

Study on Teaching Measures of Civil Engineering Construction Course with New Engineering Education

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Abstract: New engineering education pay more attention to the cultivation of students' engineering practice, and it further strengthen the global vision, engineering thinking and innovative practical ability of engineering students. Civil engineering construction course is an important professional basic course, which summarizes the construction technology of all kinds of projects and mainly studies construction technology and construction organization. The traditional teaching model cannot effectively adapt to the curriculum, which will lead to students' lack of practical ability, lack of interest and other problems. Starting with the educational concept of "New engineering education", this paper analyzes the problems of traditional teaching of civil engineering construction course, and puts forward the teaching measures. The teaching measures proposed in this paper can be used as a reference for teachers of relevant majors and courses in various ordinary universities and vocational colleges.

1. Introduction

The construction of new engineering course is an important action plan to deepen the reform of engineering education in order to meet the challenges of new economy and new business form, serve the national strategy, meet the needs of industry and face the future development. The construction of new engineering courses has become the focus of higher engineering education [1]. Guangming daily reports on the new location of new engineering and analyzes the necessity of speeding up the construction and development of new engineering in Chinese universities [2]. On the one hand, we should take the initiative to set up and develop a number of new engineering specialties, on the other hand, we need to promote the reform and innovation of existing engineering specialties. The construction and development of new engineering courses should be based on the background of new economy and new industry, set up the "New concept" of innovative, comprehensive and full-cycle engineering education, and construct a new disciplinary and professional structure combining new engineering courses with traditional engineering courses, to explore a "New model" of engineering education, to create a "New quality" of engineering education with international competitiveness, and to establish a "New system" of engineering education with Chinese characteristics, from engineering education power to engineering education power [3].

Civil engineering specialty is one of the representatives of traditional engineering specialty, and its traditional structure and design are facing great challenges in the new round of scientific and technological revolution and industrial revolution. From the perspective of the development of the construction industry, architectural design visualization, production factoryization, construction assembly, management informatization and application intelligentization are in line with the basic characteristics of "new ideas and new ways" proposed by the new engineering, and have become an important direction for the future development of the specialty, especially for the civil engineering specialty in application-oriented universities [4-5]. Therefore, in order to realize the transformation and upgrading of civil engineering specialty in application-oriented universities, it is urgent and feasible to carry out the research and practice of civil engineering talent training scheme and

training mode of “new engineering” oriented to construction industrialization and intelligence, which is of great significance to cultivate new intelligent building talents needed by future construction industry. The above research and innovation are inseparable from the innovation of civil engineering construction technology, in the undergraduate course system of civil engineering specialty, civil engineering construction course is an important professional basic course, which summarizes the construction technology of all kinds of projects and mainly studies construction technology and construction organization [6-7]. At the same time, the course involves mechanics, concrete structure, building materials, soil mechanics and basic engineering, management and other basic course knowledge, with a strong comprehensive and practical. The traditional teaching mode has some disadvantages, such as the teaching effect of teachers is poor, it is difficult to meet the needs of technology and technology of the day and the new moon, and students can’t achieve the training goal of “new engineering”. Therefore, based on the teaching background of NingboTech University, the author combs the problems existing in the civil engineering construction course at the present stage. And further puts forward the teaching reform measures to meet the training requirements of “new engineering”.

2. The Problems of Traditional Teaching Scheme

There are some problems in the traditional civil engineering construction teaching course, which also restricts the development of students' innovation ability, and it is difficult to meet the training goal of “new engineering” talents. Taking the learning situation of students in NingboTech University as an example, the author uses the textbook Civil Engineering Construction [8] published by China Construction Industry Press to introduce the existing problems and improvement methods in the teaching process in detail.

2.1 Traditional Teaching Methods

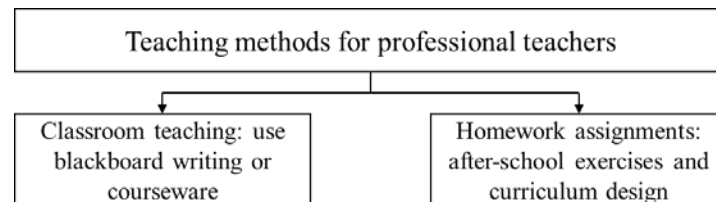


Fig.1 Traditional Teacher Teaching Methods

The cultivation of the practical ability not only comes from the practice, but also should be involved in the traditional and theoretical classroom [9]. Fig.1 shows the traditional classroom teaching method of teacher theory. It can be seen that the way of teaching is relatively simple, and students can not get an intuitive learning experience. For example, students are more passive to understand the installation and removal of scaffolding process, and through the arrangement of calculation books and simple questions to assess the way. Taking the civil engineering students of Grade 2016 of NingboTech University as an example, professional teachers have arranged a number of course designs, such as reinforced concrete frame structure support formwork design, fastener scaffolding design, single-story industrial factory structure hoisting organization design and so on. Although students can achieve good results and have good theoretical knowledge, their mastery of practical case analysis or practical knowledge of the corresponding engineering is still weak. Therefore, it is difficult to effectively cultivate compound “new engineering” talents with strong engineering practice ability and strong innovation ability.

