Study on the continuing education innovative talents training mode of civil engineering major

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Abstract. According to the characteristics of civil engineering professional continuing education, continuing education of innovative talents training mode suitable for the characteristics of our school is put forward in this paper. The characteristics of the model include: the education of professional basic courses and specialized courses should be paid attention to; engineering training should be strengthened and engineering quality should be trained; the concept of large civil engineering should be highlighted, the specialized areas should be broadened, and the curriculum system should be reconstructed; the mechanism of personnel training program should be constructed by the employers, the domestic high-level institutions and our university. It is hoped that the new training model will promote the development of continuing education of civil engineering specialty in our university.

1. Introduction

In recent years, education reform which aims to cultivate innovative engineers, is taking place nationwide. With the rapid development of science and technology, economic globalization and information globalization, the demand standards for civil engineering major are changing accordingly. Knowledge is no longer the only measure of talent. What is more important is whether students have the ability to master new knowledge and the ability to innovate. Innovation is the soul of a nation and an inexhaustible motive force for the prosperity of a country, whereas the key to innovation lies in talents. Therefore, the cultivation of innovative talents has become a basic project of strategy of reinvigorating china through human resource development.

Continuing education in our country plays a very important role in personnel training, knowledge innovation, knowledge dissemination and the promotion of science and technology into the reality. Among them, it is the soul of continuing education to train high-quality and innovative talents. A series of studies on the training mode of civil engineering specialty have been carried out both at home and abroad. As early as 1870, the United States patent law reform brought the golden age of technological innovation. After the Second World War, the government of the United States expanded its support for industry and academic research rapidly, bringing about a large scale of government research and the rapid development of research universities. Civil engineering majors at universities such as the United States and Canada held national competitions for civil engineering majors. Through a series of competition, students are enabled to master the basic knowledge and professional knowledge and students' innovative ability is cultivated. In China, experts and scholars from the school of architectural engineering of China University of Mining and Technology have explored the training mode of high quality innovative civil engineering majors. The civil engineering major of Guangzhou University has been approved as a national specialty construction site and applied as a professional discipline construction in local colleges and universities. Then, according to the demand of Guangdong engineering construction, with reference to the training mode of civil engineering major...
in America, Germany and other countries, Guangzhou University has carried out reforms on the commonly adopted training pattern of specialized subjects.

Based on some advanced experience at home and abroad, factors that restrict the continuing education of creative talents in civil engineering, and the ways to train the innovative talents of civil engineering are studied in this paper.

2. The basis of continuing education innovative talents training mode of civil engineering major

Research on innovative talents training mode of continuing education of civil engineering major is in combination with the overall arrangement of curriculum construction in the comprehensive reform program (from 2016 to 2020) of Liaocheng University. Taking high-quality applied talents training goal as the core, education idea is comprehensively updated, and meanwhile teaching methods and teaching content reform are deepened. The objective of the course is unified with the training target of professional talents. Some aspects are included as follows.

(1) The proposed pattern is based on the training objectives and training requirements of the professional personnel training program. The curriculum standard takes full account of the role, status and requirements of the course in the program of professional personnel training. In the curriculum standard, the educational thoughts, educational requirements and educational objectives embodied in the training program for professional talents are carried out.

(2) Integration and optimization of curriculum content are strengthened. The instructor of each course should analyze the content of the course, the connection between talent training goal and Industry post. So the new developments and new knowledge of the subject are fully absorbed. By introducing professional qualification standards and industry standards, the rational selection of teaching materials and the content of the reconstructed teaching are organically unified. The integration and optimization between curriculums are strengthened.

(3) Curriculum design is strengthened. Curriculum features are highlighted in the curriculum design. The pertinence of the teaching target, the selectivity of the teaching content and the applicability of the teaching method are reflected. The establishment of student-cantered teaching mode, introduction of teachers and construction of online courses are encouraged. Mixed teaching mode reform reflecting combination of online and offline is proposed. The use of a variety of teaching methods is advocated.

(4) Curriculum assessment and evaluation methods are reformed. Based on the curriculum attributes and specialty characteristics, the curriculum assessment and evaluation methods are set up. The teaching evaluation system combining process evaluation and termination assessment is constructed.

3. Improving the training mode of continuing education talents of civil engineering major

In order to meet the needs of the rapid development of civil engineering construction in our country, aiming at the characteristics of continuing education, the major of civil engineering was established, and corresponding training plans were formulated. The curriculum is based on the general practice of continuing education for civil engineering majors at high level universities at home and abroad. That is to say, the course is composed of two parts: the specialized basic platform course and the specialized direction curriculum group. The characteristics of engineering education are highlighted. The civil engineering specialty has such characteristics as multi discipline, wide caliber, and comprehensive. The knowledge structure of civil engineers is further improved. The training mode of civil engineering continuing education has the following characteristics.

(1) The education of specialized basic courses and specialized courses has been paid attention to. The hours of basic courses and specialized courses for continuing education of civil engineering major accounted for 60% of the total hours. On the one hand, after the students learn the basic courses, they generally understand the basic knowledge of various fields of civil engineering. On the other hand, through the division of professional courses group practice, the teaching of professional basic courses and specialized courses is strengthened. So that students can understand and be familiar with the major problems that civil engineers may encounter.
(2) Engineering training is strengthened and engineering quality is trained. In addition to professional training such as the application of professional knowledge, non professional training in presentation, teamwork and self-confidence is also included. Through engineering training, students' modern engineering consciousness, engineering practice ability and engineering innovation ability are cultivated. Compared with the requirements of industry, engineering training of civil engineering students in China is generally inadequate, and the quality of the project needs to be improved. To this end, the requirements of students' engineering training in the training program are raised. 1) Some special discussion courses are planed to set up. Students' literature access ability, professional reporting, writing and presentation skills, language skills, cooperative awareness and debate ability are improved in discussion courses. 2) In order to improve the students' ability to make use of the existing knowledge, the time of graduation design is extended to 14 weeks. 3) In the practical course, all kinds of comprehensive homework or design are arranged to increase the students' ability of engineering application and comprehensive ability. Cognitive practice, measurement practice and other practical links are arranged in the "professional foundation platform curriculum" stage. Curriculum design, production practice and other practical links are arranged in the "professional course group" stage. 4) On the basis of these routine engineering training, students are actively involved in the competition of structural design, CAD design competition, measurement contest and other subjects to train students' innovative spirit and practical ability.

