Higher Education Research
2022; 7(5): 143-148
http://www.sciencepublishinggroup.com/j/her
doi: 10.11648/j.her.20220705.11
ISSN: 2578-9341 (Print); ISSN: 2578-935X (Online)

The Exploration and Practice of the "333" Integrated Project Double-Creation Talent Training System with the Community as the Carrier

Qin You, Li Wei, Lv Xiang, Fang Zhuoya

Basic Engineering Training Center, Jiangsu University, Zhenjiang, China

Email address:
qinyou@ujs.edu.cn (Qin You)

To cite this article:
Qin You, Li Wei, Lv Xiang, Fang Zhuoya. The Exploration and Practice of the "333" Integrated Project Double-Creation Talent Training System with the Community as the Carrier. *Higher Education Research*. Vol. 7, No. 5, 2022, pp. 143-148. doi: 10.11648/j.her.20220705.11

Received: July 3, 2022; **Accepted**: August 30, 2022; **Published**: September 14, 2022

Abstract: Cultivating innovative and entrepreneurial engineering talents is an important subject and reform direction of Engineering Education in Colleges and universities in China. This paper analyzes the four-level system of engineering training talents in colleges and universities in China, and points out that there are "four strong and four weak" problems in the current engineering innovation and entrepreneurship talent training system, that is, stronger than classroom but weaker than extra-curricular, stronger than the whole but weaker than personality, stronger internally but weaker than coordination, stronger than knowledge but weaker than moral education. In view of the problems existing in the current training of engineering innovation and entrepreneurship talents, this paper puts forward the exploration and practice of the "333" engineering innovation and entrepreneurship comprehensive talents training system with the community as the carrier. On the basis of fully analyzing the current training mode of engineering talents in colleges and universities, taking the basic engineering training center of Jiangsu University as an example, it focuses on how to establish student associations in the center, and carries out specific implementation plans and implementation effects with associations as the carrier. The results show that the "333" integrated project talent training system based on the corporate carrier can make up for the shortcomings of the traditional talent training model, and has certain practical significance and promotion value.

Keywords: Societies, Integration, Engineering Talents for Innovation and Entrepreneurship, Cultivation System

1. Introduction

Since entering the new period of socialism, engineering education in colleges and universities in China is facing new situations, new tasks, new opportunities and new challenges. At present, China is vigorously implementing the innovation-driven development strategy and is committed to upgrading from a "manufacturing power" to an innovative "intelligent manufacturing power." The development and reform of the country are based on talents, and higher requirements are put forward for higher education. Students' theoretical knowledge, practical ability, ability to solve engineering problems, innovation ability, and innovative spirit. The direction of engineering education reform is to establish new engineering majors and upgrade and transform traditional majors. It also has a profound impact on the reform of basic engineering courses, including practice, innovation and teaching training, and further expounds how to implement the reform of moral education concepts and methods. [1, 2].

However, a considerable number of engineering training centers in colleges and universities have problems such as low investment, low-education teachers, insufficient scientific research, outdated teaching models and single content. Some colleges and universities still follow the traditional engineering talent training concept and take practical ability as the guide. Furthermore, they have a certain interdisciplinary nature and lack of innovative technologies for entrepreneurial elements. In addition, the teaching contents and teaching methods have not been actively transformed into personalized, compound, innovative and high-quality personnel training. It has not

deeply integrated ideological, political and engineering training [3]. The Basic Engineering Training Center of Jiangsu University has attracted college students to join the training courses by building a scientific and technological innovation and entrepreneurship club for college students. This makes full use of the software and hardware facilities and environmental atmosphere of the center's scientific and technological innovation. Through this unique "333" integrated engineering talent training system and other measures, they actively explore and practice the “three in one” dual-creation talent program that integrates knowledge, ability, and literacy.

