

# Evaluation on the Effect of Cultivation Mode for New Engineering College Students' Innovation Ability in Local Colleges and Universities

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## ABSTRACT

Under the background of new engineering, the development of new economy challenges the cultivation of traditional engineering professionals. In order to improve the effective teaching effect of students, this work established the effect evaluation index system of innovation ability training mode in view of the present situation of cultivating the innovation and entrepreneurship ability of engineering talents in local colleges and universities. It should be applied, implemented and popularized to effectively evaluate the effect of the training mode of new engineering talents, form a closed loop of quality engineering, constantly improve the training quality of new engineering talents, and provide talent support for national and regional innovation-driven development.

**Keywords:** *Local colleges and universities; New engineering; Innovation ability training model; Evaluation system; Evaluation effect*

## 1. INTRODUCTION

The United States put forward the concept of industrial Internet in 2012, established the Industrial Internet Alliance in 2014, and held the first Industrial Internet Innovation Summit in 2017, in which more than 200 large enterprises, government organizations and relevant scholars from all over the world participated. The emergence of the industrial Internet breaks technical barriers, deeply integrates manufacturing and Internet, and realizes intelligent manufacturing and green manufacturing. Industrial Internet needs comprehensive professional talents with comprehensive knowledge background and humanistic literacy, and the ability to solve complex and key technologies in the engineering field. Germany launched its Industry 4.0 plan in 2013 and upgraded it in 2015, which describes the future industrial development of Germany, and draws a blueprint for intelligent manufacturing development that combines "strategic policy support, product market, technical system guidance and talent training". In 2015, the Premier of State Council, Li Keqiang presented "Made in China 2025 Strategy", which is similar to Industry 4.0 in Germany and the Industrial Internet in the United States. At present, the domestic manufacturing industry is basically in the German industrial 2.0 era, and some industries have reached 4.0. China's manufacturing industry should drive more diversification and advance shoulder to shoulder to accelerate the development of national intelligent manufacturing. Faced with the change of new technology, the industrial revolution demands engineering technical talents [1,2].

In order to improve the comprehensive ability, international vision, management ability and practical ability of engineering students, the national innovation and entrepreneurship education plan for college students launches and implements, which has flexible and diverse forms, and rich and colorful contents. The innovation and entrepreneurship mode of scientific research feeding back teaching, projects driving innovation and entrepreneurship, science and technology incubation bases, and creative space for college students can effectively promote the quality of talent training and improve the employment rate. Local colleges and universities are located in non-central cities, therefore, there is still a gap between the educational conditions, teaching staff, teaching reform, quality assurance and characteristic development and the double first-class colleges and universities [3]. In 2017, the Ministry of Education implemented a new engineering research and practice project. Under the background of the new engineering construction, the reform and development of engineering education in local colleges and universities are facing opportunities and challenges. It is necessary to set up a clear orientation for running schools, laying out disciplines and specialties around the needs of regional industrial development, breaking down disciplinary barriers, constructing schools, and promoting the reform of engineering education and teaching. It is necessary to establish a path for cultivating innovative engineering talents, form a training mode of innovation and entrepreneurship ability of new engineering talents based on innovative engineering education concepts, establish new ideas, new models, new structures, new systems and new qualities of engineering education, and play a supporting role for regional economic development and industrial upgrading. How to effectively evaluate the effect

of training mode of new engineering talents effectively, form a closed loop of quality engineering, and constantly improve the quality of new engineering talents training is an urgent problem for higher engineering colleges at present. Taking the research and practice of new engineering courses as the turning point, and taking the training mode of innovation and entrepreneurship talents as the carrier, this work constructed the evaluation system of the effect of the new engineering students' innovative ability training mode in local colleges and universities, so as to highlight the new quality, new standards and new system, consummate the talent training mode, and improve the quality and employability of the talent training [4,5].

