

# Exploration and practice of environmental engineering specialty construction in colleges and universities under the background of new engineering

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**Abstract:** *New engineering is a major strategic choice for engineering education reform under the background of new technological revolution, new industrial revolution and new economy. With the great challenges brought by the new round of scientific and technological revolution and industrial transformation, the Ministry of Education has issued the Notice on Developing the Research and Practice of New Engineering and the Notice on Promoting the Practice and Research of New Engineering in recent years, actively exploring the reform of higher engineering education and earnestly cultivating new engineering talents. In order to meet the needs of national strategic development, colleges and universities have tried to innovate and reform engineering education according to their own school running conditions. Under the background of new engineering education reform, cultivating college students' scientific research and innovation ability and quality is of great significance to improve students' practice and innovation ability. The construction and reform of civil engineering specialty should change the traditional concept of talent training of "emphasizing theory and neglecting practice", strengthen the construction of "double qualified" teachers, actively expand the school enterprise cooperation mode, further promote the construction of internal and external training platform, improve the discipline competition mechanism, make use of the Internet to popularize professional knowledge, comprehensively deepen professional reform, and build a talent training mode in line with the needs of the industry.*

**Keywords:** *new engineering; Environmental engineering; Professional construction*

## 1. Introduction

The construction of new engineering is based on the concepts of "student-centered" and "industry-university joint training", emphasizing "actively serving the national strategy", "home and country feelings" of humanistic spirit, "leading the future development of the industry" and "innovation". The concept of comprehensive, full-cycle engineering education" is a supplement and update to the "Excellent Engineer Education Training Program" and "Engineering Education Certification", and it is the guidance of its development direction [1]. The Ministry of Education attaches great importance to the construction of new engineering courses, and has successively reached many consensuses, such as Fudan Consensus, Tianda Action and Beijing Guide, aiming at exploring a new model suitable for higher education reform in the new era [2].

From the perspective of specialty setting, environmental ecological engineering has typical new engineering characteristics. It is not a science or engineering in the traditional sense, but a highly cross emerging discipline. It is based on the principles of ecology, environmental science, economics and engineering, combined with the theories, methods and technologies of ecological engineering and environmental engineering, It is integrated by using modern scientific and technological achievements, management means and technology of relevant majors [3]. It can be seen that China attaches great importance to engineering education, and focuses on the research and practice of new engineering [4]. It is undeniable that China is at the world's leading level in some engineering construction and has achieved world-renowned achievements [5]. However, some phenomena in engineering construction, such as emphasizing speed, neglecting quality, emphasizing interests, neglecting environmental protection, emphasizing the whole and neglecting parts, still occur from time to time. Ministry of Education of the People's Republic of China's "Notice on Developing New Engineering Research and Practice" requires that "new engineering research and practice should be carried out around the new concept, new structure, new model, new quality and new system of engineering education reform" [6].

"Research and practice of new engineering" is the inevitable requirement for the development of higher education in the new economic era. New engineering talents are an important human guarantee to support the realization of national strategy and the rapid development of new economy. The cultivation of talents in Colleges and universities should be transformed into applied and innovative talents [7].

## 2. Optimization and adjustment of talent training program

### 2.1. Training goal adjustment

At present, under the background of new engineering, the national demand for top-notch talents is increasing. The training quality of environmental professionals has also been greatly improved, but the duration of practice is short, and there are many outstanding problems that need to be solved urgently, such as the current general lack of practical ability and poor hands-on ability in colleges and universities [8]. Compared with the 2017 and 2018 training programs, the newly revised talent training program for 2019 environmental engineering major still emphasizes the theoretical knowledge of chemistry and environmental pollution control, and adds consulting jobs according to the latest industry development and job survey results [9]. Due to the lack of understanding of the importance of practical teaching in personnel training, the training of environmental engineering professionals has not fully met the needs of top-notch personnel training, and the practice links in colleges and universities are mostly single and passive [10].

