

# Exploration on the Path of Engineering Construction Majors Serving Local Construction from the Perspective of “New Engineering”

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**Abstract:** Guided by serving national strategies and local development, the construction of “New Engineering” presents both opportunities and challenges for local universities, and the transformation and upgrading of engineering majors is an inevitable choice to adapt to the new era. Based on the connotation and goals of “New Engineering” construction, this paper reforms and innovates the talent training model and professional curriculum system of engineering construction majors, explores the path for disciplines and majors to serve local construction, and provides a reference for the development of disciplines and majors while advancing “New Engineering” construction.

**Keywords:** New Engineering; Engineering construction; Local construction

**Online publication:** March 9, 2026

## 1. Introduction

In March 2018, the Ministry of Education identified 612 first-batch “New Engineering” research and practice projects, marking the transition of “New Engineering” construction from theoretical research to practical application. After two years of construction, various universities have achieved remarkable results<sup>[1]</sup>. Wu Yan, then Director of the Higher Education Department of the Ministry of Education, highly praised the achievements of New Engineering construction as “a hundred flowers blooming and constantly innovating,” and also put forward the long-term goal of “We must be part of national strategies and take responsibility for national needs”<sup>[2]</sup>. It can be seen that on the basis of the top-level design of “New Engineering,” how local universities, combined with the characteristics and needs of regional development, construct effective paths to serve and support local construction in the process of discipline and professional construction is a topic worthy of exploration and research<sup>[3]</sup>.

The core of “New Engineering” construction in local universities is to adapt to and serve local development, lead scientific and technological forces, and support the demand for applied talent training. Its fundamental goal is to build and improve a problem-oriented professional structure and knowledge system,

a demand-oriented talent training model, and an implementation-oriented practical mechanism<sup>[4,5]</sup>. To adapt to the new pattern of higher education and the new path of engineering education reform, many universities have formed a number of guiding achievements in interdisciplinary integration, professional updating and transformation, innovation and entrepreneurship education reform, high-level talent training, and collaborative education based on their own characteristics and advantages<sup>[6-8]</sup>. At the same time, local universities have also explored and practiced in aligning with industrial chain needs, cultivating applied technical talents, and building professional and curriculum systems, forming a series of models and schemes with reference and practical significance<sup>[9-11]</sup>. However, due to differences in regionality, culture, and student levels, the promotion effect of practical experiences in local universities is difficult to meet expectations. How to construct a talent training model and curriculum application system that serves and supports local construction, and effectively implement and promote it, is also a practical problem to be solved in “New Engineering” construction<sup>[12]</sup>.

This paper studies and summarizes the problems existing in the construction of engineering construction majors in recent years. Under the background of “New Engineering” construction, guided by national strategies and local construction needs, it innovates and reforms the talent training model and curriculum system, and explores the path for engineering majors to serve and support local construction.

## **2. Reform of talent training model**

Guided by “New Engineering” construction, the transformation and upgrading of the talent training model has been gradually promoted. Through nearly 10 years of exploration and practice, a new comprehensive undergraduate training model of “core (general education) + characteristics (professional training) + innovation (development training)” has been gradually constructed<sup>[13]</sup>.

### **2.1. Deepening the training stage of the engineering construction professional cluster (Professional Cluster 1.0)**

In 2015, in accordance with the *Guiding Opinions on Guiding Some Local Regular Undergraduate Universities to Transform into Applied Universities*, the college established an engineering construction professional cluster covering five undergraduate majors: Water Conservancy and Hydropower Engineering, Civil Engineering, Engineering Management, Engineering Cost, and Road, Bridge, and River-Crossing Engineering. It also explored and implemented a hierarchical teaching model, driving the mass teaching of parallel classes (“2.5 years of professional basic courses + 1.5 years of professional core courses”) with the elite model of Mingzhi Class (“3 years of professional courses + 1 year of professional practical courses”), laying a solid foundation for the reform and innovation of the engineering construction professional cluster.

