

# Exploration of Teaching Reform Path in Civil Engineering Majors in Vocational Colleges Based on Job Ability Orientation

Yingjia Wang, Yanan Yi\*, Xianhui Man

Chongqing College of Architecture and Technology, Chongqing, China

\*Corresponding author

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**Abstract:** In the current teaching process of application-oriented undergraduate civil engineering majors, schools and teachers need to keep up with the times, focusing on analyzing the development prospects of the education industry, and examining the problems existing in practical teaching. This is also conducive to the school's active update of talent cultivation concepts. It is also necessary to clarify the real market demand when carrying out teaching activities. In the actual teaching process, teachers should optimize teaching design, promote cross-fusion of various disciplines, and teachers can also actively carry out training activities. The school focuses on improving the level of the teaching team, which has a very important impact on cultivating students' innovative abilities and improving students' initiative and enthusiasm for learning, and promoting the school to cultivate high-quality application-oriented talents needed by society.

## 1. Introduction

Civil engineering majors are closely related to surveying and design, and construction management. At the same time, with the rapid development of social economy, the current work style of the construction industry is gradually becoming more intelligent, which also shows that the requirements of social development for talents are constantly improving. In the context of the new era, application-oriented undergraduate colleges should continuously optimize and improve teaching models, prompting students to enhance their personal engineering qualities while cultivating innovative abilities and hands-on practical abilities. Against this backdrop, civil engineering majors need to implement deep reforms, clarify the development prospects of the era, take job ability orientation as the core, and promote the education cause to achieve more significant results in this process[1].

## 2. Based on job ability orientation, optimize teaching design

In the actual teaching process, when teachers optimize course design, they must clearly understand the requirements of job ability orientation and carry out corresponding reforms. This can also transform the disadvantages existing in traditional teaching models and increase the connection between classroom teaching and industry demands. This also requires teachers to expand teaching content, encourage students to clarify future job post needs. Firstly, teachers can set up corresponding teaching groups, prompting students to complete teaching tasks through teamwork. In the process of group cooperation, teachers can also require students to choose topics based on their own interests and hobbies. Every student can explore their own advantages and show their own strengths. After the group discussion ends, group members must select a member to do the corresponding summarizing work. Through this way, students can also achieve knowledge fusion and thinking collision in team cooperation. Finally, the teacher should assign scores according to the difficulty of the topic. Students can think independently and also practice. The teacher finally grades based on the students' performance and their answers to the questions. This approach can also indirectly stimulate students' enthusiasm for learning[2].

### 3. Actively Carry Out Innovative Training Activities

According to the current problems and the requirements of the new engineering construction for practical teaching, we construct a modular practical teaching model that combines virtual and real practices (as shown in Figure 1).

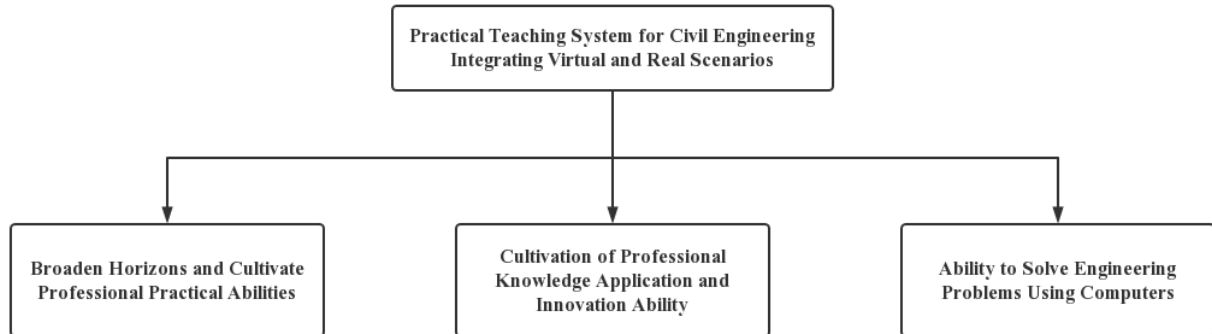


Figure 1 Modular virtual and real combined practical teaching framework

#### 3.1 Mining the advantages of modern technology, organically integrating into practical teaching

##### 3.1.1 Utilize modern information technology to improve the quality of traditional practical teaching

Practical teaching can cultivate students' hands-on ability, problem-solving ability, and comprehensive quality. It is an important link in higher education, and its role in civil engineering majors is particularly prominent. Traditional practical teaching can no longer meet the training needs of civil engineering talents in modern society. Therefore, it is particularly important to introduce modern information technology into the practical teaching of civil engineering majors. There are many types of modern information technologies, among which virtual reality (VR) technology plays a particularly obvious role in practical teaching. Virtual reality technology can achieve the combination of human-computer interaction, computer drawing, and artificial intelligence technologies, providing technical support for constructing virtual simulation practical teaching. Virtual simulation practical teaching can realize the teaching functions that traditional practical teaching cannot complete, especially in high-risk, high-investment, irreversible operations and complex engineering situations, it can provide reliable, safe, and economical practical projects, thereby improving the quality of traditional practical teaching[3-4].

