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Teaching reform of foundation engineering in applied universities based on emerging engineering education

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Abstract: Foundation engineering is an important professional course in the undergraduate course system of civil engineering major. Compared with other civil engineering major courses, the course of foundation engineering has its particularity, and the reform of this course is also of great significance. Based on emerging engineering education, the reform for teaching and practice of foundation engineering course in civil engineering major of Applied University is discussed. Some suggestions are proposed on the reform of traditional teaching contents, the setting of courses and the construction of practice bases. The evaluation system of teaching quality is also proposed in this paper.

1. Introduction

In the process of building an innovation-oriented country of China, engineering technology is an important internal driving factor. Higher education is an important link in the development of engineering technology. A new round of industrial reform has provided opportunities and higher requirements for engineering education in China. In order to enhance the competitiveness of engineering and technical personnel, China must strive to become a powerful country in engineering education and train a large number of high-quality engineering technical personnel.

Foundation engineering is an important professional basic course of civil engineering major. The majors of structural engineering and bridge engineering under civil engineering of Ningbo Institute of Technology, Zhejiang University involve foundation engineering course. Foundation engineering is the lower structure of civil engineering. The qualities of site investigation, foundation treatment and design are directly related to safety of people's lives and property, and also directly affect the safety and performance of the superstructure. It is of great significance to study this course comprehensively for future practice in civil engineering construction. Foundation engineering mainly studies the deformation and stability problems caused by the interaction between soil and the underground structure, which involves scattered knowledge and numerous calculation theories. As a result, it is difficult to master the basic principles of this course, and it is puzzled for students to carry out work when they encounter relevant engineering problems, and also restricts students to combine theory with practical engineering.

It is a necessary process to explore the reform of training methods for engineering technical personnel to meet the needs of social and technological developments. Foundation engineering is an important course of civil engineering major, and this course has a high demand for practical ability of students. Therefore, a new teaching mode must be sought to ensure the training goal of engineers and technicians adapted to the development of science and technology. This paper points out the



differences between the traditional teaching mode and the emerging engineering education mode for foundation engineering course. The purpose of this paper is to combine the concept of emerging engineering education (vigorous development of new economy characterized by new technology, new format and new industry) with the goal of cultivating innovative ability and application ability of new technology for students in Ningbo Institute of Technology, Zhejiang University. In this paper, several suggestions are also proposed for the reform of traditional teaching mode and thinking.

2. Necessity of foundation engineering teaching reform

Taking the training goal of civil engineering major in Ningbo Institute of Technology, Zhejiang University under the background of emerging engineering education as an example, this paper expounds the necessity of the reform for foundation engineering course. Emerging engineering education is characterized by new technology, new format and new industry, and it requires engineering technical personnel to have innovation ability and application ability of new technology.

With the continuous improvement of new architecture and mechanization, new foundation types are emerging. Traditional foundation engineering course mainly consists of the common shallow foundation, continuous foundation, deep foundation, foundation treatment and pile foundation engineering. With development of new construction technology, new foundation types, such as static drill rooted pile, ribbed bamboo joint pile, energy pile and other emerging new foundations, are widely used. In traditional curriculum teaching, these new types of foundations and related contents are not contained, and the relevant calculation theory has not appeared in the traditional foundation engineering course. Due to the traditional foundation engineering course has lagged behind the engineering practice under the background of emerging engineering education, it is urgent to reform the foundation engineering courses, to meet the needs of scientific and technological progress and social development.

3. Reform of foundation engineering teaching and practice

Around the concept of emerging engineering education, we need to improve the traditional training mode and curriculum system for engineering and technical personnel, and train innovative engineering and technical personnel to meet the needs of scientific and technological and economic development. In line with the characteristics of personnel training with strong professional knowledge, work steadfastly, innovative ability and strong practical ability, the concept of emerging engineering education is integrated into innovative education, focusing on training high-quality applied civil engineering professionals with innovative spirit, practical ability and international vision.

Based on the emerging engineering education model, the author discusses the reform of foundation engineering course in civil engineering major, combined with the implementation of comprehensive reform of civil engineering major in Ningbo Institute of Technology, Zhejiang University.

3.1 Reform of teaching content

The teaching contents should be reformed with the goal of training innovative and applied ability engineering technical personnel. Under the background of emerging engineering education, students with strong innovative ability are required to meet the need of future work. The teaching of foundation engineering course should take into account the new features, new standards, new trends and new normal conditions of the development of higher engineering education at home and abroad. According to the requirements of seeking innovation, emphasizing practice and strengthening ability for personnel training, the teaching process should pay attention to absorbing the latest theories and achievements in the field of civil engineering and enrich the contents of this course. The teaching content should be formed a unique course teaching system, increasing the relevant content of new foundation types. Students should be trained with innovative ability and application ability of new technology.