## **2. EVALUATION INDEX SYSTEM OF NEW ENGINEERING COLLEGE STUDENTS' INNOVATION ABILITY TRAINING MODE**

Taking Jiamusi University as an example, the school takes the first batch of demonstration colleges and universities of innovation and entrepreneurship reform in Heilongjiang Province as an opportunity, takes the new engineering department as the guide, always adheres to the socialist direction of running schools, adheres to the Party's educational policy in an all-round way, and takes the concept of innovation, coordination, green, openness and sharing as the guidance. Taking strengthen moral education and cultivating people as the fundamental task, the university adheres to running school with high quality, building school with talents, and managing school with characteristics. It is necessary to adhere to the development direction of modernization, internationalization and informatization, take the connotative development road, and strive to provide talent and intellectual support for local economic and social development and national needs. In order to further promote the teaching reform, improve the innovation and entrepreneurship education system of college students, and continuously improve the quality of education and teaching, Jiamusi University has always carried out the work of innovation and entrepreneurship education for college students. Through a variety of measures, it creates a strong atmosphere of innovation and entrepreneurship. In accordance with the spirit of innovation and entrepreneurship documents such as the *Implementation Opinions of the General Office of the State Council on Deepening the Reform of Innovation and Entrepreneurship Education in Institutions of Higher Learning* (issued by the State Council (2015), No.36) and the construction objectives of high-level universities in schools, the undergraduate quality engineering construction plan can be implemented, and the school's mission of cultivating application-oriented undergraduate talents is run through the teaching practice. The school has established a top-level design, management mechanism, curriculum construction, teaching reform, practical training, teaching management, teaching team, fund guarantee, characteristic demonstration and other aspects of 9

first-level index evaluation system and 34 second-level index system, and the total score is 100 points [6,7].

### **2.1. Top-level design**

First, the school comprehensive reform plan and the "13th Five-Year Plan" include the relevant contents of deepening the reform of innovation and entrepreneurship education, and clearly put forward that the reform of innovation and entrepreneurship education should be open to all students and all teachers. Second, it is necessary to formulate and report the implementation plan of innovation and entrepreneurship education reform. Third, it is necessary to revise the talent training program to clarify the goals and requirements of innovation and entrepreneurship education.

### **2.2. Management mechanisms**

First, it sets up a leading group for innovation and entrepreneurship, which consists of the group leader appointed by the main responsible persons, the deputy group leader appointed by the school leaders in charge, and the person in charge of relevant departments. Second, it establishes the mechanism for innovation and entrepreneurship education led by the educational administration department and jointly managed by the student affairs department, the Youth League Committee and other departments, in which special persons are designated to take charge and relevant work is regularly studied.

### **2.3. Curriculum development**

First, it is necessary to integrate innovation and entrepreneurship education into relevant professional courses. Second, compulsory courses and elective courses should be set up for all students in research methods, subject frontiers, entrepreneurial foundation, and employment entrepreneurship guidance, including credit management. Third, it should build online open courses such as innovation and entrepreneurship MOOC and video open courses, with a certain scale of course enrollment and good teaching effect. Fourth, it is necessary to establish an online open course learning certification and credit recognition system. Fifth, it is necessary to organize and compile relevant teaching materials for innovation and entrepreneurship education and establish a case base.

### **2.4. Teaching reform**

The first is to carry out heuristic, discussion, and participatory teaching, and students can benefit a lot from the small class teaching, which covers a lot; the second is to reform the content and methods of assessment, and

explore the implementation of non-standard answer examination.

### **2.5. Practical training**

First, it has built a practical platform that can concentrate on innovation and entrepreneurship education; second, professional laboratories, virtual simulation laboratories, entrepreneurship laboratories and training centers have basically covered students of relevant specialties; third, the resources for scientific and technological innovation in schools have been opened in principle to all students in schools; fourth, it has built a group of students' off-campus practical education bases based on university science and technology parks, undergraduate pioneering parks, entrepreneurship incubation bases and small and micro enterprise pioneering bases; fifth, it has actively implemented the innovation and entrepreneurship training program for college students; sixth, it organizes and guides students to actively participate in all kinds of scientific and technological innovation, creative design, entrepreneurial plans and other special competitions, and obtain excellent results; seventh, it establishes student innovation and entrepreneurship associations and entrepreneurial clubs, and the campus innovation and entrepreneurial culture construction effect is obvious.

### **2.6. Teaching management**

First, it sets up reasonable credits for innovation and entrepreneurship; second, it basically sets up a system for the accumulation and conversion of credit for innovation and entrepreneurship; third, it sets up innovation and entrepreneurship training plans for willing and potential students, and sets up innovation and entrepreneurship files and transcripts; fourth, it introduces relevant regulations on flexible schooling system, allowing students to suspend their schooling and start their own businesses; fifth, it sets up innovation and entrepreneurship scholarships; sixth, students' innovation and entrepreneurship achievements are recognized and added in the work of evaluation, early graduation, exemption from trial and research.

### **2.7. Teaching staff**

First, it establishes professional teaching team of innovation and entrepreneurship education; second, it employs well-known scientists, successful entrepreneurs, entrepreneurs, venture capitalists and other industries of outstanding personnel as innovation and entrepreneurship teaching or guidance teachers; third, it establishes innovation and entrepreneurship mentors (the proportion of external tutors is not less than 70%) and formulates corresponding management norms; fourth, it carries out training related to innovation and entrepreneurship education for teachers; fifth, it establishes a temporary post

training system to encourage relevant professional teachers and professional teacher of innovation and entrepreneurship education to enter the industry and enterprises to train.

