

# Research and Practice of "integration of specialty and innovation" Application-oriented Talents Training Model for Mechanical Majors under the Background of New Engineering

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**Abstract.** In the traditional engineering talent training model, innovation ability education and professional education are separated, and it is urgent to strengthen the cultivation of innovation ability in engineering education talent training. Take the mechanical specialty as an example, research the combination of professional and innovative education in talent training, determine the goal of innovation ability among the training objectives through the top-level design of "ask the industry to know the needs", and establish a curriculum system that deeply integrates innovative and professional education. The innovation ability training is integrated into the whole process of talent training. Breaking through the campus-centered training model, industry companies participate in the talent training process, establish a multi-level practice platform, and students gradually improve their innovation capabilities through "learning-competition-practice-promotion". The research has achieved successful experience through practice and enriched the talent training mode of application-oriented universities.

## 1. Introduction

At present, China is in the critical period of manufacturing transformation and upgrading, so we must deal with the "two-way squeeze of manufacturing" (low-cost competition in emerging countries, technology blockade in developed countries). The scale of talent training in higher engineering education is huge, but it still can't meet the challenges facing the manufacturing industry[1].

In order to provide talent support to achieve the "Made in China 2025" strategic goal of manufacturing power, the Ministry of Education and the other three departments jointly issued the "Manufacturing Talent Development Planning Guide"[1, 2]. In February 2017, the Ministry of Education reached a consensus on the construction of a "new engineering course" in Fudan, and determined the connotative characteristics of the new engineering course and the path choices for the construction and development of the new engineering course[3]. In April 2017, the Ministry of Education clearly defined "cultivating and innovating outstanding engineering and technological talents and providing intellectual and talent support for industrial development and international competition" through the "Day Action"[4]. So far, it took two years. In order to cope with the fourth industrial revolution, China's new engineering personnel training and construction line were basically formed.

China engineering education quality report released by the Ministry of education in 2017 shows that the innovation ability of engineering graduates in China is still insufficient. In recent years, under the impetus of "Internet +" competition, the National University has formed the upsurge of College Students' innovation and entrepreneurship education. However, the mode of personnel training in Colleges and universities has not yet fundamentally changed[5]. It has not really established an effective "double creation" talent training model, and lacks the corresponding personnel training mechanism and training system.

Under the background of new engineering construction, it is of great significance to explore the

training model and path of application-oriented entrepreneurship and innovation talents for the application-oriented universities[6]. Guided by the construction of new engineering, this paper studies the training model of innovation and entrepreneurship talents in mechanical specialty, and explores the construction of the system and path of application-oriented innovation and entrepreneurship talents training in new engineering.

## **2. Mechanical Specialty Creates Integration Needs**

The main task of Application-oriented Universities in the construction of new engineering is to cultivate application-oriented talents who have the ability of innovation and entrepreneurship and practice and are competent for the needs of the industry. Changchun Institute of Technology(CIT) is an application-oriented university and a pilot unit for the transformation and development of local undergraduate universities in Jilin Province. It has a full range of mechanical majors, including four majors: mechanical design and manufacturing and automation, mechatronics, material molding and automation, and automotive service engineering. In the context of the construction of new engineering disciplines, it is urgent to explore an innovative professional talent training model suitable for application-oriented universities. Requirements include:

(1) The new engineering needs to build a new training model for innovative and entrepreneurial talents in applied universities. Understand the needs of industrial enterprises for talent innovation ability, and bring the innovation and entrepreneurship ability into the training objective through the top-level design of "ask the industry to determine the demand".

(2) In order to support the training objectives of innovative talents, it is necessary to establish a curriculum system of integration of entrepreneurship and innovation education and professional education for mechanical majors. Through the progressive innovation and entrepreneurship training system of "professional cognition, theoretical improvement, professional promotion and practice strengthening", the innovation and entrepreneurship ability of graduates can be improved to meet the needs of the industry for talent innovation ability.

(3) The traditional "innovation curriculum + discipline competition" mode can't meet the needs of new engineering. It is necessary to build a practice platform under the collaborative mode of enterprises and universities. Enterprises should participate in personnel training. Through "engineer training, participation in engineering projects", a multi-level cooperation mode should be formed. Young teachers should participate in enterprise engineering projects to realize the four aspects of enterprise, specialty, teacher development and student training will benefit and develop together.

