An Attempt on the Civil Engineering Talent Cultivation Model for Western Applied Local Colleges and Universities Based on the Professional Certification

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Keywords: Professional accreditation, Practical, Civil engineering, Cultivating mode, Western local colleges.

Abstract. Based on the certification of civil engineering, the article takes Guizhou University of engineering science, an application-oriented university in western China, as the research object. Civil engineering talent training mode suitable for the local development in western China has been constructed on the basis of extensive research. Graduation requirements elaboration, curriculum system construction, internship and practical training and teaching staff construction are explained in detail. The research content in this paper is positive to the professional certification and talent training program of civil engineering for western application-oriented universities in China.

Introduction

Professional certification is a kind of professional certification carried out by professional certification institutions for professional education colleges and professional education plans. It is carried out by professional associations together with educators in this field to provide quality assurance for students entering the university education in the professional field [1,2]. In china, civil engineering professional certification is organized by the higher education civil engineering professional evaluation committee of the ministry of housing and urban-rural development. Since 1995, the start of professional certification, ninety-two schools have passed the engineering education certification for civil engineering major, which cover seventeen "985" universities and seventeen "211" universities in twenty-seven provinces, municipalities and autonomous regions, fifty-seven local universities and one military academy. Applied local undergraduate colleges is different from the "985" and "211" colleges in the aim of training students and employment direction in nature, therefore the implementation of civil engineering indicators and observation point in the assessment criteria system is not the same. The OBE educational philosophy of student centered, output oriented and continuous improvement must be carried out and the training scheme is constituted based on the indicators and observation point in standard system, which is helpful to pay special attention to the construction of civil engineering specialty and cultivate high-quality civil engineering professionals.

Guizhou University of engineering science is a newly-built local undergraduate college and the civil engineering of this college has been enrolled since 2012, which is a typical newly established major and three hundred and thirteen graduates have graduated in the past three years. Teachers of civil engineering college have made a lot of reforms and attempts for civil engineering major, which has promoted the construction of civil engineering major in our college. In this paper, based on the latest professional certification standards and national civil engineering professional standards, for the goal of the national professional certification, firmly grasping how to conduct civil engineering professional training in the local undergraduate colleges under the professional certification background of this problem.
Personnel Training Objectives

The talent training program should have open training objectives that are in line with the school's positioning and meet the needs of social and economic development. The training objectives can reflect the expected achievements of students in the social and professional fields about five years after graduation [3]. From the current proportion of civil engineering personnel structure, Guizhou Province points out the development direction and provides opportunities for the civil engineering industry. There is a big gap in the demand for civil engineering personnel and setting up civil engineering major also has great development prospect. Located in bijie city, Guizhou Province, Guizhou University of engineering science is positioned as an engineer serving the front-line production and management of local industrialization, urbanization, informatization and agricultural modernization. Civil engineering is to train students to meet the needs of socialist modernization and the development of local economy.

In order to develop training programs in line with market demand, the employment situation of graduates has been fully investigated in the three hundred and thirteen graduates. According to the regional survey of employment sectors, 41.03% in Bijie city, 35.9% in Guizhou Province and outside bijie city, 23.08% outside Guizhou Province, and 0% in foreign countries. It can be seen that the employment proportion of graduates in Bijie is the largest, which is 76.93% in Guizhou Province. From the nature of employment industry, engineering construction accounts 37.18%, engineering cost 11.54%, engineering design 7.69%, engineering supervision 2.56%, engineering surveying and mapping 2.56%, real estate management 6.41%, other industries 32.05%. From the survey data, the employment direction of graduates is mainly engaged in front-line engineering technology and management engineers. Therefore, according to the positioning of civil engineering major and the feedback of the job market, the goal of talent training is set, which is expressed below. Having a solid theoretical foundation and systematic professional knowledge of civil engineering, with civil engineering and related field construction technology, construction management, engineering test, engineering survey, the structure design of strong practical ability after the engineer's basic training, with the basic quality and ability to acquire and engage in the national registered construction engineer, structural engineer, supervision engineer and other professional qualifications after 5 years, as well as a good professional ethics, a certain degree of innovation ability and a team spirit of high-quality engineering and management personnel.

Graduation Requirements of OBE Education Philosophy

Graduation requirement is to show civil engineering major student should achieve the basic requirement after 4 year's university study. The graduate attribute profile in the Washington agreement is composed of a set of independent, evaluable graduate basic requirements, each of which represents the qualities and potential skills that must be possessed by the person receiving the education [4,5]. Graduation requirements should be able to support the achievement of training objectives, and fully cover the 12 indicators of civil engineering certification standards [3,6]. The civil engineering major is characterized by multiple disciplines, wide professional scope, strong comprehensiveness and high humanistic quality. In order to make the graduation requirements of the training program specific, accurate and operable, the employment direction of students must be defined and push graduation requirement backward from specific graduation obtain employment direction.

The survey data of the employment direction shows that the main direction of student employment is housing construction, road and bridge engineering and the Geotechnical and underground engineering, in which housing construction is 57.69%, Geotechnical and underground engineering accounted for 2.56%, roads and Bridges has 6.41% and 33.33% for other direction. Considering the career change, the number of the other direction in civil industry accounted for only 1.28%. Based on the requirements of employment in the three directions, 12 indicators of civil engineering certification standards are reversely mapped. 31 secondary indicators of graduation requirements are developed in the three directions, corresponding to 12 indicators of civil
engineering certification standards. The graduation requirements of the three directions of civil engineering 31 secondary indicators corresponding to the respective curriculum system. Indicators mentioned above are no longer detailed due to the length of the article.