##### 3.1.2 With the help of virtual simulation technology, develop alternative virtual simulation training projects

Considering the specificity of civil engineering majors and the scarcity of practical training bases in civil engineering colleges in our country, the virtual simulation training center can better meet the needs of majors and the cultivation of talents by universities. The Virtual Simulation Training Center is the physical embodiment of virtual simulation technology. Through 3D simulation animation technology, it can complete the integration of architecture from standardization, design, construction to operation in front of students. Students can understand professional knowledge more vividly and intuitively, especially some complex structures, concealed projects, and links that traditional practical training cannot touch, effectively deepen the content of professional practical teaching and the efficiency of practical training.

##### 3.1.3 Use network video technology to build remote video practical teaching projects in school-enterprise cooperation

The ultimate goal of universities in training students is to work in companies. This is also their important way to serve society and repay the country. Therefore, universities should increase the

participation of companies in student training, increase the strength of school-enterprise cooperation, and realize the talent cultivation mode of dual main bodies of schools and enterprises. Schools and enterprises can use network video technology to construct a "Internet + education + architecture" teaching model to complete remote video practical teaching projects, integrate industry resources, integrate online and offline, so that students can go deep into enterprises at any time and anywhere, and companies can understand students at any time and anywhere, which is convenient for selecting talents and signing employment agreements in the later period[5].

### **3.1.4 Create a practical teaching case library**

In the process of constructing a practical teaching model that combines virtual and real practices, we should pay attention to the creation and improvement of the practical teaching case library. The practical teaching case library can effectively provide resource guarantees for practical teaching, and it is also an efficient means of reflecting and rectifying practical teaching. The establishment of a practical teaching case library is the basis for the combination of virtual and real practical teaching, and it is also an important way to improve the efficiency of virtual and real practical teaching. Universities can rely on the campus network to establish an online course platform, share teaching resources, integrate classic practical cases, and establish a practical teaching case library suitable for students based on student situation analysis and practical teaching purposes. The construction of the practical teaching case library should include various resources such as knowledge context, mind maps, video animations, and three-dimensional models, improve practical effects, and optimize practical teaching projects.

## **3.2 Apply the Virtual-Reality Combination Method According to the Nature of Practical Courses**

The virtual-reality combination practical teaching system for civil engineering primarily consists of three categories: (1) The practice module aimed at broadening perspectives and cultivating professional practical abilities, such as civil engineering cognition internships, civil engineering production internships, architectural environment and energy system testing internships, engineering survey internships, general geological internships, architectural cognition internships, and graduation internships, etc. (2) The design module focusing on the application and innovation of professional knowledge, such as construction organization design, concrete course design, engineering budget design, bridge engineering design, building architecture course design, foundation base course design, steel structure roof frame, heating engineering course design, and graduation design, etc. (3) The engineering software application module aiming to use computer to solve engineering problems, such as BIM technology training, computer drafting training, structural calculation software application, and indoor thermal environment numerical simulation, etc. The combination of virtual and real methods can achieve the training objectives of practical teaching. For example, using VR virtual reality field video interactive technology can serve the internship practice module, engineering typical problem case library, and virtual design institute can improve the design module, while the software application typical case library docking research, real projects of practice base can enrich the engineering software application module.

## **3.3 Multi-Mode, Multi-Perspective, Develop Virtual-Reality Combined Practical Teaching Projects**

### **3.3.1 Establish school-industry-research practice bases in the campus, research feeds back to practical teaching**

Civil and construction engineering majors pay attention to both theory and practice. Based on this, further strengthen the cooperation between universities and enterprises, and build cooperation relationships between universities and enterprises, and between enterprises. Relying on the collaborative innovation of enterprises and promoting the cooperation between enterprises, it can promote the mutual integration of innovative elements between enterprises, facilitate the effective flow of innovative resources, and thus promote the conversion of the results of enterprise

knowledge activities. In the process of collaborative cultivation, it is necessary to meet the needs of enterprises for technology, and to achieve the feedback of scientific research on education and teaching. Focus on cultivating students' outcome-oriented awareness, use innovative practice activities to effectively output the results of theory and practice, let students feel a sense of accomplishment and gain. Combine teaching with scientific research, production, and engineering. Based on this, according to the actual needs of enterprises, teach through the engineering examples of enterprises, thus improving students' hands-on ability and overall quality. The integrated teaching system of industry, academia, and research should be established from the following aspects: (1) establish internal and external tutor system, combine school and enterprise, and jointly cultivate talents; (2) Use the advantages of university research and the financial advantages of enterprises to jointly solve industry problems and provide internship opportunities for students; (3) Share the company's site, equipment and the university's instruments, software facilities, and provide students with rich internship opportunities.

