arrangement of each group. Students can independently choose one or more second classes according to their own characteristics, foundation and future development plans, and establish a classroom accommodation mechanism. Students can replace the course scores of the first class with the achievements of the second class, such as competition awards and scientific research projects, to give students more independent and multidimensional growth space.

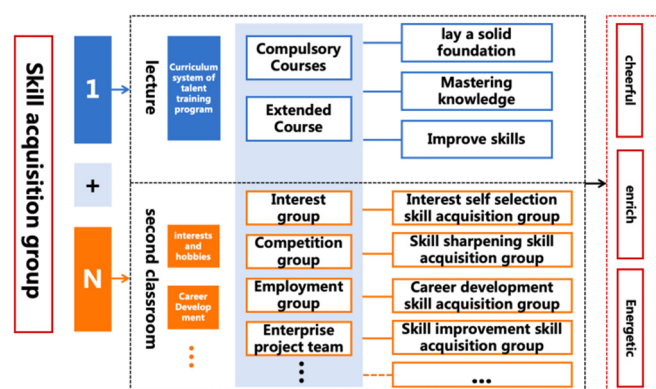


Figure 2. "1+n" double classroom skill acquisition group

Using the faculty team jointly built by the school and enterprise of the Institute of industry and a number of open

training workshops, such as the Hongmeng workshop, which provides students with Hongmeng application development sandbox, smart IOT platform, artificial intelligence practice platform, industrial Internet data acquisition workstation, etc., students can independently arrange time and choose equipment for autonomous learning and exploration, and create a skill acquisition environment of "on-demand selection", "like-minded", "diligent learning and hard practice" for students, so that students can learn comfortably, enrich and vigorously, and enhance the adaptability of the process of professional ability acquisition.

3.3. Construction of "Three-Dimensional Simultaneous Development" Skill Acquisition Evaluation Model

In view of the problem that the evaluation model cannot adapt to the sustainable development of students, the three-dimensional development evaluation model of "study+ ability+ quality" is innovatively constructed by taking the goal of stimulating students' internal learning ability and promoting sustainable development and taking the diagnosis and improvement of students' self-development as the path. The first dimension is students' academic performance, which is consistent with the existing curriculum academic evaluation methods; Dimension 2 localizes the advanced comet vocational ability evaluation model in Germany, integrates the eight ability indicators in the model, including functionality, intuition, economy, use value orientation, enterprise production process and working process orientation, environmental protection, creativity and social acceptance, with software project development, and formulates evaluation indicators to comprehensively evaluate students' Vocational ability. The first is to integrate into practical courses, change the past practice of focusing on the realization of functions, evaluate the tasks and projects of each course with new indicators, and constantly strengthen students' awareness. Second, in the practice of the second classroom, enterprise tutors use their own development experience and enterprise standards to evaluate, and further improve students' comprehensive ability and quality of software development. Dimension three designs the evaluation of quality factors such as learning motivation, learning attitude, and professional identity, specifically including observation points such as the completion of autonomous learning at ordinary times, activity participation, completion of project plans, and team contracts. The evaluation is implemented through school enterprise mentor evaluation, peer evaluation, and self-evaluation, focusing on the role of non intellectual factors in skill acquisition, stimulating learning potential, guiding students' autonomous learning and self-improvement, and paying attention to the diagnosis and reform of students, and establishing a circular promotion mechanism.

By constructing a three-dimensional evaluation model, students are evaluated comprehensively, pluralistically and scientifically from different dimensions and levels, so as to realize the transformation of the evaluation of skill acquisition from external and superficial behavior to internal and stable psychological quality and cognitive function, and enhance the adaptability of students' future development.

4. Effect

(1) Two way interaction between teaching and learning.

First of all, the construction of curriculum chain and classroom link chain makes the connection between professional courses closer, and the teaching teams of different courses work together to give students a more novel teaching experience. Secondly, the construction of "1+n" double classroom not only provides students with more platforms to exercise their skills, but also realizes personalized teaching to a certain extent. It breaks the traditional one-way teaching mode of "what teachers teach, what students have to learn", and gives students choices such as time, content, platform and project. Finally, through multidimensional evaluation, a virtuous cycle of teaching and learning is formed. After the implementation of the new collaborative education mode, the survey found that students' interest in learning was significantly improved, and the degree of skill mastery, skill diversity and learning satisfaction were greatly improved.

(2) Organic integration of learning and production. By integrating enterprise real projects, enterprise norms and standards into the course teaching, students can learn the development of real projects and master the skills required for the post; Students participate in Teachers' horizontal projects, scientific research projects, skill competitions, etc. in the second classroom. In the process of learning, students can also achieve the output of the project, scientific research, competition and innovation. At the same time, relying on enterprise resources, the practical ability of teachers in the school has been further improved through enterprise training, joint participation in enterprise scientific research projects, horizontal subject development, teacher training and other forms. Through the "one lesson, two teachers" teaching mode, the teaching ability of enterprise tutors has been improved, the construction of school enterprise mixed teaching team has been implemented, and the protection of school enterprise collaborative education has been provided.

(3) Synchronous improvement of morality and technology. Through the implementation of the new education mode, the skill level of students majoring in software technology in our school has been significantly improved. In the past two years, they have won more than 30 provincial and above competition awards. The students have a solid foundation, outstanding skills, innovative thinking and good comprehensive quality, and they can find their own positioning, match to different positions in the software industry, and better meet the needs of regional industries for software development talents. In addition, by tracking the career development of graduates and feedback from employers, students' professional attitude, learning ability and sustainable development ability are better reflected.

5. Summary

The vocational education law has upgraded vocational education as a type of education from a policy to a legal system, making it clear that vocational education and general education are two different types of education. Vocational education should follow the laws of economic and social development and meet the new requirements of a service-oriented society. How to enhance the adaptability of vocational education and cultivate more high-quality skilled talents is an urgent problem to be solved. Under the

background of enhancing the adaptability of vocational education, taking the software technology major as the carrier, this paper studies from three aspects: the adaptability of teaching content, the adaptability of vocational ability acquisition process, and the adaptability of individual development, puts forward the innovative school enterprise collaborative education mode, and carries out practical research in our school's software technology major, so as to promote the cultivation of high-quality software technology skilled talents, highlight the adaptability of our school's software technology talent cultivation to the development of regional software industry, and boost the high-quality innovation and development of software industry.

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