2. Current Situation and Problems of College Students' Engineering Innovation Talents Cultivation

The current engineering double qualified personnel training system in ordinary colleges and universities is generally divided into four levels; cognitive, basic, comprehensive, and innovative. The training system is aimed at students of different majors and grades to carryout targeted hierarchical training to meet the needs of students of different majors [4]. This system includes learning engineering background knowledge, basic industrial knowledge, basic skills training, comprehensive engineering practice and innovation and other aspects of skills knowledge.

2.1. The Current Four-Level System for Cultivating Talents for Innovation and Entrepreneurship in Engineering

(1) *Engineering awareness training:* This level of training is mainly for non-mechanical students. They focus on the cultivation of general knowledge and understanding of engineering applications, mainly on surface popularization. Demonstration of equipment processing, engineering culture, and basic lathe operations, etc. Through the teacher’s demonstrations, some students teach through hands-on operation, popularize the foundation of engineering, enable students to further understand the design and manufacturing process of products, and establish preliminary engineering awareness.

(2) *Basic engineering training:* This level of training is mainly for first- and second-year students majoring in computer science and engineering, and focus on the cultivating students’ practical ability. The training program is divided into two parts: cutting processing and material forming. The cutting processing includes turning, milling, and assembly. However, material forming includes casting, forging, welding and heat treatment [5]. The whole training process focuses on cultivating students’ basic operating skills and engineering practice ability in mechanical manufacturing, parts processing technology, machine tools through verification and design internship projects [6].

(3) *Comprehensive engineering training:* This level is mainly for sophomores and juniors students in computer science related fields. It not only popularizes hands-on operation on the ground, but also has a certain degree of technical difficulty and technical depth. The training program is mainly designed and comprehensive. In addition to the basic engineering training, the training content are also added, including advanced manufacturing training, such as CNC machining, wire cutting, laser processing, and 3D printing. In this level of training, "task-based teaching" is used for comprehensive engineering practice. By defining certain tasks, students must complete design procedures for processing, manufacturing and function realization. And students continue to complete reports to improve their practical and analytical ability in engineering applications. [7, 8]. Through this level of learning, students can understand modern advanced manufacturing technology, process, equipment, practice basic and practical skills, and apply them to complete comprehensive training projects, which can cultivate students’ teamwork spirit and stimulate their innovative ability.

(4) *Engineering innovation training:* This course is for the third and fourth year students of machinery or related machinery majors. On the basis of the second and third stage engineering training, it pays attention to the cultivation of students’ cutting-edge knowledge of disciplines, scientific research and innovation capabilities. Relying on platforms such as "Maker Workshop" and "Maker Space", engineering innovation training is carried out through open training projects, university students’ scientific research projects, national university student mechanical innovation design competition, robot competition and other competitions. Students form an innovation teams, design projects, manage projects independently, and complete projects independently. The work training center provides students with facilities, equipment, materials and tools designed and manufactured [9], so as to cultivate the ability of thinking and solving problems of college students and improve the innovation ability of engineering practice.

2.2. There Are "Four Strong and Four Weak" Problems in the Current Engineering Innovation and Entrepreneurship Training System

(1) *The problem of “strong in-class” and “weak out-of-class”*

Students receive intensive and high-intensity training during the engineering training plan in a short time. The skills are not applied in practice and gradually become unfamiliar [10] which is stronger than classroom teaching but weaker than extra-curricular training, resulting in an unsatisfactory teaching effect.

(2) *The problems of "strong overall" and "weak individuality"*

The current engineering talent training system is cognitive, basic, comprehensive or innovative. It depends on some homogenized "popular" training problems and the trained personnel. There is still a gap between the knowledge structure and professional skills and the needs for economic and social development [11], which needs to be supplemented by "individualized" training.

(3) The problems of "strong internal" and "weak coordination"

At present, the training of engineering talents is often faced with the shortage of teachers. At this time, it is often necessary to attach great importance to the internal excavation of the center's own teacher's potential. However, external stakeholders are less involved in talent training due to lack of coordination. The training mechanism is fails to revitalize the training team of engineering innovation and entrepreneurship talents in the school, which is stronger than internal mining potential but weaker than collaborative education. The foundation of engineering talent training and upgrading is not solid.

