

# "Exploration and Practice of New Engineering Talent Cultivation Mode of "Thick Foundation, Emphasis on Application, Interdisciplinarity, Integration of Industry and Education

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## Abstract

**The connotation of new engineering is characterized by the cross-fertilization of new disciplines from the industrial demand, and the cultivation of high-quality comprehensive and applied talents with strong self-learning ability, comprehensive basic knowledge, practical ability and innovation consciousness. The cultivation of new engineering talents is not only to teach basic engineering knowledge, but more importantly, to cultivate students' engineering thinking, so that they will be able to flexibly utilize and properly solve the unknown and complex problems they face in future engineering practice. This paper explores the new engineering talent cultivation mode and practices it from the aspects of knowledge system, teaching pathway, nurturing concept, teaching mode, teaching resources, teaching methods and innovative achievements.**

## Keywords

**Thick foundation; Heavy application; Interdisciplinary; Integration of industry and education.**

## 1. Introduction

The Department of Higher Education of the Ministry of Education "Notice on the Research and Practice of New Engineering Science" requires that "the research and practice of new engineering science centers on the new concept[1-2], new structure, new mode, new quality and new system of engineering education reform", and is clearly divided into three specific groups, such as "the group of colleges and universities with superiority in engineering, the group of comprehensive colleges and universities, and the group of local colleges and universities" [3-4]. It is clearly divided into three specific groups, such as "engineering superiority universities, comprehensive universities and local universities" [5], and requires that each different subdivided group of colleges and universities must combine the characteristics of their own disciplinary positioning and key service industries to determine the direction of the development of research and exploration at different stages of the development and implementation of ideas and priorities. Colleges and universities should closely combine with their own local economic characteristics, based on serving the local economy and seizing the important opportunity of "new engineering" planning and construction[6], and constantly and comprehensively improve their own higher education internationalization level strength and industry influence.

Shi Yanping believes that the biggest advantage of colleges and universities is the talent advantage, and talent support is an important part of the supply of university-industry-research supply, and the cooperation between industry[7], academia and research can make the current college students deepen the requirements of the industry and enterprise, and promote the scientific and technological cooperation and the sustainable development of the enterprise. Geng Lele, through a comparative analysis of the University-Industry-Research

cooperation model of Germany, Japan and Sweden[8], concluded that China's University-Industry-Research cooperation model should clarify the parties' own role positioning, actively enhance the initiative of small and medium-sized enterprises to participate in University-Industry-Research collaborative education and set up a national specialized agency to promote University-Industry-Research cooperation. Song Lei summarized the industry-university-research cooperative education model as "four-helix synergistic structure"[9], which is an effective way for colleges and universities to carry out pedagogical innovation and cultivate innovative talents, and at the same time, all of them can have corresponding effects on economic and social development. In summary, scholars' research on University-Industry-Research Collaborative Education is broad and not specific enough, mostly detached from the background of the construction of new engineering disciplines and regional characteristics, and lacks comprehensive research with new perspectives, and the analysis of the talent cultivation mechanism of new engineering disciplines under the collaborative mode of cooperation between the University-Industry-Research Collaboration is incomplete[10], and has not constructed a mature and referable cooperative education system of University-Industry-Research Collaborative Education.

## 2. Construction Content

### 2.1. Body of knowledge

Professional cross-fertilization of intelligence, complexity and integration is the development direction of the engineering field, and the engineering problems encountered in practical applications are often interdisciplinary and comprehensive problems, and it is difficult for a single discipline, technology or professional knowledge to comprehensively understand the nature of the problem and put forward reasonable and scientific solutions. Based on this background, highlighting the cross-fertilization of specialties in the construction of knowledge system is an important element in the construction of "New Engineering".

### 2.2. Teaching pathways

The innovation of the deep integration of information and teaching methods is an important part of the process of realizing the qualitative improvement of talent cultivation. The rapid development of information technology and Internet technology has promoted the updating of new technologies, models, methods and thinking in modern education, and the resulting "Internet + teaching/classroom", MOOC and a series of online learning platforms have broken through the traditional teaching of the "four-one" model (i.e., a room, a book, a pen, a mouth). The "four ones" model (i.e., a room, a book, a pen, a mouth) has been broken through the traditional teaching. The advantages of "Internet+" have broadened the teaching pathway and provided a reliable carrier for teaching practice in the context of new engineering disciplines.

### 2.3. Philosophy of Parenting

The concept of curriculum ideology and politics integration and human education drives the construction of the talent training system and the reform of the talent training model, which should incorporate ideological and political education throughout, highlighting the cultivation purpose of helping students to shape a correct worldview, outlook on life and values.