### **2.8. Financial security**

First, special funds have been arranged to support innovation and entrepreneurship education and teaching and fund students' innovation and entrepreneurship; second, colleges and universities affiliated to ministries and commissions use the basic scientific research operating expenses of central universities to support students in carrying out innovative scientific research work.

### **2.9. Characteristics of the demonstration**

First, it deepens the reform of innovation and entrepreneurship education with distinctive characteristics, and the related work in the domestic or provincial scope of demonstration radiation leading role is obvious, which has a strong influence; second, it forms some of the school's characteristics of innovation and entrepreneurship education results.

In order to improve the comprehensive ability, international vision, management ability and practical ability of engineering students, the National College Student Innovation and Entrepreneurship Education Program launches and implements, which has flexible and diverse forms, rich and colorful contents, scientific research and feedback teaching, and projects drive innovation and entrepreneurship models such as science and technology incubation bases, and creative space for college students. It effectively promotes the quality of talent training, and improves the employment rate. Local colleges and universities are located in non-central cities, so there is still a gap between the conditions of running schools, teaching staff, teaching reform, quality assurance and characteristic development with 211, 985 and double-class colleges and universities. In 2017, the Ministry of Education implemented a new engineering research and practice project. Under the background of new engineering construction, the reform and development of engineering education in local colleges and universities are facing opportunities and challenges. It focuses on strengthening moral education and cultivating people, defining the orientation of schools, laying out disciplines and specialties around the needs of regional industrial development, breaking the barriers to discipline, building the community between schools and enterprises, promoting the reform of engineering education and teaching, establishing a path for the cultivation of innovative engineering talents, forming a model for the cultivation of innovation and entrepreneurship ability of new engineering talents with innovative engineering education ideas, and establishing new ideas, new models, new structures, new systems and new quality of

engineering education, so as to play a supporting role for regional economic development and industrial upgrading. How to effectively evaluate the effect of new engineering talents training model and form a closed loop of quality engineering is worthy discussing.

### 3. TEST ON THE EVALUATION INDEX SYSTEM OF INNOVATION ABILITY TRAINING MODEL OF NEW ENGINEERING COLLEGE STUDENTS

From the 26 engineering majors in the school, 5 majors are selected according to the distribution of disciplines and colleges to evaluate the effect of the innovative ability training model of college students, and a leading group of test experts is set up, which is composed of relevant professors and enterprise experts. According to the index system and field investigation, the corresponding evaluation and test results are obtained through evaluation. From the results, the innovation and entrepreneurship practice of mechanical design and manufacturing and its automation specialty and automation specialty has obvious effects. By competition practice, the implementation of project teaching, scientific research feeding teaching, standardized operation, effective measures, and high quality of student employment have distinctive features. The innovation and entrepreneurship quality of metal engineering, biomedical engineering, computer science and technology is not high, which needs to be effective

integrated and implemented. The evaluation test results are shown in Table 1.

### 4. RESULTS ANALYSIS AND DISCUSSION

From the test results, taking the mechanical design and automation major, and the new engineering as an opportunity, engineering practice teaching resources can be integrated to use the laboratory, training base, science and technology innovation base, university students science and technology innovation center integration, and professional innovation practice carrier, therefore, students' innovation and practice ability can be significantly improved.

Under the background of the new engineering department, it is necessary to innovate the training mode and evaluation system of talents, deepen the reform of higher engineering education in local colleges and universities, perfect the training mode and evaluation system of talents' innovation ability, revise the evaluation index system through the evaluation test results, construct the evaluation system which accords with the integration of national strategy-driven development and local economic development. Through the research and practice of new engineering, colleges and universities constantly improve the innovation and entrepreneurship education system of engineering talents, improve the quality of talent training and employment, and provide reference for the promotion of new engineering training in local colleges and universities.

**Table 1.** Test results of the evaluation index system of college students' innovation ability training mode

Level I indicators	Value	Mechanical design, manufacturing and automation	Automation	Metal engineering	Biomedical engineering	Computer science and technology
Top-level design	10	9	9	8	8	8
Management mechanisms	5	4	4	3	2	3
Course construction	15	13	12	11	10	10
Teaching reform	10	9	8	7	5	6
Practical training	15	12	11	9	7	8
Teaching management	10	9	9	7	6	7
Teachers' team	10	10	9	9	7	8
Funding guarantee	5	4	4	4	3	4
Characteristic demonstration	20	16	15	15	12	13
Value	100	86	81	73	60	67

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