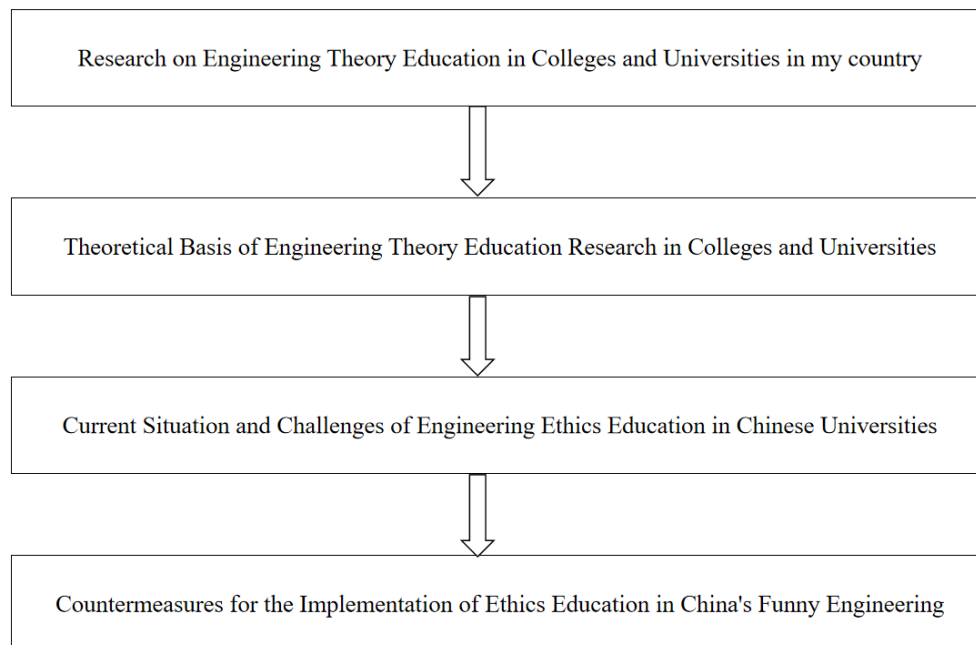


Figure 1: technical roadmap

The overall level of talent training quality is high, but it highlights the lack of top-notch talents, and the unstable output of high-quality talents, which can not meet the urgent needs of the development of the times for the cultivation of talents majoring in environmental engineering. In professional teaching practice, how to effectively improve the teaching quality of practical links, integrate the knowledge learned in environmental engineering textbooks with practical posts, and realize the organic and deep integration of theoretical knowledge and practical application, It is an urgent problem for the construction of environmental engineering specialty to connect social enterprises with the current talent training in Colleges and universities. At the same time, it is also to meet the urgent needs of the society for the cultivation of top-notch talents. Under the new situation, the University of Electronic Science and Technology of China has developed a digital environmental protection characteristic environmental engineering major by integrating environmental science and electronic information technology in combination with social needs and its own advantages. Since the content of civil engineering as one of the training objectives has been deleted in the latest talent training plan, civil engineering has also been deleted from the main disciplines, and the corresponding core courses have

also been reduced from 17 to 15. At the same time, chemistry courses, as an important basic course of this major, have also been adjusted accordingly. Physical chemistry, which is too theoretical, has been deleted (still a required course, but not a main course), and inorganic chemistry has been changed into general chemistry with more emphasis on comprehensive chemistry foundation and stronger application, which makes the degree courses in the training program more refined and targeted. Through interviews, find out the shortcomings of engineering ethics education in domestic colleges and universities, analyze the excellent engineering ethics education methods in foreign countries, and then put forward the countermeasures suitable for carrying out engineering ethics education in Chinese colleges and Universities under the background of new engineering. See Figure 1.

## **2.2. *Emphasis on basic knowledge and skills learning***

Solid basic knowledge is the most basic condition for scientific research innovation, and it is the premise for all scientific research work such as mastering the background of scientific problems and refining key and difficult points. Mastering discipline skills, especially the experimental operation skills of environmental engineering specialty, is the key to ensure the efficiency of scientific research. The management departments at all levels of the school are the key to promoting the transformation of the training mode of applied talents. The formulation of relevant policies and the implementation of plans of the school should meet the needs of this central theme, mobilize the subjective initiative and service consciousness of all teachers, stimulate the vitality of running a school, and change the traditional and administrative management concept. The construction of practical teaching platform and system must be put in an important position in the construction of new major of environmental ecological engineering.