3.2 Improvement of practice teaching base

Under the background of emerging engineering education, students should be trained with strong practical ability. The ultimate goal of foundation engineering course is to cultivate and improve application ability of students. Students should combine theory with practice, analyze and solve practical problems with learned knowledge. Students in Applied Universities also should be trained with strong application ability of new technique in civil engineering field and lay a solid theoretical basis for better serving the society in the future.

Practice teaching is the most important link to cultivate practical ability of students. Studying on the spot can deepen understanding of foundation engineering and make students understand more intuitively and impressively. Actively responding to the spirit of "Notice of the Department of Higher Education of the Ministry of Education on the Development of New Research and Practice", we can establish teaching practice bases with Ningbo Construction Co., Ltd., Ningbo Institute of Civil Architectural Design Co., Ltd. and ZDOON Building Materials Group., to strengthen the understanding of new foundations for students.

We should carry out extracurricular scientific and technological innovation activities, create a strong academic atmosphere for scientific and technological innovation, and we also should set up a scientific and technological innovation fund project for college students, and cultivate innovative ability in an all-round way. Cooperation between university and enterprises in platform, talents and projects, can effectively shorten the distance between university personnel training and enterprise needs, guarantee that the innovation practice base will play the most effective role.

3.3 Reform of teaching methods

Teaching methods are the general terms of behavior adopted in teaching activities. Its intrinsic characteristics lie in the values of education, the restriction of teaching contents on methods and the influence and restriction of teaching organization on teaching methods. The reform of teaching methods is mainly carried out in the following two aspects.

One is to use heuristic teaching methods to stimulate interest of students in learning. Interest is one of the most critical factors for students to learn foundation engineering. To stimulate interest of students in learning and mobilize their initiative and enthusiasm in learning are the key factors to improve the quality of teaching. Teachers need to constantly improve their teaching quality, teaching level and try to stimulate interest of students in learning. When teaching the knowledge points of the course, the specific engineering background should be taken as an example to make the course scene. On the other hand, enlightening questions in the teaching process of foundation engineering can arouse students' thinking and concern and increase their enthusiasm for course learning.

Secondly, the interactive teaching mode can be adopted to increase the classroom atmosphere, so that students can discuss the relevant issues of course teaching content and teachers can guide them. Through the interaction between teachers and students in the course, we can not only activate the atmosphere, but also deepen understanding of the problem, and arouse initiative and enthusiasm of students in learning, so as to enhance interest of students in learning.

3.4 Improvement of teaching means

Course teachers of foundation engineering should pay more attention to the use of modern information technology means. In the teaching process, teachers should be good at using multimedia, and combine it with traditional blackboard teaching means. Appropriate use of network media, teaching video and other modern multimedia means, the use of a large number of colorful pictures, videos, etc., will explain the knowledge points vividly to students, enhancing interest of students in learning.

4. Teaching quality assessment system

The emerging engineering education mode is not only a teaching reform, but also an attempt to cultivate students in multidimensional training ways, and a practice of the new concept of talent cultivation. Therefore, diversified teaching quality evaluation system is essential. Teaching evaluation

is an important process of teaching work, and objective and fair teaching evaluation is the basic premise of improving teaching quality management system. The emerging engineering education mode cannot be separated from the teaching staff with innovative and practical abilities, and its teaching quality should be evaluated. To this end, it is necessary to establish a corresponding evaluation system for teaching and the teaching evaluation system should be carried out under the concept of emerging engineering education. In addition to evaluating teaching attitude, teaching content, teaching methods and teaching means, teaching quality assessment system should include evaluating about ability of teachers to cultivate innovative ability of students and new technology application ability.

5. Conclusions

Foundation engineering is a course closely combined with engineering practice, and it is an important professional course that develops with new theory, new technology and new technology. The concept of emerging engineering education is an inevitable requirement for higher engineering education to actively meet the need of the national innovation-driven development strategy and promote industrial transformation and upgrading. On the basis of defining the training objectives of civil engineering major under the background of emerging engineering education, teachers are required to design teaching contents pertinently, find out teaching methods suitable for foundation engineering courses, closely link theoretical knowledge with engineering practice, and cultivate first-class professionals with innovative and applied abilities of new techniques, especially for the applied universities.

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