### 2.4. Modes of teaching and learning

Problem-oriented driven talent cultivation cannot be separated from scientific, innovative, guiding and specialized teaching mode. The innovation and reform of talent cultivation in line with the connotation of "new engineering" should be tailored to the specialties, and the teaching mode with specialties, university characteristics and regional characteristics should be

established. Talents exported to the industry and society must have the comprehensive ability to solve "complex engineering problems", and this is the core of talent training.

### 2.5. Teaching resources

The rational allocation of teaching resources driven by scientific research results is one of the necessary conditions to support the improvement of the quality and efficiency of talent training. Our students have published more than 10 papers and 30 patents in the new model.

### 2.6. Teaching methods

Diversified teaching methods help to improve students' learning interest, participation and learning efficiency, and the coordinated construction and promotion of the application of virtual experimental teaching center is an important component of the reform and development of engineering education.

### 2.7. Innovative results

The practice base drives the new engineering majors to emphasize the importance of industry-university-research cooperation education, and the practice base training not only gives students the opportunity to test the "truth" learned from books, but also inspires students to innovate their achievements.

## 3. Building Results

Integrate internal and external faculty resources, form excellent teaching team, and utilize its synergistic effect in teaching and practice. By inviting many famous teachers from Wuhan University, Hubei University, Wuhan University of Light Industry and so on to train and exchange with the teaching team, as well as visiting Hubei University of Technology, Hubei Institute of Automobile Industry, Donghu College, Shouyi College, Wenhua College and other colleges and universities to carry out off-campus research, and actively learning from excellent teachers of the same level of the faculties and departments within the university, the innovative teaching reforms of the college have achieved effective results, introduced six highly skilled personnel of the enterprise, set up three mentor teams, participated in the editing of five textbooks, and actively constructed university-level and provincial-level quality courses. The innovative teaching reform of our college has been effective, six high-tech talents from enterprises have been introduced, three instructor teams have been formed, five textbooks have been edited, and school-level and provincial-level high-quality courses have been constructed actively.

## 4. Summary

The talent cultivation model of the new engineering specialty of thick foundation, heavy application, interdisciplinary, and integration of industry and education aims to take students as the center, focus on the needs of enterprises, and cooperate between schools and enterprises to jointly cultivate application-oriented talents. This paper focuses on the construction method and construction results, and in the future talent training, it will also pay more attention to basic education, emphasize practical teaching, and actively communicate with enterprises to cultivate applied talents.

## References

- [1] Zhu Yuping, Zhang Xuejun, Gao Xiang et al. Research on Integration Cultivation of Engineering Practice Innovation Ability [J]. Experimental Science and Technology, 2022, 20(03):44-48.

- [2] Junlei Qi, Baoqiang Cong, Xiaoguo Song. Research on the cultivation mode of innovation ability of top talents based on cross-discipline under the background of "new engineering" [J]. Mechanical design. 2023, 40(01):155-160.
- [3] Zhou Shao-Ping, Chen Jian-Jun, Zhang Lan-Zhu, et al. Process equipment and control engineering "four-in-one" professional upgrading mode under the background of new engineering discipline [J]. Chemical Engineering Higher Education, 2022, 39(01):58-62.
- [4] Sun Zhibo, Shi Chengkun, Geng Xiangwei, etc. Teaching research on comprehensive innovation training of "artificial intelligence + engineering practice" [J]. Journal of Beijing University of Aeronautics and Astronautics (Social Science Edition), 2019, 32(06):148-151.
- [5] Wang Lin, Qu Shan, Wang Jie et al. Research on the Innovation and Practice of Talent Cultivation Mode of Hydrology and Meteorology Interdisciplinary Talent Cultivation---Taking Nanjing University of Information Engineering as an Example [J]. Science and Technology Information, 2021, 19(32):118-121.
- [6] Li Yuyao, Pang Chunying, Yang Yu. Cultivation of Innovation and Entrepreneurship Awareness of New Engineering Talents[J]. Education Modernization, 2021, 8(55):30-32.
- [7] Shen Yufeng, Xu Yingzi, Liu Lu. Strengthening the use of higher mathematical knowledge in the teaching of mechanics of materials to cultivate students' scientific thinking ability[J]. University Education, 2013(23):58-59.
- [8] Wan Chunxiu, Jiang Guijuan. The significance of teaching self-knowledge courses from the perspective of students' growth and development[J]. Heilongjiang Science, 2021, 12(5):1-5.
- [9] Zhao Dong'e. Research on Innovation and Entrepreneurship Education Mode under the Background of New Engineering [J]. Heilongjiang Education (Higher Education Research and Evaluation), 2021(1):1-3.
- [10] Hu Bo". Quality Improvement Mechanism for Cultivating Innovative and Entrepreneurial Talents in Colleges and Universities under "New Engineering"[J]. Journal of Shanxi University (Philosophy and Social Science Edition), 2020, 43(4):132-136.