Some schools have tried to decentralize their powers and functions in the management mode, carried out the reform of the secondary management system, and fully mobilized the enthusiasm of the secondary colleges, so as to effectively improve the efficiency of running schools and the quality of education. Have the concept of sustainable development, knowledge of pollution control and prevention of water, gas, sound and solid waste, and knowledge of environmental planning, resource protection and drainage engineering. Have the ability to develop and research new technology, new theory and new equipment of environmental engineering. Through the integration and optimization of enterprise practice content, this paper discusses how to achieve the effective training method of students' basic practical ability; Study how to carry out targeted engineering training for students in the form of project in the off campus professional production practice; Study how the graduation design (Thesis) scheme can effectively cultivate students' ability to practice and solve practical engineering problems, and finally put forward a new practical link training scheme aiming at the cultivation of engineering practical ability. According to their own foundation and characteristics, all colleges and universities should establish a stable practical teaching base with joint enterprises, take multiple measures such as the implementation of virtual simulation project, promote the construction of the practice platform of environmental ecological engineering specialty, and strengthen the practical teaching link, so as to ensure that the students of this specialty get enough practical training in the practical teaching link.

## **3. Professional construction and reform practice**

### **3.1. *Improving the scientific research and innovation ability and quality of college students majoring in environmental engineering Cultivation approach***

Scientific research method is an important issue in scientific research work, which is related to the effectiveness of scientific research work. As the ancients said: get twice the result with half the effort with half the effort with half the effort with half the effort with half the effort with half the law. Through sufficient research on the status quo of industry development, combining job requirements with school positioning—training goals—graduation requirements—curriculum system as atop-to-bottom logical relationship, combining industry-determined positions and employment positions with school positioning is as follows: Professional training objectives and training objectives determine the graduation requirements of students, and graduation requirements determine the composition of the curriculum system and the teaching objectives of each course as the main framework of the talent training program. Relying on practical assessment methods, improving the professional ability of environmental engineering students is an effective measure to improve the discipline construction under the current new engineering background. At present, the reform of

practical teaching should focus on the improvement of students' comprehensive quality and innovative ability.

Focus on the construction of top-quality courses. The plan covers most experimental courses in the environmental field, including air pollution control engineering, water pollution control engineering, environmental microbiology, solid waste recycling, environmental monitoring, etc. In the form of modular courses, the knowledge level, emotion, attitude and value cultivation level of teaching and scientific research needs are shown to help students grow up from different dimensions, and there is no shortage of characteristics such as the unity of theory and practice, the orientation of future career choice, etc., so as to build a systematic. The core courses "Water Pollution Control Engineering" and "Environmental Monitoring", the experimental courses "Environmental Monitoring Experiment" and "Water Pollution Control Engineering Experiment" strive to set up flexibly, and open large-scale open network courses, that is, MOOC realizes the network sharing of high-quality course resources. Adopt the teaching method of combining theory and practice, appropriately increase the proportion of experimental courses, and follow the principle of "independent operation, technical exchange and result sharing" in the whole experimental process. Scientific thinking is divided into logical thinking and non logical thinking, and its conceptual level is shown in Figure 2. Logical thinking is concept based judgment and reasoning, with fixed rules to follow, non logical thinking has no fixed logical rules to follow, and the reliability of the conclusion is limited, but the creativity is great.

