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# Research on the Cultivation of Vocational Competences of Secondary Vocational Students Under the Background of School-Enterprise Cooperation —— A Case Study of Mechanical Order Classes

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**Abstract:** This paper explores the school-enterprise cooperation model in secondary vocational colleges. School-enterprise cooperation aims to cultivate high-level technical and applied talents meeting enterprise needs, so as to improve students' practical operation and problem-solving abilities. The talent training adopts the order class model, and a talent training assessment system covering professional literacy, professional foundation and other aspects is constructed. In this context, reforms are carried out on the courses of PLC Application Technology and CAD. The former updates content combined with real enterprise projects, while the latter adopts project-driven teaching method and relies on enterprise practice. In response to various problems faced by school-enterprise cooperation, this paper puts forward corresponding countermeasures, including schools strengthening enrollment guidance and employment guidance, improving cooperation mechanisms, and enterprises actively participating in all links of talent training. School-enterprise cooperation has a significant effect on improving the vocational competences of secondary vocational students. However, due to time and resource constraints, the research has limitations such as insufficient samples and incomplete evaluation. It is expected that in-depth research in the future will promote the improvement and development of its talent training model.

**Keywords:** School-enterprise cooperation; Assessment system; Curriculum reform; Solutions

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## 1. Introduction

Vocational education undertakes the important mission of cultivating high-quality workers, is the main channel for transporting technical and skilled talents to the society, and is also the foundation for promoting industrial upgrading. With the rapid development of science and technology, the society's demand for professional and technical talents is increasing day by day, which has promoted the rapid development and expansion of vocational education. The scale of vocational education and the number of students have begun to show a doubling growth trend. More and more people have begun to pay attention to the development of vocational education and recognize that promoting vocational education has strategic significance for national prosperity and strength<sup>[1]</sup>. The report of the 20th National Congress of the Communist

Party of China proposes to comprehensively promote the comprehensive innovation and coordinated development of higher education, vocational education and continuing education. There are many similar models abroad: for example, “apprenticeship system” originated from vocational education in Britain at the end of the 18th century. In English, the expression of school-enterprise cooperation includes: “Cooperative Education”, “Business-Education Partnership”, “School-Enterprise Cooperation”<sup>[2]</sup>, etc. The “sandwich” talent training method was first tried by South Shields Technical College in Britain in 1903<sup>[3]</sup>. Domestic scholars have conducted a lot of research on the teaching model<sup>[4]</sup>, system and policy<sup>[5]</sup>, and students’ vocational competence cultivation<sup>[6-8]</sup> of school-enterprise cooperation. Talent training models such as “customized”<sup>[9]</sup>, excellent engineers<sup>[10]</sup>, applied talents<sup>[11]</sup>, dual-base eight-semester<sup>[12]</sup>, and dual-school-enterprise cooperation<sup>[13]</sup> have been fully practiced in different schools. Under the background of school-enterprise cooperation, students in vocational colleges can study and receive theoretical guidance at school, and conduct practical operation in enterprises. It is a two-way process that provides an opportunity for mutual learning between schools and enterprises<sup>[14]</sup>.

Under the background of the new era, secondary vocational colleges are facing new talent training requirements and innovation challenges. In the process of education, teaching and talent training in colleges and universities, the cultivation of vocational competences occupies a pivotal position, which profoundly affects students’ employment and career development trajectory. Students’ vocational competences include practical operation, social adaptation, market competition and innovation abilities. Through school-enterprise cooperation, secondary vocational colleges can adjust and improve their status and management level in the economic environment; enterprises will obtain more professional and technical talents. At the same time, school-enterprise cooperation can help learners achieve comprehensive development and targeted improvement of their professional skills, and also has a significant promoting effect on regional economic and social development.

## **2. Implementation of school-enterprise cooperation model**

### **2.1. Talent training objectives**

Under the school-enterprise cooperation talent training model, the teaching objective is to cultivate students’ practical operation and problem-solving abilities. In practical training, such as ordinary lathe processing, CNC lathe processing, fitter processing, etc., students need to participate personally and operate by themselves. Different from the traditional step-by-step operation, school-enterprise cooperation encourages students to independently formulate processing sequences and explore the impact of processing sequences on workpieces and whether they are unique. For example, in fitter training, students face the problem of manual tapping after plate tooth drilling. They find that it is difficult to grasp the balance of the plate tooth, which is easy to deviate from the axis, and due to the inability to screw in vertically, the plate tooth breaks, the thread deviates, and the workpiece is scrapped. Faced with this challenge, students showed innovative spirit and independently designed and manufactured a self-vertical bracket for tapping. This innovative tool ensures the verticality between the tap and the processing surface through the cooperation of a vertical base and tap sleeves of different sizes, and adapts to the processing needs of workpieces of different sizes through the cooperation of positioning screws and bench vices. Students discover and solve problems in practical operations. Active innovative thinking is in sharp contrast to the traditional teaching model. The main goal of school-enterprise cooperation is to cultivate people with practical operation ability and innovative spirit, or to cultivate high-level technical and applied talents who can meet enterprise needs. For example, in Guangken Sugar Industry Group and BYD Enterprise, a branch factory under them is mainly engaged in machine maintenance. Then the company needs employees with certain maintenance ability and basic service awareness. According to the actual needs of the enterprise, the school should focus on cultivating students’ technical maintenance skills and enhancing their awareness of providing high-quality services after entering the workplace in the last semester of their studies.

