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## Reform and Practice of the Dual Drive Talent Training Model of School Enterprise Collaboration and Subject Contest Innovation Education in Local Universities

Mingdong YI<sup>1,2</sup>, Jingjie ZHANG<sup>1,2</sup>, Chonghai XU<sup>1,2</sup>

1. School of Mechanical Engineering, Qilu University of Technology (Shandong Academy of Sciences), Jinan 250353, China

2. Shandong Institute of Mechanical Design and Research, Jinan 250353, China

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**ABSTRACT:** *With the continuous development of modern equipment manufacturing industry, the integration of industry and education through school enterprise collaboration has become an important way to improve the quality of teaching and talent cultivation in universities. In the training of mechanical professionals in local universities, based on the perspective of industry education integration, deep school enterprise collaboration, combined with mechanical subject competitions to supplement theoretical knowledge learning, can construct new formats for the teaching of this major and create a high-quality professional learning environment for students. The dual drive talent cultivation model of School Enterprise Collaboration and Subject Contest Innovation Education in local universities can solve many problems in the development process of local universities, such as insufficient dual teacher teachers, lagging practical training facilities, and disconnection between curriculum construction and industry demand. This article analyzes the current situation of talent cultivation and professional teaching in mechanical majors in universities, and proposes new strategies such as innovative industry education integration models, joint construction of teaching resources by schools and enterprises, optimization of practical training conditions by schools and enterprises, strengthening of teaching teams, and enhancing the comprehensive quality of students. It is hoped that this can help to build an efficient new pattern of industry education integration for local mechanical majors in universities, and cultivate high-quality, high-level, and high-quality talents.*

**KEYWORDS:** Local universities; Mechanical major; School enterprise collaboration; Subject contest innovation education

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### INTRODUCTION

In 2018, the General Office of the Ministry of Education issued a notice on the first batch of research and practice projects for "New Engineering", proposing to grasp the connotation of "New Engineering" construction, accelerate the cultivation of engineering and technology talents in emerging fields,

transform and upgrade traditional engineering majors, and actively layout talent cultivation in future strategic and competitive fields. In this context, many universities follow the national strategy of "Made in China 2025" in the cultivation of mechanical professionals, with the construction of "New Engineering " as the support point, and carry out research and exploration of the integration of industry and education in mechanical majors<sup>[1]</sup>. The aim is to establish professional standards and training objectives through the integration of industry and education, based on the construction of new engineering disciplines and guided by student output, The school enterprise collaboration has established an efficient professional teaching system and practical training base, forming a talent cultivation model for the integration of industry and education in mechanical majors based on new engineering disciplines, providing talent and technical support for regional economic and social development and industrial transformation and upgrading, and promoting overall industrial progress and development.

### **Teaching characteristics and current situation of mechanical major under the background of integration of production and teaching.**

#### ***Main feature.***

The characteristics of local colleges and universities are to train high-quality, high-level and high-literacy professionals for the development of regional economy, and the mechanical major has distinct characteristics. After the continuous development of manufacturing industry in recent years, various technologies are constantly innovated, and the demand for mechanical professionals in this industry is becoming more and more vigorous. In this context, it puts forward a more severe test for the teaching of mechanical majors in local universities.

#### ***Teaching status.***

At present, there are still some problems in the construction and practice of the integration mode of production and education of mechanical majors in local colleges and universities, especially the influence of traditional education concepts on talent training, such as the unreasonable construction of practical training system and insufficient cooperation between schools and enterprises<sup>[2][3]</sup>.

(1) The integration of theory and practice is not enough.

Mechanical major has strong practicality, but its theoretical basis determines the final quality of practice. From the professional point of view, the position of theory and practice should be equal in the teaching of this major. In the teaching of mechanical majors in local universities, the lack of combination of theory and practice is an urgent problem to be solved<sup>[4]</sup>. On the one hand, the practical training course of college mechanical major is to consolidate the theoretical foundation of students; On the other hand, the practical training course is to allow students to complete the confirmation and integration of theoretical knowledge in practice, and apply it correctly in specific technical operations. However, due to the influence of traditional education, professional practical training courses are often

not paid enough attention, and even practical training is arranged long after the theoretical courses are explained, which leads to a disconnect between the theory and practice of some students.