## **3. Contents of the Reform of the Talent Training Model**

### **3.1. Research ideas**

Combine the talent cultivation of industry education integration of new engineering construction with the transformation and upgrading of manufacturing industry and innovation-driven development to determine new engineering

"Whole process + progressive" application-oriented university innovation and entrepreneurship talents training model research direction and content. The research idea is to build a close integration of entrepreneurship and innovation education and professional education, to support the training objectives and graduation requirements, to build a deeply integrated curriculum system, with curriculum teaching as the main body, practical teaching as the focus, industry education integration as the support, subject competition as the supplement, and to integrate innovation ability training into the whole process of talent training. Through the multi-level open platform of "innovation laboratory + Creative Workshop + enterprise practice base + incubation base", we will strengthen the teaching of innovation and entrepreneurship practice and improve the students' innovation and entrepreneurship ability.

### **3.2. Reform objectives**

Guided by the construction of new engineering, through the top-level design to determine the training objectives and requirements of Applied Innovation and entrepreneurship talents, to achieve

the deep integration of entrepreneurship and innovation education and professional education curriculum system, to build a multi-level innovation and entrepreneurship practice platform of integration of industry and education, to cultivate the innovation and Entrepreneurship tutor team, to complete the system construction and practice optimization of Applied Innovation and entrepreneurship talents training.

(1) Through top-level design, the "whole process + progressive" training model, to ensure that the needs of innovative talents training of new engineering can be effectively supported by mass entrepreneurship and innovation education;

(2) To build a curriculum system for the integration of entrepreneurship and innovation education and professional education based on "professional cognition, theoretical improvement, professional improvement, and practice strengthening" for mechanical specialty;

(3) Build an open multi-level practice platform of "innovation laboratory + Creative Workshop + enterprise practice base + incubation base", and establish the operation mechanism of industry education integration;

(4) We will build a team of innovative and entrepreneurial teachers for mechanical majors and form a docking mechanism between teachers and students.

### 3.3. Main contents of the reform

The research framework of this project is shown in Figure 1.

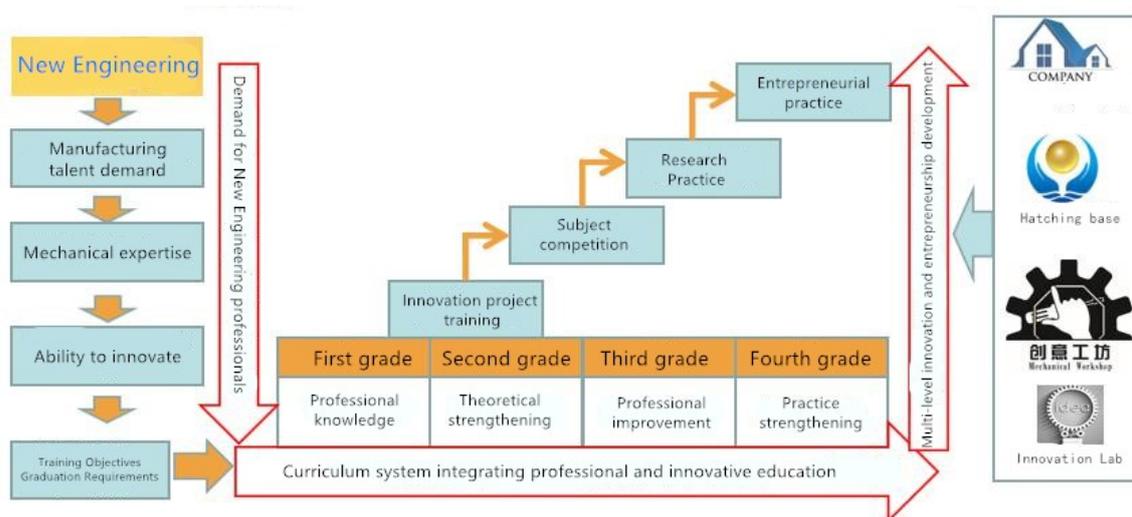


Figure 1. Research content

(1) Research on the training model of innovation and entrepreneurship talents in "whole process + progressive" application-oriented universities

To meet the needs of the industry, we will carry out the top-level design of entrepreneurship and innovation education for mechanical majors. According to the training orientation of application-oriented talents in our school, we will investigate the needs of the regional manufacturing industry, determine the training objectives of mechanical talents and the specific needs for the knowledge and ability of innovation and Entrepreneurship of talents, and define the index points that the entrepreneurship and innovation curriculum system needs to support. The design process is shown in Figure 2.