(4) The problem of "strong knowledge" and "weak moral education"

In the current engineering talents training program, teachers often focus on imparting knowledge and cultivating students' ability. There are deficiencies in the education elements such as paying attention to the cultivating students' engineering cultural literacy, engineering ethics awareness, and professional ethics. It is stronger than knowledge training and weaker than moral education. It is necessary to establish a talent system that integrates the knowledge, ability and accomplishment of existing educational institutions [12].

3. "333" Integrated Training Measures with the Community as the Carrier

3.1. Form a College Student Innovation Club

As a national experimental teaching demonstration center, the Basic Engineering Training Center of Jiangsu University actively explores new ways to promote the cultivation of high-quality innovative talents. In 2017, it was planned to establish the "Future Engineers Association" of Jiangsu University, which is an innovation and entrepreneurship association for college students. It attracts more than 100 members every year. In the top-level design, the association established an advisory committee to educate and guide the development of the association. It is composed of relevant leaders and professors of the basic engineering training center, school structures and colleges, industry and enterprise leaders and excellent alumni. The association has also set up a group of instructors responsible for the theoretical and practical guidance to various innovation associations under the association. It is mainly composed of teachers with certain scientific research guidance abilities from the basic engineering training center and affiliated colleges. Under the guidance of the advisory committee and the instructor group, the association has established a council composed of the chairman, vice-chairman and directors, which is responsible for convening the general meeting and making collective consultations and decision-making on the important affairs of the association. The council has an office of the president, which is composed of the president, vice-presidents and secretary-general. It is responsible for the daily affairs and decision-making of society. The innovation center of the association is mainly responsible for the establishment and daily management of various innovation societies. The secretariat is mainly responsible for the daily management and service of the association.

3.2. Constructing the "333" Talent training System with the Community as the Carrier

In line with the principle of "carrying forward the spirit of innovation and entrepreneurship, training engineering practice ability, serving young people to become talents, and creating a first-class innovation platform", the association is based on the existing engineering training to train college student's engineering ability and scientific research provides continuous power for talent training. Take the student innovation and entrepreneurship ability as the guidance, the center carry out engineering innovation practices through innovative projects, subject competitions, and skills training to improve students' ability to solve complex engineering problems and realize the whole process of engineering talent training from undergraduate enrollment to graduation. At the same time, it pays attention to integrating "cultivating people with morality" into the talent training system. It not only pays attention to the cultivation of students' knowledge and ability, but also pays attention to the improvement of engineering culture and supports students' engineering ethics and professional ethics. Provide humanistic care in life and other aspects, effectively promote scientific research education and practice education, and help guide college students to grow quickly and comprehensively. "333" integrates the whole process of the "three qualities" project talent training system. Rely on learning, seeking knowledge, practice, science and truth. The association fully implements the fundamental task of "cultivating self and cultivating people". Relying on skills training, discipline competition and innovation projects, we will gradually build and form "three types of projects", improve the practical professional skills, independent scientific research ability, innovation and entrepreneurship ability of college students, cultivate the "333" integrated whole process project of "three qualities" of learning and knowledge, practice and truth, and a scientific talent training system.