(2) The practical teaching method is not scientific.

Generally speaking, the reform of the teaching of mechanical majors in local colleges and universities starts from the theory course, with the aim of innovating their own teaching concepts, optimizing teaching methods, and building a more efficient professional teaching environment<sup>[5]</sup>. The reform of theoretical courses is of great significance to the development of practical teaching, but it is not directly related.

However, in the process of professional teaching reform, few teachers have realized that the major partly dependent on practical teaching needs to innovate the teaching mode and teaching method in practical teaching, and the student group has not strengthened the awareness of practical operation skills training, so the learning surface of the major is relatively narrow and the depth of professional learning is not enough<sup>[6]</sup>.

(3) Practical teaching is tedious.

In the training curriculum system of innovative and entrepreneurial talents of mechanical design, manufacturing and automation majors, most of them are still concentrated in natural or basic sciences such as mathematics, physics, chemistry and mechanical principles, which is not conducive to the play of students' innovative ideas. The construction of innovative courses should be aimed at the training process of students majoring in mechanical engineering, so as to avoid students having fewer opportunities to participate in engineering practice, overcome the disconnection between theoretical knowledge and engineering practice, and solve the problem of insufficient innovation and entrepreneurship ability. In terms of content and form, there are also many problems in the training mode of mechanical majors in colleges and universities, such as insufficient content leading to insufficient interest in students' professional learning and insufficient form leading to low participation in students' professional learning.

### **Current situation of professional development.**

(1) The teaching ideas of traditional professional education for innovation and entrepreneurship education are generally updated slowly.

Based on the core idea of "output", the concept of "results-oriented" education focuses on what students "learn" rather than what teachers "teach"<sup>[7]</sup>. This concept has deeply influenced the university education reform in the United States, Japan and other countries, and is recognized as "a correct direction for pursuing educational excellence and an educational reform concept worth learning". It is also one of the core concepts of China's engineering education professional certification. As the first major in Qilu University of Technology to pass the engineering education certification, the mechanical

design, manufacturing and automation major has always insisted on updating the modern education concept in the long-term process of running the school, and gradually transferred the traditional teaching mode of "content oriented" and positive design of teaching content to the "outcome output" of students. However, the concept of "student-oriented" and "results-oriented" education and teaching is mostly in a single course or teaching link, and there is no systematic way to realize it.

(2) There is no established paradigm for the transformation of new engineering talent training model for innovation and entrepreneurship education.

The major of mechanical design, manufacturing and automation has a long history, the inertia of traditional professional education mode is large, the exploration time of new engineering construction is short, and there is no established talent training mode, which will inevitably lead to the lack of innovative talent training in a short period of time, and it is difficult to meet the social demand for new scientific and technological talents. In addition, the technological change represented by intelligent manufacturing technology has profoundly affected and changed the production, organization and management methods of high-end equipment manufacturing industry, resulting in a deepening contradiction between the demand for new mechanical design and manufacturing and automation professionals and the training of professional innovative talents<sup>[8]</sup>. How to explore the effective mode and realization way of the new engineering transformation of mechanical design, manufacturing and automation majors, and then adapt to and lead the innovative development of emerging industries and technologies has become an important challenge for college educators.

(3) The coordination mechanism of talent training model oriented to innovation and entrepreneurship is not systematic.

In the teaching reform of mechanical design, manufacturing and automation specialty, it is more a single reform of a certain link of teaching, ignoring the synergistic effect among various elements that affect the quality of talent training, and lacking integrity and operability<sup>[9]</sup>. Talent training is a systematic engineering, which takes curriculum teaching, practical teaching, laboratory construction, learning effect evaluation or ideological and political education as a single theme of teaching reform, ignoring the multi-cause and complexity of talent training, and the reform effect is not obvious. In addition, the various systems and platforms of talent training are independent, the operation mechanism focuses on students, and the continuous improvement mechanism of implementation results is lacking.