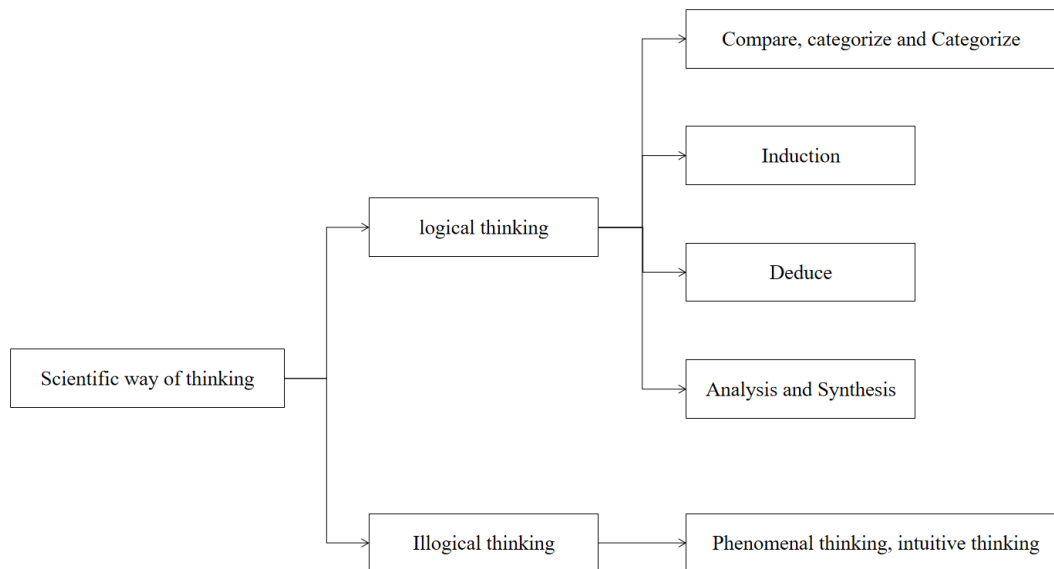


Figure 1: Concept level diagram of scientific thinking method

### 3.2. Improving the scientific research and innovation ability and quality of college student

The innovation achievements of engineering majors are transformed by inventions, patent applications and scientific papers. The professional skills of environmental engineering major mainly include the following three aspects: analytical experiment skills, process design and operation management skills, and engineering design skills. Specifically, the four-year professional skills training program formulated by the university is divided into four levels: theoretical basic training, improvement of comprehensive ability, scientific research and innovation practice and professional skills competition. Through practical application, comprehensively cultivate students' engineering practice ability, explore new ways and new methods of joint evaluation of teaching between schools and enterprises, formulate a set of effective quality standards for the cultivation of engineering practice ability, pay attention to the implementation of various indicators, The new training mode is compared and analyzed with the original training mode, and the new training mode is comprehensively evaluated.

It is very important to build a team of teachers of environmental ecological engineering specialty with high professional knowledge, engineering experience and educational ability through various channels and different ways to improve the training quality of students and the social recognition of environmental ecological engineering specialty. In addition to the above two points, engineering colleges and universities also need to broaden their research vision, actively absorb and learn from the excellent engineering ethics curriculum, and explore its value and significance. Disciplinary

competition is an important way to integrate practical teaching links inside and outside the classroom, stimulate students' creative passion, and also help to cultivate students' innovative spirit, team awareness and practical ability. In the Internet age, vigorously promote the "internet plus Popular Science" action plan and popular science informatization construction project, strengthen Internet thinking, promote the application and sharing of high-quality educational resources for civil engineering majors, and build a number of high-quality online open courses represented by national excellent courses, national network resource sharing courses, micro courses and massive open online course courses (for example, At present, the School of Civil Engineering of Southeast University has five courses, including theoretical mechanics, material mechanics, engineering structure design principle, on-site construction technology of civil engineering, and BIM technology theory and application. It won the project of Southeast University's online open course in 2018), accelerating the reform of student-centered teaching mode.

#### 4. Conclusions

The key point of the construction of new engineering is to expand the connotation of engineering education, in which the implementation of engineering ethics education is required in terms of talent quality. However, at this stage, there is a special lack of colleges and universities in China to carry out engineering ethics education. On the contrary, engineering ethics education should be included in engineering education, which reflects the problems existing in engineering education in Colleges and universities in China As an important part of environmental engineering, practical teaching is of great significance to comprehensively improve the training quality of engineering education talents in China. In addition to optimizing talent training programs and strengthening school-enterprise cooperation, there is still a lot of work to be done in professional construction and development, such as further increasing professional content, highlighting professional characteristics, strengthening professional publicity, and improving the quality of teaching teams. Under the situation of new engineering construction, artificial intelligence, assembly industrialization, Internet informatization, etc., it is necessary to find out the training orientation of civil engineering professionals, rationally plan the training objectives, attach importance to the construction of "double-qualified" teachers, and strengthen the productive practice teaching in enterprises, so as to cultivate high-quality new engineering professionals and fill the gap of talent demand in the industry. Under the background of new engineering, it is urgent to improve the construction level and strength of environmental engineering specialty in an all-round way in combination with the characteristics of our applied university.

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