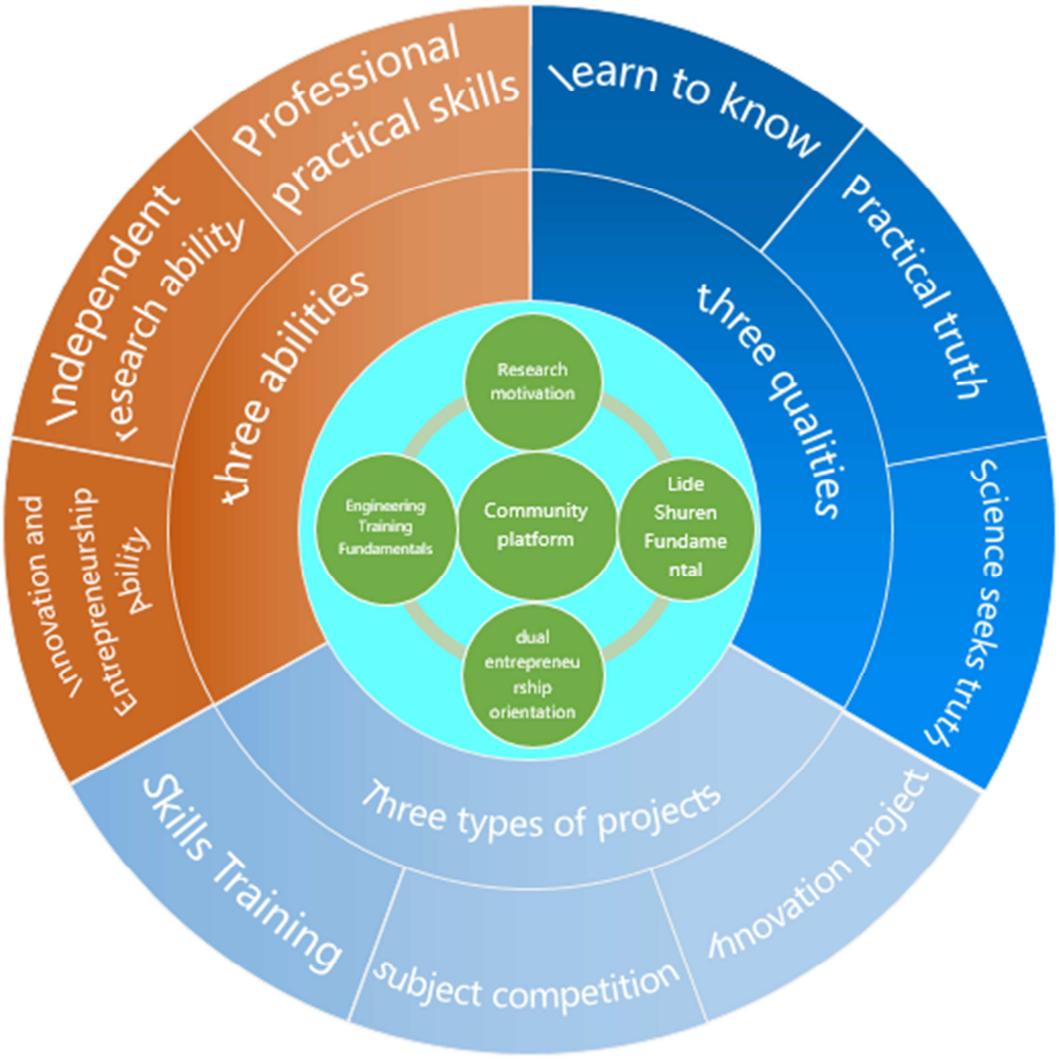

Figure 1. *Structure of "333" integrated talent training with the community as a carrier.*

3.3. "333" Talent Training Specific Measures

Four specific measures are proposed in response to the "four weaknesses" of talent training mentioned below.

(1) Implement the "Thousand-Day Training" plan.

For future engineers, the ability of "innovation and entrepreneurship" needs to be cultivated in the process of undergraduate study. Innovative practice courses and innovative community activities will introduce innovative practice projects and various innovation competitions. Each link requires students to complete the corresponding work and provide comprehensive training for students. So that the knowledge and skills learned by students in engineering training can be integrated, and students' engineering ability can be continuously improved.

(2) Carry out the "12345" talent training project.

The growth and development of students in the club should be "participating in at least one innovation and entrepreneurship project, at least two elective courses, learning to apply at least three engineering software, participating in at least four discipline innovation competitions, and participating in at least five practical activities". Through the "12345" project, so that students can be fully "individualized" training and realize the comprehensive improvement of knowledge, ability and quality.