2.2 Teaching Content

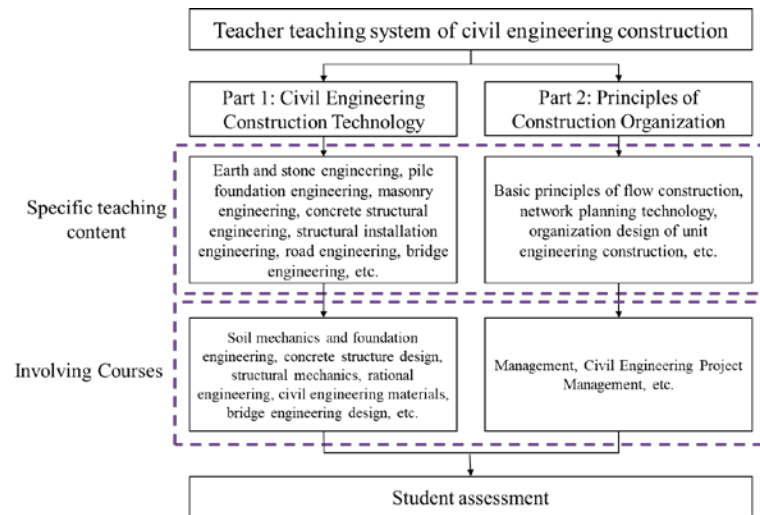


Fig.2 Teaching System for Civil Engineering Construction Teachers

Fig.2 shows the teaching system of the civil engineering construction course, which covers 11 chapters including basic engineering, concrete engineering, road and bridge engineering, masonry engineering, etc., the construction technology and construction organization includes 5 chapters, such as flow construction, network plan, etc. There are many problems in the course, such as wide coverage and various contents, which make the students' learning more difficult [10].

On the other hand, civil engineering construction courses usually organize each chapter in the Order of the construction of the project, and each chapter mainly introduces the construction techniques and methods of this section in the form of sub-projects and sub-projects, taking earthwork as an example, this chapter only deals with the determination of site elevation, earthwork allocation, earthwork transport machinery, earthwork compaction, foundation pit support, excavation and precipitation, these points of knowledge are self-contained and have no connection with other chapters [11], it is difficult to meet the training requirements of "New engineering" for students.

2.3 The Weakness of Teachers' Engineering Practice Ability

The comprehensive quality and practice field of professional teachers play an important role in the teaching of civil engineering construction courses. At present, there are about 580,000 full-time engineering teachers in China, and the ratio of teachers to students is about 1/17 [12-13]. Most of the young teachers are graduate students with master's degree or doctor's degree. They are good at research and have little experience in engineering. This makes it difficult for young teachers to integrate into the thinking system of engineering practice efficiently, to train students with the times, and to meet the requirements of the training plan of civil engineering specialty. The practice site is the basis of training students' practical ability, and the necessary practice site can meet the needs of "new engineering" education [14]. The engineering practice ability of professional teachers and the venue have indeed become two important reasons that restrict the training of students under the requirements of "new engineering".

As a course with more practical knowledge, civil engineering construction has more than 40 key points of engineering operation only in the part of civil engineering construction technology, which has higher requirements for professional teachers' engineering practice ability and practice site. At present, domestic colleges and universities pay more attention to theoretical teaching and carry out "spoon-feeding" teaching for students [15].