### **3.3.2 Combine course design with professional competition to enhance the cultivation of innovative practical abilities**

The course design of civil engineering majors is an important means to exercise students' comprehensive abilities. However, the current course design shows the characteristics of single form, simple content, and lagging professional skills, which contradicts the training requirements of civil engineering talents. Professional competitions show the characteristics of being avant-garde, complex, flexible, and comprehensive, which effectively makes up for the deficiencies of course design. Professional competitions are basically organized by the Ministry of Education, first-class professional associations, and leading enterprises. The topics are reasonable, the reviews are authoritative, and the results are fair. It can not only enhance students' professional abilities but also reflect the demand for talents from enterprises and society. The course design of universities should be well combined with professional competitions so that most students can get better professional exercises.

### **3.3.3 Enrich practice methods and pay attention to the position of "double creation" in practical teaching**

In the context of the country's key development of "double creation", universities should strengthen the position of "double creation" in practical teaching. Through practical teaching, students' interest in "double creation" can be stimulated. "Double creation" can not only cultivate students' creativity and research ability to meet the training purposes of practical teaching, "double creation" can also increase the combination of school and enterprise, deepen the reform of practical teaching; guiding teachers can also improve their own professional skills in the process of guiding students' "double creation", and complete the cultivation of "double-teacher double-ability" teachers. "Double creation" can also be completed within the school-industry-research practice base, supporting and complementing each other, thus continuously optimizing the effect of practical teaching.

## **4. Strengthening the Construction of the Teaching Staff**

Improve teachers' instructional design abilities. Vocational teachers must possess a strong ability to design teaching for vocational skills training. Understand the impact of the subjects they teach on students' professional qualities and abilities, as well as their connection with subsequent subjects. Based on the development needs of the industry and enterprises, and on the knowledge, literacy, and abilities required for work in this specialty, relevant courses are selected. Higher vocational colleges advocate training students in practical operations and teaching them the basic theoretical knowledge.

Improve teachers' abilities to use information technology. The development and use of information technology have not only changed the teaching environment and methods of teachers but also the learning environment of students. Through informatization, students can gain more

knowledge and improve their independent learning abilities. At this stage, teachers should not only be satisfied with the training of basic skills such as various multimedia equipment and office software but also should have certain text processing software and media material processing tools. They can create beautifully designed and high-quality courseware according to teaching requirements.

Improve teachers' abilities to integrate ideological and political courses into professional courses. Through curriculum politics, students can both master their professional knowledge and skills in learning and learn how to behave, thereby cultivating excellent moral qualities. Combining political and professional courses to maximize their educational role. The focus of integrated curriculum political teaching is to fully explore efficient political elements and political factors, maximize the political utility, and achieve the organic combination of architectural curriculum political education and professional course education.

Improve teachers' teaching implementation abilities. In higher vocational education, besides having good experimental conditions, there must also be strong experimental conditions. Therefore, higher requirements have been put forward for the teaching quality of higher vocational education. In the actual teaching process, it is necessary to connect with the basic characteristics of the specialty, use internships, and practical teaching methods to allow students to have more practical skills, enhance students' practical operation abilities, and thus achieve the purpose of being a dual-teacher vocational teacher.

Improve teachers' teaching innovation abilities. Vocational teachers must continuously improve their innovative abilities. To have a high level of creativity, one must have a creative personality. From the perspective of human development, creative education is a kind of harmony and pursuit of personality development. Teachers also need to constantly reform their teaching concepts, enhance their continuous innovation abilities, and thereby better understand the development track and trend of the sector of vocational education in which they participate.

Improve teachers' reflective teaching abilities. The teaching supervision ability of vocational teachers mainly refers to the ability to continuously check, control, evaluate, and feedback during the entire teaching process, with teaching activities as conscious objects, to ensure that the expected teaching goals are achieved. The teaching process is a dynamic process, from teaching preparation, teaching implementation to teaching reflection. In each stage or link of teaching, teachers have to put in a lot of effort, pay attention to students' reactions and feedback at all times, and summarize the problems and solutions in teaching.

## 5. Conclusion

In conclusion, with the rapid development of the socio-economy, the orientation towards vocational ability has entered the current teaching process. Applied undergraduate civil engineering teaching also needs to keep up with the times, focus on updating and reforming the teaching system, while paying attention to analyzing the development prospects of the era. Teaching work should be carried out with engineering practice as the core, prompting all disciplines to achieve deep integration in this process. At the same time, the school can also build corresponding hardware platforms, encouraging students to deeply and comprehensively understand various types of knowledge in this process. Finally, teachers can also actively carry out assessment evaluations, requiring students to connect innovation with practice in this process, cultivate innovation ability, improve personal learning quality, which has a significant positive impact on students' future entry into job work.

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