How to strengthen top-level design, promote all-factor collaborative education in teaching and non-teaching processes involving talent training such as system construction, platform construction and mechanism construction, and establish a process tracking and effect feedback supervision and continuous improvement mechanism based on training the ability to solve complex problems are the key issues for the innovation and development of mechanical design, manufacturing and automation majors.

## **Research on dual drive talent training mode of School Enterprise Collaboration and Subject Contest Innovation Education in local colleges and universities.**

### 2.1 School-enterprise collaborative joint system/revised training program.

The prerequisite for the realization of this model is to combine the professional characteristics and the development trend of the industry to jointly develop training programs. The school and enterprise jointly designed the 2022 training program for the major of mechanical design, manufacturing and Automation, and established an integrated training system of "mechanical drawing" course teaching + "Innovation and entrepreneurship practice - creative 3D model" creative training + "Comprehensive practice of mechanical Innovation design and production" discipline competition practice<sup>[10]</sup>. It has improved the long-term operating mechanism of students' initiative, teachers' promotion and enterprises' linkage.

### 2.2 Schools and enterprises jointly cultivate innovative and entrepreneurial talents.

The necessary condition for the realization of this model is that the College of Mechanical Engineering of Qilu University of Technology has jointly established the "Cooperative Education Alliance of Mechanical majors" with many machinery industry enterprises to create a collaborative education demonstration talent training entity integrating the functions of talent training, scientific research, technological innovation, enterprise service and student entrepreneurship. "Production" is the basis of "learning" and "learning" is the use of "production". Relying on the alliance, the actual subject of the enterprise is taken as the subject of the students' discipline competition, course design and graduation design, and the "academic double tutor system" is established to open up the last kilometer of talent training.

### 2.3 University-enterprise cooperation to promote professional inheritance and development.

The decisive condition for the realization of this model is that the major of mechanical design, manufacturing and automation, as a traditional engineering major, should deeply promote the integration and development of the industry and enterprises, and use the integration of production and education to help the reform of the education model for the training of innovative and entrepreneurial talents, and the innovation and entrepreneurial education will run through the whole process of talent training. In this way, we can jointly enhance the ability of independent innovation, and strengthen the cross-integration with management, control, artificial intelligence and other disciplines, so as to achieve the coordination and unification of traditional majors and cross-disciplines<sup>[11]</sup>. At the same time, combining the normative and rigorous characteristics of engineering, and fully respecting the individual differences and creative thinking of students, to achieve the coordination and unity of standardization and innovation.

## **Practice of integration mode of production and teaching in mechanical specialty.**

3.1 The School Enterprise Collaboration and Subject Contest Innovation Education dual drive talent

training mode is implemented.

In the construction and practice of the production-education integration teaching mode for machinery majors in local colleges and universities, a dual-drive model should be built, that is, the School Enterprise Collaboration and Subject Contest Innovation Education form a dual-drive talent training mode to promote the effective improvement of the teaching quality and talent training quality of machinery majors. In the specific implementation, local colleges and universities should adhere to the purpose of "promoting reform through competition, promoting education through competition, and improving ability", rely on the "mechanical discipline competition", effectively integrate the School Enterprise Collaboration and Subject Contest Innovation Education of the major, and carry out innovation from the overall teaching system such as teaching content, process, form, teaching team, curriculum assessment, etc. Enhance students' professional ability and professional quality, and promote them to become comprehensive talents<sup>[12][13]</sup>.

#### (1) Construction of teaching content.

The teaching content is also an important part in the construction of the dual driving teaching mode of "school-enterprise cooperation" and "Science and innovation education" for mechanical majors in local colleges and universities. In practice, teachers can reconstruct teaching content according to professional standards and competition content.

#### (2) Teaching form reform.

"Do learn to teach" and "teach to do" alternately. The teaching content of mechanical majors needs to be completed by a lot of practical training. Therefore, after teachers explain a knowledge point, they will immediately arrange students to practice, guide students to find their own problems in the actual operation, and let students learn to actively think and explore the deep content of professional teaching. Finally, the teacher will summarize and refine.