### **2.2. Talent training methods**

The order classes under school-enterprise cooperation adopt a 2 + 1 academic system, and students will go to off-campus

internships in the last year. Each class has a teacher who accompanies the students to the enterprise for internships to assist the enterprise in effectively managing the students. This kind of internship is often regarded as a transitional stage for employment. Enterprises usually come to the school for interviews and selections in April and May every year, and the selected students will directly enter the enterprise to start internships. After 6 to 12 months of internship, if they perform well, the students will officially become employees of the enterprise and be fully managed by the enterprise. In addition to the professional theoretical knowledge that ordinary classes also need to learn, the course content of order classes includes various practical operations of the enterprise or courses with enterprise characteristics. Half of the teachers are on-campus teachers, and the other half are professional and technical personnel from cooperative enterprises invited by the school to teach, so that students can better learn professional knowledge and work more easily in the future.

### **2.3. Talent training assessment system**

The talent training evaluation system is to test whether students meet the training objectives. To ensure the quality of talent training, vocational colleges and cooperative enterprises should establish an effective teaching quality evaluation system, which should include evaluation indicators such as students' professional literacy ability training, professional basic ability training, professional theory evaluation, and professional skill evaluation<sup>[15]</sup>. When implementing practical education, the school clearly defines the responsibilities of school teachers and enterprise mentors in internship management and performance evaluation, formulates detailed evaluation rules and standards, and constructs an effective three-way communication mechanism between schools, enterprises and students through diversified evaluation subjects and comprehensive content coverage, so as to ensure that the internship assessment and evaluation are scientific, fair, multi-participated and timely feedback. The assessment system includes: first, establish clear assessment standards, divide skill points according to workstations based on positions, form work step, workstation and post assessment modules, and build a complete vocational skill assessment system; second, divide assessment levels. For mechanical engineering majors, skill assessment is divided into basic skills (such as basic operations like maintenance), second-level skills (advanced maintenance such as detection with instruments), and highest-level skills (comprehensive judgment and use of multiple parameters to solve problems); third, design assessment methods. Construct relatively independent assessment units according to the assessment content and post levels. The school regularly organizes skill appraisal exams and reasonably arranges them according to students' skill training levels.

## **3. Curriculum reform under the background of school-enterprise cooperation**

### **3.1. Reform of PLC application technology course**

As a core course for mechatronics majors in secondary vocational schools, the PLC Application Technology course has always played a key role in cultivating students' core technical abilities. However, the traditional curriculum structure often focuses on intensive training of single instructions, and the connection between knowledge points is relatively weak, making it difficult to effectively improve students' comprehensive application and comparative analysis abilities. The task training in the course is mostly simulation training, which helps students master basic instruction knowledge but does not involve the technical requirements of positions. The update speed of course content is also slow, which is out of touch with the actual needs of enterprises and post skill requirements. The PLC Application Technology course of the school-enterprise cooperation order class has undergone new reforms. The course content is closely combined with real enterprise projects, taking the enterprise's automated production line as the main line, and gradually extending from local control to overall control, forming a teaching content system from easy to difficult and step by step. Through close communication and cooperation with school-enterprise cooperation units, new technologies, new processes and new standards are integrated into the course content to ensure seamless connection between teaching and enterprises.

### **3.2. Reform of CAD course**

A major highlight of school-enterprise cooperation is that enterprises can become real venues for students to practice CAD design and learning. Students have the opportunity to go deep into the enterprise site to understand the specific connection between product generation process, structural design and CAD. In the CAD course of the school-enterprise cooperation order class, a project-driven teaching method led by teachers, with students as the main body and aiming at cultivating students' vocational competences is adopted. This method takes real enterprise or social projects as carriers, allowing students to experience the whole process of projects under the guidance of professional mentors or industry experts, and exercise their professional knowledge, skills, methods and social abilities. The highlights of school-enterprise cooperation are prominent. Enterprises provide practice venues for students. Students go deep into enterprises, participate in product design and development in the "master-apprentice" mode, cooperate with professional tasks assigned by teachers, follow enterprise systems with an employee mindset, and realize the connection between school and enterprise positions. For the drafter position, after discussions between the school and the enterprise, the corresponding relationship between vocational actions and learning fields is clarified, focusing on the practical-oriented part mapping CAD drawing technology course. Its purpose is to cultivate drawing technicians who can proficiently use drawing software and complete part mapping and drawing. Through practice, students comprehensively improve their drawing skills, professional abilities and social practice abilities such as teamwork.