### **2.2. Full implementation stage of the “3+1” talent training model (Professional Cluster 2.0)**

On the basis of cluster training, the professional “3+1” training model was fully implemented in 2020, that is, completing all professional courses in three years and carrying out professional internships and graduation projects (theses) in the fourth year. By shortening the learning time of professional courses, the connection and timeliness of professional content are strengthened, and core courses are consolidated through professional internships and practices to improve the application and expansion of professional skills, accumulating rich experience for the reform and innovation of the engineering construction professional cluster.

### **2.3. Pilot reform stage of the “2+1+1” talent training model (Professional Cluster 3.0)**

Innovation and practice of the comprehensive training model of “core (general education) + characteristics (professional training) + innovation (development training)” have been promoted, including general education centered on engineering construction majors, professional training featuring discipline categories, and development training innovated through interdisciplinary integration. A “2+1+1” talent training system of “2 years of general courses in the cluster + 1 year of professional courses in the discipline category + 1 year of personalized development through innovation” has been formed. Students are fully informed about the characteristics of the engineering construction industry and majors, guiding their employment tendencies and career planning to realize general training of cluster majors; through controlled professional diversion in discipline categories, professional training of discipline categories is realized through one year of professional core course learning; in the fourth year, according to students’ employment tendencies and career planning, targeted internship and practice topics are constructed, and communication channels between teachers and students in practice, internships, employment, and further study are opened, providing effective guidance on employment and further study to realize personalized development training of students.

## **3. Innovation of professional curriculum system**

Modular curriculum teaching for engineering construction majors is constructed from four aspects: cultivation and guidance of engineering awareness, learning and consolidation of professional foundation, training and strengthening of professional skills, and internship and practice of engineering craftsmanship. The connection and cohesion of curriculum content are innovated to realize the training goal of serving local construction in an “all-staff, whole-process, and all-round” manner<sup>[14]</sup>.

### **3.1. Module for cultivation and guidance of engineering awareness**

The cultivation and guidance of students’ engineering awareness is the primary task of the curriculum system and the foundation for its realization. In general courses, the cultivation of awareness, such as patriotic feelings, cultural inheritance, dedication, scientific rigor, and craftsmanship spirit, is strengthened in ideological and political courses. Ideological and political elements in professional general courses are thoroughly explored to stimulate students’ interest in professional knowledge learning and exploration, guide them to establish the awareness and goal of serving local construction, and realize “all-staff” education by professional teachers and public course teachers.

### **3.2. Module for learning and consolidation of professional foundation**

As a prerequisite for the practical application and improvement of professional skills, a professional foundation is the core of the curriculum system. The connection between courses and the progressive relationship between courses is further promoted, the positioning of various professional courses is clarified, and the content connection between general courses, basic courses, and core courses is optimized. Aligning with industry and local construction needs, the curriculum knowledge system, application methods, and evaluation standards are accurately focused on, with interest guidance, curriculum teaching, strengthening and consolidation, internship and practice, and innovative application as the main line, realizing “whole-process” education.

### **3.3. Module for training and strengthening of professional skills**

The training and strengthening of professional skills are the characteristics of the curriculum system. Based on

professional courses, the goal of training and strengthening is achieved through the setting of practical courses. Taking industry and local construction needs as the entry point, professional course content is analyzed, and comprehensive topics are constructed to run through the entire curriculum system teaching process. It is carried out in the form of curriculum design, curriculum practice, internship reports, and graduation projects, giving full play to professional advantages and characteristics to form complete, comprehensive topic training results.

### **3.4. Module for internship and practice of engineering craftsmanship**

In the innovative personalized development training in the fourth year, teachers are encouraged to guide students' personalized, demand-oriented, and hierarchical development through scientific research projects, discipline competitions, further study, and actual projects. Guided by local construction needs, the internship and practice of engineering craftsmanship are promoted to realize "all-round" education.

## **4. Practical platform for serving local construction**

Practical path platforms are explored and built from two aspects: "student-centered practice" and "practice to assist rural revitalization." Guided by local needs, practical achievements are displayed and promoted through formation and innovation, forming a multi-level and multi-dimensional training implementation plan<sup>[15]</sup>.

