

# Research on the New Path of Teaching Mode of Practice Courses for Mechatronics Majors

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**Abstract:** It is the main way to transform the traditional vocational teaching system and build an innovative mechanical and electronic talent cultivation mode centered on improving practical ability. This study will briefly analyze the problems in the mechanical and electronic practical teaching activities, and analyze the path of talent cultivation, the construction of teaching resources, practical teaching bases and practical teaching modes to explore the effective construction of mechatronics practical teaching system, in order to cultivate technical and skilled talents with professionalism and adapt to the requirements of the post.

**Keyword:** Mechatronics; Practical Teaching; Pathway Design

## 1. Backgrounds

Teaching quality is the lifeline of vocational education, and the quality of vocational education has gradually become a popular topic in vocational education, especially in enhancing students' comprehensive vocational ability. Curriculum development, reform and the effectiveness of classroom teaching have become the core of improving teaching quality, as well as the focus and difficulty of teaching reform. Although China's vocational education has made remarkable achievements, the organic link between vocational education and the industrial chain has not yet been effectively solved, and the relationship between vocational education and regional socio-economic development is not close enough.

This paper mainly focuses on the problem of practical teaching of electromechanical specialties in the curriculum to carry out research. After researching the employment

situation of enterprises, analyzing the structure of electromechanical integration professional talents and the analysis of enterprise demand for highly skilled personnel. The analysis found that the machining demand market is very large, especially the urgent demand for skilled machining talents, and the demand for maintenance personnel who understand the electric electromechanical equipment is also on the rise. Interviewed enterprises said that at present there are two problems of electromechanical talents: on the one hand, some people have higher education, solid theoretical knowledge, but weak practical ability and working ability, need to have vocational training to be able to do the job; on the other hand, experienced technicians, satisfied with the status quo, lack of self-study, new ideas, new technologies, new technologies and other new technologies at their wits' end. In the process of transforming from traditional labor-intensive industries to high-tech knowledge-intensive industries, enterprises seeking the highest quality products need a large number of production technicians with technical, managerial and operational skills. Most enterprises indicate that there is a great demand for skilled electromechanical personnel, and the proportion of practitioners in the electromechanical industry with a high level of professional and technical skills is very low, which provides an important basis for the need to reform the mechatronics profession.

## 2. Reform Objectives of Practical Teaching in Mechatronics

Relying on the advantages of the electromechanical industry with the background of advanced manufacturing industry, the "spiral and step-by-step" talent cultivation model is machine-based, supported by mechanical and

electronic technologies, with digital transformation of electromechanical equipment's and application of industrial robots technology as the main direction. Through the cross-connection between the courses in the learning field, sharing of practical training resources, and the cyclic spiral of each learning project according to the mode of "completed behavior", it promotes the gradual progression of students' comprehensive ability from "novice to veteran, competent to expert", and realizes the comprehensive vocational ability and technical skills of the students. It realizes the enhancement of students' comprehensive vocational ability and accumulation of technical skills, improves students' hands-on ability, comprehensive problem analysis ability and solution, and meets the needs of regional social and economic development.

### 3. Teaching Reform Path Design for Mechatronics Majors

#### 3.1 Innovative Talent Cultivation Model

Drawing on the OBE concept, student-centered and benchmarking against the standards of the Sydney Agreement Certification 12 Project, the OBE concept is adopted to carry out the connotation construction of the profession, standardize the mechanism of talent cultivation, improve the quality of talent cultivation, and enhance the international competitiveness of engineering and technology education, as well as to promote the profession to set up a mechanism for continuous improvement and implement it thoroughly. Relying on the mechanism of multi-master sportsman, student-centered, modern apprenticeship order classes are formed in accordance with the characteristics of regional industrial clusters and employment demand, and the cultivation objectives and graduation requirements are formulated in a result-oriented way, so as to guarantee the cultivation of high-quality talents for intelligent manufacturing through the construction of faculty, curriculum construction and quality system. With the main line of students' success and the modern apprenticeship order class as a platform, the company carries out the cultivation of the two objectives of civics and competence, implements the construction of teachers, curricula and quality system, and realizes the differentiated cultivation of students around the direction of

employment and advancement in the intelligent manufacturing industry.