3. Measures of Civil Engineering Construction Course

At present, there are many problems in the teaching process of civil engineering construction, which seriously restrict the cultivation of "new engineering" professionals. This paper puts forward the corresponding teaching reform measures for the civil engineering construction course in

3.1 Optimize the Teaching Contents

The professional teachers should reform the traditional teaching methods, expand the corresponding contents according to different chapters, expand the students' vision, and lay a foundation for realizing the training goal of "New engineering". The professional teachers should reform the traditional teaching methods, expand the corresponding contents according to different chapters, expand the students' vision, and lay a foundation for realizing the training goal of "New engineering". The teacher should adjust the teaching mode, the traditional teaching mode can only explain the relevant knowledge through limited time. The teacher should transform the classroom main body into the student, and combine the multi-media teaching method effectively. Through the introduction of the latest engineering cases to stimulate students' interest, select classical engineering construction technology, construction machinery photos, construction video, project organization flow chart, bidding contract and so on to deepen students' understanding of some chapters and stimulate students' interest in learning. In the process of evaluating students, join the link of student report. Table 1 shows the contents of the students' PPT presentation in the civil engineering construction chapters. Teachers can divide the students into several study groups and conduct case studies or new process introduction reports before each lecture. Further improve students' interest in autonomous learning and the ability of engineering case analysis to meet the training requirements of "new engineering". Many domestic scholars have also reformed the classroom teaching of civil engineering construction theory by selecting new teaching materials, compiling learning handouts in advance [16], adjusting class hours [17], and further improved the classroom efficiency.

Table 1 Corresponding Chapters Of Civil Engineering Construction and Student Courseware Production Table (Partial)

Course Chapter	Study group report content
Chapter 1: Earthwork Engineering	Concept of machinery and equipment required for site leveling and excavation of foundation pits
Chapter 2: Pile and Foundation Engineering	Types and uses of piles
Chapter 3: Masonry Engineering	Examples of new masonry materials and processes
Chapter 4: Concrete Structure Engineering	Examples and uses of new concrete materials
Chapter 9: Scaffolding Engineering	Types of scaffolding and case analysis of collapse accidents
Appendix	Reinforcement anchoring optimization, concrete protection layer action

3.2 Improve the Practical Level of Teachers

The talents trained in the new engineering course have higher engineering practice ability. The traditional theory-based teaching restricts the development of students. It also puts forward higher requirements for the engineering practice of professional teachers. For civil engineering construction courses, NingboTech University prioritizes teachers with engineering experience, at the same time, teachers should be encouraged to study regularly or irregularly in the school or off-campus practice base, to experience the concrete construction, supervision, design links, and to increase the ability of engineering practice. At the school level, teachers are encouraged and supported to adjust the direction of scientific research, to balance the vertical issues of theoretical research, applied basic theoretical research and the horizontal issues of solving practical engineering problems, we can not blindly pursue the quality of scientific research and ignore the quality and significance of scientific research. Among them, the research of new technology and new technology can be combined with daily teaching to improve students' practical ability [18].

3.3 A Variety of Ways to Optimize Students' Practical Learning

Civil engineering construction is a course with more practical knowledge. On the basis of theoretical classroom teaching and the reform of professional teachers, various ways should be

adopted to optimize students' practical activities. First of all, on the basis of the “double-teacher” cooperation platform, the college actively carries out the contact of the practice base and organizes the students' on-the-spot observation. Yu Q Z [19] also found that simple theoretical teaching can't enable students to master knowledge effectively. NingboTech University organized students of grade 2017 and 2018 to carry out on-site practice teaching activities, and let students know the knowledge of civil engineering construction in advance through holiday production practice. Taking the chapter of pile foundation engineering as an example, in the process of leading students to visit, professional teachers focus on the construction process of cast-in-place pile, the manufacture of pile reinforcement skeleton, pile detection and other knowledge.

In the follow-up teaching activities, professional teachers will combine BIM and VR technology, digital information technology into the civil engineering construction curriculum system. In the early stage of each class, through the play of live engineering video, stimulate students' interest in learning, building perceptual knowledge. The content of the video mainly involves the construction scene, geological conditions, engineering survey, construction quality control and so on. Generally speaking, the development of civil engineering construction courses can be promoted by various means, which enables students to interact with construction operations on campus by various means such as sight, hearing and touch, to solve the problem of traditional teaching of civil engineering construction theory to imparting practical knowledge. Mainland scholars such as Lu H Y [20] and Yuan J [21] have used the above techniques to reform the teaching of civil engineering construction courses, and have received good feedback from students.

4. Conclusion

The course of civil engineering construction is a civil engineering professional course with strong practicality, complex knowledge system and small correlation between chapters. It is difficult to stimulate students' learning interest and engineering practice ability by using the traditional teaching mode. It cannot meet the training requirements of “new engineering” and the needs of employers. In the process of teaching, teachers are required not only to have a high level of theoretical knowledge, but also to have engineering practice experience. In the modern education and teaching system, how to cultivate students and give full play to their enthusiasm as much as possible is the focus of the reform. In order to train more “new engineering education” professional practical talents, the teaching of civil engineering construction must be reformed from many aspects, such as optimizing teaching mode, improving teachers' practical level, introducing new technology and so on, so as to improve the teaching quality of the course.

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