#### 3.2 Strengthen the comprehensive quality of professional teachers.

With the development of The Times, colleges and universities should pay attention to the reconstruction of the environment and actively introduce some new teaching equipment and software when cultivating professional talents in the mode of integration of production and education in mechanical majors, so as to help students better integrate with the market and master emerging technologies and advanced application ideas.

#### (1) Training of high-level teachers.

In the construction of the School Enterprise Collaboration and Subject Contest Innovation Education dual drive teaching model for mechanical majors in local universities, universities should attach importance to the cultivation of high-level teachers, in order to build a learning environment with strong support and complete infrastructure for students, thereby greatly improving the efficiency of talent cultivation in mechanical majors<sup>[14]</sup>.

(2) The construction of high-level teaching team.

In the construction of the dual-drive teaching mode of School Enterprise Collaboration and Subject Contest Innovation Education for mechanical majors in local colleges and universities, in order to improve the service ability of schools and the willingness of enterprises to participate in the process of talent training, the actual situation of colleges and enterprises is analyzed from a practical perspective, and on the basis of the original teaching and research section, colleges and enterprises establish a joint teaching and research section. The members of the Joint Teaching and Research Office are composed of professionals from the enterprise side and professional teaching teams of colleges and universities, which play a connecting role in the integration of production and education and cooperation between schools and enterprises<sup>[15]</sup>.

3.3 Professional development is closely related to the needs of regional economic development.

In the construction of the integration model of industry and education for mechanical majors, local colleges and universities should closely follow regional economic development in the setting of majors, conduct research on the development situation of the manufacturing industry in the region, take the initiative to comprehensively promote cooperation with related enterprises in the field of science and technology, strengthen the docking and integration of technology and industry, thoroughly implement the integration of industry and education, and strive to cultivate talents suitable for regional economic development needs<sup>[16]</sup>.

(1) In-depth research on regional economic development needs.

Investigate related manufacturing industries in the region, have a detailed understanding of some high-end equipment manufacturing bases, robot industrial parks and other high-end equipment manufacturing industries, and actively explore a new integration model suitable for local industry and education, so as to promote talents to better complete their studies and find employment. Local colleges and universities should attach importance to the status of the integration of industry and education, and carefully select local enterprises that integrate industry and education. The integration with enterprises should not only stay on paper or in form, but must hold the determination of win-win situation, identify cooperation points, and try to meet the needs of both sides.

(2) Build a practice base for school-enterprise collaboration.

After finding a suitable enterprise, the practice base and technology research and development platform should be immediately launched to provide high-quality practice places for teachers and students. In addition to building training bases such as intelligent manufacturing center training base and industrial robot training base with off-campus enterprises, high-quality training bases should also be built within the school to provide students with professional practice needs at different stages, and technology research and development centers can also be built together with relevant enterprises to lead professional teaching to the forefront of the industry and expand students' professional vision.

## CONCLUSION AND PROSPECT

Students are the foundation of the survival and development of colleges and universities, and the development of colleges and universities depends on the development of students. The implementation of the concept of "student-oriented" education is the promotion of the Marxist thought of "the free and all-round development of human beings" and the call of higher education reform in the new era. Under the new economic conditions, how to implement and promote the new education and teaching concept of "student-centered, results-oriented, continuous improvement" in China Engineering education professional certification, and train high-quality talents to meet the needs of the industry and society are the primary issues in the new engineering transformation of traditional engineering majors. Under the background of engineering education certification, the mechanical design, manufacturing and automation major of Qilu University of Technology has established a dual-drive talent training model of School Enterprise Collaboration and Subject Contest Innovation Education, and its innovation and development exploration experience can provide references for the development of traditional engineering majors under the background of new engineering construction.

At the same time, the school-running mode of the integration of production and education has begun to be popularized in Chinese colleges and universities, and has obtained good results. The dual-drive teaching mode of School Enterprise Collaboration and Subject Contest Innovation Education focuses on cultivating students' vocational skills. Through school-enterprise collaboration and discipline competition, students' ability is trained, students' employment is promoted, the development of related enterprises is good, and more professional technical talents with craftsman spirit are cultivated, contributing to the improvement of local regional economic level.

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