#### 3.2 Co-creation and Sharing, Building Diverse Teaching Resources

3.2.1 Updating education and teaching standards  
Focus on high-end equipment manufacturing, intelligent manufacturing of new ideas, new technologies, new norms into the teaching standards, school-enterprise cooperation to cultivate composite talents in line with the core curriculum standards.

##### 3.2.2 Rich Online Resources

Relying on the Intelligent Vocational Education Cloud, develop and introduce online learning resources for the professional core courses required for the mechatronics specialty; introduce simulation training software such as intelligent virtual factory, virtual process, cloud design and streamline operation. Relying on the industrial Internet platform, establish a data resource base for design, process, equipment operation and so on.

##### 3.2.3 Building a Resource Base of Cases

Collect information on typical cases of enterprise production and management, standards of skill competitions and typical works. Collect typical representative figures' deeds and outstanding alumni cases of the intelligent manufacturing industry on various topics, build a successful model case bank, and promote the spirit of great national craftsmanship.

#### 3.3 Adapting to Development and Reforming Teaching Materials and Methodologies

##### 3.3.1. Updated Course Content

Integrate artificial intelligence technology, industrial Internet, big data and cloud computing, and the technical basis of Internet of Things into the professional curriculum system. Systematically transform the traditional courses of design, process, testing and production management with the new industry, new technology and new ways and methods of intelligent manufacturing.

##### 3.3.2. Development of a new series of teaching materials

In accordance with international professional standards and in line with industry standards, the basic platform of the teaching materials for basic professional courses will be revamped and upgraded through the dual development of schools and enterprises. Developing new project teaching carriers, supporting the development of

a professional core curriculum of loose-leaf teaching materials with the trinity of "loose-leaf teaching materials + loose-leaf notes + functional inserts"; developing workbook-type teaching materials with practical course modules such as personalized inquiry and practical activities; and constructing nationally accredited, high-quality online resource-sharing courses and nationally planned teaching materials.

### 3.3.3. Promoting a "four-pronged" classroom revolution

Adapting to the situation of "Internet + Vocational Education", taking the enhancement of the "four abilities" as the starting point, promoting the "four" classroom revolution based on the "cloud, network and end", realizing the three-dimensional communication and interaction, timely teaching evaluation, data-based teaching decision-making and automation of resource pushing.

## 3.4 Reform, Expansion and Construction to Create Intelligent Manufacturing Practice Teaching Base

### 3.4.1 Construction of on-campus practical training bases

To "training base studio, production training synchronization, teaching integration" as the principle of construction, in accordance with the "workflow, workflow, graduation design and graduation internship employment integration" teaching implementation standards, relying on the "electromechanical key laboratories" to implement the "72" training base construction projects.

### 3.4.2 Construction of off-campus internship bases

The construction of off-campus internship bases is an important way for schools to carry out school-enterprise cooperation, strengthen connotation construction and improve the quality of school running. Students can better cultivate their professional skills and professionalism by utilizing the software and hardware resources of enterprises in the process of off-campus internship. Given that the current demand for positions in the electromechanical industry is inconsistent with the training objectives of the Mechatronics program, this paper explores plans for school-enterprise cooperation and resource sharing of teachers and equipment in order to actively establish a platform for students and enterprises to choose each other. Secondly, the process control is

strengthened to synchronize, homogenize and sequentialize school teaching, to achieve perfect integration with employers in terms of curriculum development, course development, cognitive practice, job practice and even employment, and to encourage enterprises to cultivate professional development through the joint research and development of school teachers and enterprise social services. Through the construction of "order classes", staff training and new technology application with enterprises, we strengthen the cooperation between schools and enterprises, and form the measures of "mutual benefit and win-win, common construction and common use", and establish stable and long-term off-campus internship bases.