(3) Establish a teacher-sharing platform.

In addition to the teacher team trained by the engineering training center itself, it also hires expert tutors inside the school and enterprise tutors outside the school. The professional direction focuses on machinery, automatic control, computer, machine vision, enterprise culture and management. The platform cultivates students' positive innovative thinking, practical ability, understanding of enterprise system culture and social enterprise needs, and pay attention to collecting feedback from experts and tutors, and constantly improve the engineering talents and enrich the connotation of results.

(4) Integrate engineering culture into engineering education.

Pay attention to giving full play to the advantages of club members from different colleges and multi-disciplinary integration. We should develop the humanistic spirit and

professional quality of engineering students and pay attention to the leading role of Party building. Cultivate students with the craftsmanship and spirit of excellence. Giving humanistic care in innovative practice, moral education, and cultural life [13], and effectively promote scientific research and education and practice education.

4. The Implementation Effect of the "333" Integrated Project Talent Training System

"Future Engineers Association" has trained more than 500 college students, who are capable of self-operation and iterative growth. In addition to winning awards in various national and provincial competitions, they have cultivated and have the ability to win prizes in Innovation and Entrepreneurship Projects for College Students and scientific research projects. It has made great achievements and cultivated various typical comprehensive talents, became a model for the club to train high-quality engineering talents, and formed the engineering talent training characteristics of combining talents with education. [14].

4.1. Student's Engineering Ability, Team Spirit, and Innovation Ability Have Been Effectively Improved

Since the establishment of the society, the student innovation projects has been realized. In recent years, it has won 5 provincial-level innovation projects, 9 school-level scientific research projects, 13 innovation projects, 10 innovation practice fund projects and 5 inter school projects. There were 5 utility model patents. The "entrepreneurship and innovation" education has achieved remarkable results. Major breakthroughs were made in the innovation competition. In the past three years, it has won 63 provincial and above awards such as the comprehensive ability competition of engineering training for college students, and nearly 110 school-level awards, including 5 national-level A-level special awards and 3 first-class award.

4.2. Improve the Level of Teacher Team Construction

The research results of teachers are remarkable. In recent years, the ministry of education has 8 industry university research cooperation education projects (3 projects have been completed), 4 provincial and ministerial education reform projects, 2 school-level ideological and political research projects, and 5 provincial and ministerial teaching competition awards. Among them, there were 5 first prizes. The ministry of education also won the first prize of the national on-the-job training young teachers' micro class teaching competition, and the "seven consecutive titles" of the advanced manufacturing technology practice teaching competition of Jiangsu Engineering College.

4.3. Remarkable Achievements in Lide Shuren

The innovation team of the basic engineering training center won the "three links" comprehensive reform management service demonstration post of Jiangsu University. Etc. for more than 20 times, Li Bufa, Huang Bo and other students won the honors of "Top Ten Innovation and Entrepreneurship Star" and "Work-study Star" of the school. The club and the party branch have jointly established "Three Pairs, Two Carriers, One Innovation and Competition". The example was awarded the first prize of Jiangsu University's "Party Building Innovation and Excellence", and the activity of "Recalling a Century of Party History and Educating People with Ingenuity" was awarded the second prize of Jiangsu University's "Best Party Day Activity".

4.4. External Promotion and Expected Prospects

Since the establishment of the association, it has created three major school-level events such as "Creative Jiangsu University Cup" maker competition, "Future Cup" intelligent vehicle control competition, "Craftsmanship Cup" innovation competition, Creative Design and Production Competition and other three major engineering competition brand projects. More than 1000 students from nearly 20 universities participated in the competition, and they were recognized by relevant departments and experts of the university. The basic engineering training center, which is the guiding unit of the association, has been awarded the Jiangsu Innovation and Entrepreneurship Practice Education Center, which laid a foundation for the further development of the association, demonstration and leadership [15].