(3) The concept of large civil engineering is highlighted and the curriculum system is reconstructed. Value orientation and standardization for application-oriented undergraduate course construction is found by construction of curriculum concept. Curriculum systems are turned from layers to mesh. Students are trained in the ability to understand and apply knowledge in a complex and uncertain environment. In the traditional training model, discipline differences and the rapidity of students' adaptation to jobs are emphasized too much, whereas the shaping of professional ideas and engineering quality is ignored. It is difficult for students to cross the gap between similar subjects. Therefore, in the civil engineering professional direction, the course system is reconstructed and the two disciplines are strengthened. Meanwhile, the difficulty of professional courses is reduced and similar courses and contents between the two different disciplines are shared to broaden the professional side and enhance students' social adaptability. History of civil engineering and the frontiers of civil engineering are added to enable students to gain a better understanding of the current situation and future trends of the major and related disciplines. There are 17 required courses (592 hours) after reform. On the one hand, the proportion, type of curriculum design and the teaching time are increased. Three curriculum designs such as curriculum design of housing architecture, concrete structure course design and basic engineering course design are arranged. Total teaching time is 8 weeks to correspond with professional courses. On the other hand, in order to reduce theoretical teaching hours, the classroom teaching is controlled in a reasonable range. The classroom teaching skills courses such as the professional foreign language, computer culture foundation, engineering drawing course are abolished to encourage students to self-study. Through these measures, the practical ability, team cooperation ability and interpersonal communication ability of students are trained.

(4) The mechanism of making plans for personnel training by employers, institutions of higher learning and schools in our country has been put forward. On the one hand, through contact with large and medium-sized construction, design and supervision units in Shandong Province, the requirement of knowledge, ability and quality of professionals in Shandong civil engineering field has been comprehensively and systematically mastered. On the other hand, through the investigation and study of the talent training program of fraternal colleges and universities, the existing problems of talent training program and curriculum system of civil engineering major are clearly defined. Subsequently, professional construction expert group is established. The professional construction expert group consists of three engineers of large construction design units, three professors of civil engineering from our university, and two professors of civil engineering from other university. The rationality of
the personnel training program and the scientific nature of curriculum system is examined by the group.

4. Conclusions
The preliminary model of training engineering innovative talents is put forward in this paper. Effects of the experiment show that it is feasible and necessary to train innovative talents in engineering adult education. Adult education students, however, are less qualified in basic knowledge, depth and breadth than full time students. Also, learning environment and conditions have great limitations. However, adult students are significantly better than full-time students in engineering practice and ability to solve practical engineering problems. They understand the process and background of the whole project, making it easier to capture the engineering innovation. In our country, every year tens of thousands of adults take part in continuing education, such as degree education and vocational qualification training. If scientific and effective methods of engineering education are adopted, a large number of engineering innovative talents are created. It can be seen that, the talent training mode reform of continuing education in civil engineering has just begun. The final effect needs to be checked by time and employers. Efforts should be made to ensure the smooth implementation of the training mode of civil engineering major in which the big civil engineering view and the application characteristics are highlighted.

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References
[1] Su Chun Hong . On the task of adult education and the frame of thought for reform [J]. China adult education, 2002, (1): 10-11. (in Chinese)
[2] Xun Yuan, Zhang Chen. The Model Of Adult Education In Learning Society [J]. Gansu Theory Research, 2001, (6) : 86-88.
[3] Li Dengling, Liu Wenjie. Preliminary study on the cultivation of innovative ability of engineering students [J]. Research in Higher Education, 2002 (5): 62-64. (in Chinese)
[4] Li Caijin, Wang Fuming. Innovation and development of continuing education in universities [J]. Chinese Adult Education, 2007, (3): 113-114. (in Chinese)
[5] Tao Yongfang, Shang Caihui, Cuihuahua. Exploration of innovation in higher engineering education [J]. China Higher Education, 2005 (1): 54-56. (in Chinese)
[6] Hu Fengying. Basic experience and Enlightenment of adult education development [J]. Vocational Education Newsletter, 2002, (2): 26-28. (in Chinese)
[7] Li ZhongGuo. Characteristics and Enlightenment of American Adult Education [J]. Vocational and Technical Education, 2001, 22(22): 53-55. (in Chinese)
[8] Jiang Daliang. Current goals and development direction of correspondence education in China [J]. Journal of Hunan City University, 2007, 28(5): 104-107. (in Chinese)
[9] Yan Zhiyong. Redefining the concept of continuing education from multiple perspectives [J]. Continuing Education Research, 2010, (2): 7-10. (in Chinese)
[10] Zhang Junping, Yu, Qicai, etc. Taking discipline construction as the leader and promoting the construction and exploration of Civil Engineering Specialty [J]. Research in Higher Education of Engineering, 2008 (2): 113-116. (in Chinese)
[11] Liu Xila. 21 century China Civil Engineering Education [J]. Education Research of Tsinghua University, 1998, (1): 95-100. (in Chinese)