### **4.1. Student-centered practical path**

To strengthen the professional connection between students and teachers, enhance the integration of interdisciplinary integration, and clarify the training goal of serving local construction, teacher teams guide students to build platforms for learning exchange and scientific exploration, stimulating their potential in discipline competitions, professional expansion, further study, and communication and publicity. Guided and led by teachers, planned and carried out by students, with students as the main body and teachers as assistants, the form of internships and practices is innovated, and the second and third classrooms are enriched. Students are guided to focus on serving local construction, integrate the curriculum system into it, promote the practical application of students' professional knowledge and skills, cultivate their ability to reflect on disciplinary exploration through practical problems, and enhance their enthusiasm, initiative, and innovation.

### **4.2. Practical path to assist rural revitalization**

Closely focusing on the strategic needs of local rural revitalization, explorations have been carried out in village planning, infrastructure construction, landscape design, and cultural promotion. Multiple modules have been constructed, including preliminary planning and landscape design, theoretical analysis of infrastructure, digital twins, model making, and cultural integration and promotion, realizing the purpose of professional services for local construction in a multi-faceted, multi-level, and multi-dimensional manner.

## **5. Effects of practical exploration**

The ideas and methods proposed in this paper have been piloted and practiced in the engineering construction professional cluster, achieving remarkable results in teacher-student training and teaching, and reaching the initial goals of "New Engineering" construction.

On the one hand, it has promoted teachers and students to conduct in-depth research and learning on national and local policies, continuously advancing the construction and development of "New Engineering,"

and professional courses have been closely aligned with local strategic development and construction needs. Closely combining the key points of the local 14th Five-Year Plan construction, teacher teams have carried out multiple field surveys and reconnaissance through various activities, familiarizing themselves with the construction ideas and key points of villages under the local rural revitalization strategic plan. Through professional course village residency practice activities, field surveys, on-site teaching, etc., they have led students to form landscape planning and design schemes such as topographic surveying and mapping, village squares, waterfront areas, camping bases, agricultural experience parks, and tourist avenues. The achievement data have been exchanged with local functional departments in the form of special reports and improved as background data for practical topics, accumulating a number of reference materials.

On the other hand, it has strengthened the connection between professional course content and serving local construction, innovated the curriculum system, implemented modular teaching content of “cultivation and guidance + learning and consolidation + training and strengthening + internship and practice,” and constructed schemes and practical paths for serving local construction. A series of scientific research and teaching projects and paper achievements have been derived in professional talent training models, practical teaching systems, interdisciplinary integration, curriculum teaching innovation, and local rural revitalization construction schemes, vigorously promoting the construction of “New Engineering.”

At the same time, it has improved the connotation of student-centered training. In the process of building and carrying out practical platforms, the main body has gradually shifted from teachers to students, guiding students to think actively, stimulating their ability to learn and apply professional courses, giving full play to professional advantages, and achieving in-depth cross-integration in discipline competitions, academic exchanges, and inheritance and development of local culture. While enriching the second and third classrooms, it has helped students accumulate rich achievements.

## **6. Conclusion**

From the perspective of “New Engineering” construction in the new era, the path for majors to serve and support local construction has been explored in the process of innovation and reform of talent training in engineering construction majors. It not only provides theoretical support and implementation paths for the talent training of engineering majors and aligns with industry and industrial needs, but also provides a reference for the professional construction and talent training of other disciplines. The formed achievements can not only stimulate students’ initiative in exploration, in-depth research, and practical ability, but also be transformed into actual projects and projects under corresponding conditions, achieving the goal of cultivating applied professionals and further promoting the construction of “New Engineering.”

## **Funding**

Key Teaching Research Projects of the College of Science and Technology of China Three Gorges University: Exploration on the Path of Engineering Construction Majors Serving Local Construction from the Perspective of “New Engineering” (JY20240010)

## **Disclosure statement**

The authors declare no conflict of interest.

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