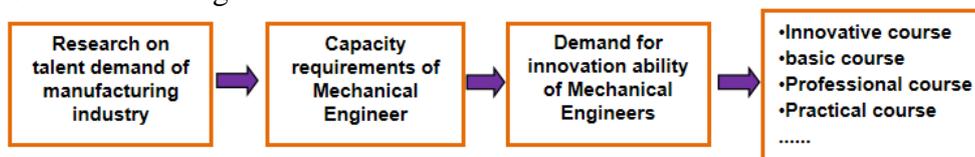


Figure 2. Determine the training plan

Exploring the "whole process + progressive" innovation and entrepreneurship training model;

1) "The whole process" refers to integrating the cultivation of innovative ability into the whole

process of talent training. Mainly "course teaching as the main body, practical teaching as the focus, as a support, and subject competition as a supplement", through the multi-level, three-dimensional, full coverage of dual innovation and professional curriculum system, the dual innovation training content runs through Link.

2) "Progressive" is a combination of talent training process, through the "creative training-discipline competition-scientific research practice-enterprise practice" progressive training model, from low to high innovation ability training model, and gradually improves students' practical innovation ability.

In 2017, CIT initiated the compilation of the 2018 version of the talent training plan, and the four mechanical majors carried out the reform of the "full process + progressive" application-oriented college innovative talent training model. The research team carried out research on the professional talent needs of industrial and industrial enterprises in Shanghai, Tianjin, Wuhan, Nanjing and other places, visited more than 20 machinery enterprises, and obtained the first-hand demand of the industry and enterprises for the innovation and entrepreneurship of mechanical professionals data. Invite enterprise managers and experts to participate in the designation of talent training objectives, and scientifically determine the ability requirements of innovation and entrepreneurship in the training objectives of mechanical professionals.

(2) Establish a curriculum system for deep integration of professional innovation education and professional education in machinery

The curriculum system is the foundation for achieving graduation requirements and training objectives, and is at the core of talent training. For the current form of dual-creation education is greater than practice, and it is not closely integrated with the training goals of various professionals. Aiming at the training requirements of dual innovation in mechanical majors, a curriculum system based on the deep integration of dual innovation education and professional education based on "professional cognition, theoretical improvement, professional improvement, and practical strengthening" was established.

CIT has set up a Teaching Guidance Committee for the integration of industry and education, we should build a curriculum system of professional innovation integration, and enterprises should participate in the formulation of some practical courses and teaching organization work.

(3) Constructing a multi-level and dual-creation practice platform under the industry-education integration model

The process of innovation education is a process in which innovative thinking and innovation practice collide with each other. The practice of innovation and entrepreneurship is very important for the cultivation of innovation awareness and ability. Guided by the construction of new engineering disciplines, explore the establishment of multi-level and multi-field school-enterprise cooperation, establish a multi-level and dual-innovation platform of "open innovation laboratory + creative workshop + business practice base + incubation base", and build school-enterprise The collaborative training mechanism provides effective support for dual-innovation course teaching, disciplinary competitions, major innovation projects, and enterprise projects.

(4) Training Teacher Team

In order to support the cultivation of innovative talents, a team of innovative and entrepreneurial teachers was established. Under the arrangement of the school's teacher development center, 20 professional teachers participated in innovative and entrepreneurial training and obtained teacher certificates. Establish a team of innovative and entrepreneurial teachers with high professional standards and strong business capabilities, and establish a docking mechanism between mentors and students.

#### **4. Conclusion**

The project fills in the blank of the research on the training model of innovative talents of mechanical specialty in the construction of new engineering in the Application-oriented Universities of Jilin province, forms the training model of combining innovation and professional education,

enriches the reform methods and paths of the training of innovative talents of mechanical specialty in our university, and develops the practice of the training of innovative talents of the integration of production and education.

The application-oriented innovation and entrepreneurship personnel training reform of machinery has been carried out in the first and second semesters of 2018-2019 academic year. Through empirical research, the effectiveness of innovation and entrepreneurship training model, curriculum system, teaching methods and conditions, and practice support environment has been determined. The main courses of mechanical design basis, mechanical manufacturing basis, and mechanical equipment design and so on have all been integrated into the innovation and entrepreneurship education, and achieved good results. The proportion of students majoring in machinery participating in large-scale innovation projects and discipline competitions has increased from 20% to 70%. Later, we will continue to modify and improve the training system and content, and finally form the application-oriented innovation and entrepreneurship training and teaching system in line with the goal of new engineering construction.

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