5. Conclusion

This paper puts forward the "333" model of engineering innovation and entrepreneurship training based on community carriers, and analyzes the current situation and shortcomings of engineering training in colleges and universities. In addition, we will focus on the construction of student associations and how to rely on community carriers to solve the problem of current engineering personnel training. Aiming at the problems of "four strong and four weak" in the training of engineering talents, an integrated training system of engineering talents is constructed and innovated. The results show that the "333" integrated project innovation and entrepreneurship talent training system based on the community carrier has achieved good results in Jiangsu University. According to the training requirements of "new engineering", the center will further strictly optimize the composition of associations and institutional regulations, conduct more in-depth overall planning for innovative projects and competitions, and invite excellent mentors from enterprises to participate in joint guidance to closely integrate the needs of society and enterprises. The center also will establish a shared and collaborative education practice platform integrating education, training, and R&D.

Acknowledgements

The authors would like to thank the funding: Higher

Education Reform Research Project in Jiangsu Province in 2021 (2021JSJG613), Exploration of Engineering Training Practice Education Model from the Perspective of "the Integration of Moral, Intellectual, Physical, Aesthetic and Labor Education".

References

[1] Li Gang, Qin Kun, Wan Youchuan, etc. Teaching reform of remote sensing experiment for new engineering subjects [J]. Higher Engineering Education Research, 2019 (3): 40-45.

[2] Fang Ruiling. The relationship between building morality and cultivating people and improving the quality of ideological and political teachers in colleges and universities [J]. Shandong Youth, 2018 (9): 16-17.

[3] Wang Xiumei, Han Jingran. Problems existing in engineering training center and practice turn under the background of new engineering [J]. Experimental Technology and Management, 2019 (9): 8-11.

[4] Ye Xiaoqin. Research on the cultivation of innovative talents in engineering training centers under the background of new engineering [J]. Experimental Technology and Management, 2019 (12): 274-277.

[5] Shi Duanwei, Liao Dongmei, Wang Zhonghua, etc. Research and application of engineering training and innovative practice teaching system in comprehensive universities [J]. Experimental Technology and Management, 2019 (7): 201-205.

[6] Zhang Qiliang, Zhou Yu, Lu Zhi. Construction and implementation of "Trinity" hierarchical practice teaching system [J]. Experimental Technology and Management, 2019 (1): 33-36.

[7] Wang Wei, Zhang Yanrui, Ma Yuqiong, etc. Research on engineering training teaching system based on open model [J]. Experimental Technology and Management, 2015 (1): 192-194.

[8] Chen Jian, Zhu Luchuang, Wang Jie, etc. Research on the curriculum system of technical ability training in engineering training [J]. Experimental Science and Technology, 2020 (4): 74-78.

[9] Zhong Quanxiong. Construction of engineering training teaching platform based on the cultivation of innovative talents [J]. Education Modernization, 2017 (41): 9-10.

[10] Zhang Mengchi, Chen Yun, Ma Aoling. Research on engineering training teaching reform based on innovation ability training [J]. Laboratory Science, 2019 (1): 155-157.

[11] He Chuming. Personalized talent training and section curriculum setting under the background of popularization [J]. Teaching Research, 2009 (1): 21-24.

[12] Yang Jichang. The cornerstone of creating the future [M]. Southeast University Press. 2004: 21.

[13] Ge Caixia, Han Xiaolin, Wang Henglei, etc. Research on the "five-in-one" model of practice and cultural education in chemical engineering colleges and universities [J]. Shandong Chemical Industry, 2020 (49): 212-215.

[14] Zhang Dongyan, Zong Yongchen, Wang Peiqing. Research on the construction of practical teaching system for engineering management specialty: Taking Tibet College of Agriculture and Animal Husbandry as an example [J]. Journal of Higher Education, 2020 (28): 56-58.

[15] He Chuming. Vigorously carry out social practice activities to improve the socialization skills of college students [J]. Journal of Social Sciences, 2013 (10): 176-178.