### 3.4.3 Transform the training method and vigorously carry out students' skill competition activities

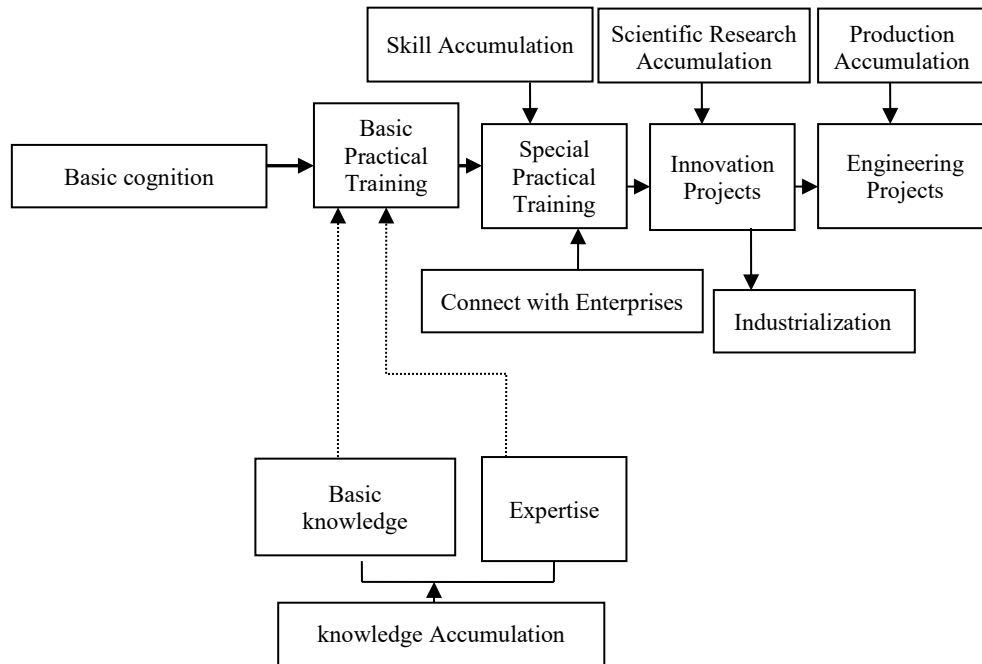
The comprehensive education of "post-course, competition, certificate and creation" is an important feature of vocational education as a type of education. We actively participate in various scientific and technological competitions to promote the improvement of teachers' and students' professional and vocational skills, encourage the development of students' personalities, and cultivate the spirit of entrepreneurship and innovation, hands-on ability and teamwork. Explore the cultivation of top-notch talents, and select good seedlings for competitions from each class to form an excellence class. Students in the excellence class are trained individually, focusing on a class of technological innovation projects and majoring in a professional skills competition, improving the quality of talent training and laying a solid foundation for the cultivation of innovative craftsmen.

### 3.4.4 Innovative mechanisms for the operation of training bases

Setting up the entity of intelligent manufacturing engineering comprehensive service department, the intelligent manufacturing practice teaching base for production, learning, research, training "four-in-one" operation and management, improve the quality of talent training and the comprehensive benefits of the base.

To sum up, to meet the demand of regional economic construction for high-skilled talents in mechatronics technology, relying on the advantages of the industry, we can cultivate the talents required by the enterprises through the

reforms of innovative talent cultivation mode, building on- and off-campus training bases, and construction of "two-teacher" teaching team, practical teaching of mechatronics specialty.



**Figure 1. Advanced Mode of Practical Training**

### 3.5 Constructing a Learning Model and Teaching Resource Platform based on Problem-Based Orientation

Constructing a problem-oriented learning model, placing learning in complex and meaningful problem situations, allowing learners to cooperate in solving practical problems, and exploring knowledge-based problem design, teacher coaching, group cooperation and learner reflection. Analyze the content of each module of the course, determine the teaching objectives and teaching content for each knowledge point, organize teaching by adopting the blended learning mode (face-to-face teaching and online teaching, in a certain proportion), construct the online teaching platform supporting the blended learning mode, develop the blended learning environment and resource content, evaluate the teaching effect qualitatively and quantitatively, and summarize the blended teaching mode based on the personalized learning of college students. A blended learning mode is adopted, combining the online learning mode with the classroom learning mode, and combining the traditional learning mode with modern network methods.

### 4. Conclusion

Starting from the reform of practical classroom teaching of higher vocational mechatronics

majors, drawing on the concept of OBE and taking the students as the center as the starting point, we put forward the reform ideas of perfecting the teaching content, constructing the teaching resources, and building the on- and off-campus training bases, so as to enable the students to actively participate in the learning, improve their ability to comprehensively apply the knowledge to solve the practical problems, enhance the competitiveness and the employment level in the employment, and serve the local economic construction.

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