## **4. Problems and solutions under the school-enterprise cooperation model**

### **4.1. Problems existing in the school-enterprise cooperation model**

Under the school-enterprise cooperation model, students, schools and enterprises all have problems to varying degrees. On the part of students, due to being minors, they choose majors under the influence of their parents, are confused about their career paths, lack learning enthusiasm, and have difficulty converting their mentality from students to employees, which affects individuals, schools and enterprise cooperation; during internships, they have poor discipline, low retention rate, are easy to job-hop, lack integrity, are addicted to mobile games, and do not listen to instructions. On the part of schools, there is a lack of special school-enterprise cooperation management departments and detailed systems, making communication and promotion difficult; teachers have difficulty practicing in enterprises due to curriculum pressure; the construction of training bases is plagued by insufficient enterprise equipment donations, lack of financial support, and no subsidies and material support from the school itself, and students' satisfaction needs to be improved. On the part of enterprises, they are not enthusiastic about participating in the formulation of talent training programs, leading to a disconnect between the programs and needs; insufficient investment in the construction of training bases, due to expensive equipment, cognitive deviations and unbalanced investment returns, affects enthusiasm and base construction, although co-construction should be mutually beneficial and win-win.

### **4.2. Countermeasure analysis under the school-enterprise cooperation training model**

In view of the problems under the school-enterprise cooperation training model, the following countermeasures can be taken<sup>[16]</sup>: When enrolling students, secondary vocational schools should introduce the development direction of each major in detail to new students, carry out career planning education. After enrollment, teachers should distribute and class teachers should organize class meetings to interpret the talent training program in a timely manner, and conduct employment guidance in advance to cultivate students' practical ability, learning skills and good professional quality, establish a correct employment concept, pay attention to moral education, and transport "high, precise and professional" technical talents. Schools need to improve the school-enterprise cooperation training mechanism, establish a special cooperation management department, clarify personnel responsibilities, formulate perfect and distinctive rules and regulations according to national policies and their own actual conditions, sign internship agreements between schools, enterprises and students, extensively solicit opinions to ensure that the system is practical and operable, conduct full-

process dynamic supervision of internship work, and schools and regions with conditions build an information-based internship management platform using modern information technology. Enterprises should actively participate in the talent training process: first, take the initiative to participate in the formulation of talent training programs, put forward needs at the beginning of talent training, deeply participate in all links such as enrollment and selection, provide industry insights for schools, and ensure that the quality of talents keeps pace with the times; second, participate in the construction of training bases, donate applicable equipment or provide venue support to achieve long-term win-win results between schools and enterprises; third, strengthen the guidance and management of interns. Before the internship, send employees to the school to hold mobilization meetings; during the internship, old employees pass on experience, and management personnel pay attention to students' psychology; after the internship, truthfully feedback their performance, and discuss improvement measures with the school to cultivate high-quality talents.

## 5. Conclusion

School-enterprise cooperation has a significant effect on improving the vocational competences of secondary vocational students. Through this cooperation, students learn vocational skills and enhance professional literacy in practice, thereby improving their employment competitiveness, and also obtaining more diversified employment and career development opportunities. Enterprises' participation in school education makes up for the shortcomings of school education. The ways to improve students' vocational competences include: internships allow students to go deep into the front line of enterprises, experience practical work, understand industry rules and vocational requirements, and improve their practical operation ability and professional literacy; school-enterprise cooperation projects provide students with opportunities to solve practical problems, and exercise their problem-solving ability and teamwork ability through teamwork and innovative thinking; enterprise mentors provide students with precise guidance with their rich experience and industry knowledge, and students' interaction with them can insight into the industry frontier, broaden their horizons, and improve their vocational competitiveness; schools and enterprises jointly develop industry-education integration courses, integrate enterprise actual business into classroom teaching, improve students' professional literacy and practical operation ability, and make them adapt to the workplace faster; schools and enterprises also carry out vocational skills competitions to provide students with more platform resources, exercise their vocational skills, and enhance their self-confidence and competitiveness. However, due to the short development time of cultivating secondary vocational students through school-enterprise cooperation and the limitations of research resources and time, this study has limitations such as insufficient sample data due to regionality, lack of universal representativeness, incomplete effect evaluation due to short implementation time, and inability to track and conduct big data analysis on students participating in key competence cultivation who have not graduated, and timely feedback employer evaluations. It is still expected that more in-depth research and practice in the future will promote the continuous improvement and development of the school-enterprise cooperation talent training model.

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## Disclosure statement

The author declares no conflict of interest.

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