**Modular Curriculum System**

The curriculum should support the achievement of graduation requirements, and the curriculum system should be designed with the participation of enterprise or industry experts [3,6]. In order to meet the export-oriented principle in the OBE training mode and enable our graduates to adapt to the needs of the industry, our school has conducted research on more than 20 companies through discussion, telephone communication and mail survey. According to the survey results, students' practical ability ranks first (51.3%), laziness (32.6), non-conformity (12.4%) and others (3.7%). Therefore the training of students' practical training courses is payed attention to when adjusting the training program. It is very necessary to establish the training direction conducive to the employment and development of students according to the background and characteristics of the school, which is not only related to the development of students, but also related to the qualification of civil engineering major and the development of the school.

The curriculum system adopts modular setting, including general education module, subject category module, professional course module, personality course module, innovation and entrepreneurship module and the second class module. The general education module focuses on the education of socialist core values, humanistic spirit and scientific spirit. The discipline module focuses on building a broad foundation of discipline knowledge, broadening the scope of knowledge, and laying a foundation for students' future academic development. It is open to all training directions in the civil engineering major. The professional course module is designed to cultivate students' solid professional knowledge, practical ability and innovative spirit. The personality course module is set up to embody the personality education. The innovation and entrepreneurship module aim to strengthen the cultivation of students' innovation and entrepreneurship practice ability, and train students' innovation thinking, innovation method and innovation ability. The second class refers to the activities and projects outside the first class to expand students' quality education, and is an important teaching field to cultivate students' innovation and entrepreneurship ability and social responsibility. The directional training of civil engineering is reflected in the professional modules, which are set in three directions: building construction, roads and Bridges, and geotechnical underground engineering. In order to guarantee students' practical education, there are practical courses corresponding to the theoretical courses of each compulsory course and elective course in the professional module.

**Reform of Practical Teaching System**

In order to cultivate students' practical ability and innovation ability, this paper constructs a practical teaching system with two modules: practical teaching and practical training. The module of practical teaching includes independent experiment and course design. The practical training module includes professional course practice, cognitive practice, production practice, graduation practice and graduation design, etc.

The traditional teaching mode of experimental course is attached to the theory teaching, which is a single teaching mode dominated by experimental teachers[2]. A large number of experiments focus on verification and lack of autonomy and innovation. In the new experimental course teaching, students are the center, and the teacher is responsible for assigning the experimental tasks. Students independently design the experimental scheme and operate the experiment by consulting the data. Students can consult the experimental instructor whenever they encounter problems in the experiment process. In each experimental course, students can set their own experimental objectives for the research frontier issues of the experimental course and complete the corresponding experiments independently. After the completion of each experiment, the teacher made comments on each experiment. In the process of experimental guidance, teachers should pay attention to
cultivate students’ autonomy and innovation, establish students’ basic scientific research ability, and exercise students’ ability to find problems, analyze problems and solve problems.

Curriculum design is an important part of the training for theory course, but the "water class" phenomenon is more serious in the course of teaching. The new teaching plan changes previous curriculum design pattern that multiple students or classes share the same design. At present, curriculum design must one person one design. For three consecutive years, students’ design questions cannot be repeated. In the process of teaching pay attention to the cultivation of the students process to collect and process data, fundamentally eliminate student plagiarism and the emergence of the "water class". In the teaching, attention should be paid to the cultivation of students’ process and the collection of process materials, so as to fundamentally eliminate students’ plagiarism and the appearance of "water class".

**Construction of Double-qualified Teachers**

Under the background of professional certification, higher requirements are put forward for the number, structure and professional background of teachers engaged in civil engineering teaching. The number of teachers can meet the teaching needs, the structure of teachers should be reasonable, and there are enterprises or industry experts as part-time teachers, the engineering background of teachers should meet the needs of professional teaching [3,6]. Teachers should not only have the teaching and research ability to meet the certification requirements, but also have the experience and ability to solve practical engineering problems. Teachers should not only have the professional title certificate, but also have the professional qualification certificate. Teachers should not only have the professional title certificate, but also have the professional qualification certificate. Teachers can’t only come from universities, but also come from enterprises or industries experts.

At present, most of the teachers are masters or doctors graduated from universities and have no engineering experience. In order to meet the requirements of professional certification of double-qualified teachers, the introduction of civil engineering teachers has the priority to introduce teachers with engineering background under the same conditions. Secondly, the college encourages teachers to take up temporary posts in enterprises or participate in enterprise projects. At the same time, the college also encourages teachers to participate in the civil engineering professional qualification certificate examination. During the examination, teachers should learn and be familiar with the current industry norms and policies, so as to make teaching and industry connection. Thirdly, while sending teachers out, the school also invites experts from enterprises and industries to students’ classes, including part-time teachers, cooperative guidance of practical teaching, lectures and seminars.

**Summary**

Professional evaluation is scientific, rational and forward-looking, and it is a sign of the qualification of the major. Civil engineering professional certification is an important index to measure the level of civil engineering education, which points out the direction for the development of civil engineering. Based on the evaluation of civil engineering and in line with the principle of promoting construction through evaluation, training objective has been formulated to meet the needs of local economic construction and development, which is training front-line engineering technology and management engineers. According to the market demand of the industry, the three training directions of housing construction, roads and Bridges, and geotechnical and underground engineering were determined, and a modular course system with different directions was established, so that students could choose their own training direction according to their interests and wishes. In the process of practical teaching, according to the student-centered principle, the practical teaching system of two modules, namely, practical teaching link and practical training, is constructed to cultivate students’ practical ability and innovative ability. In terms of teacher training, attention should be paid to the introduction and training of teachers with engineering background, and great efforts should be made to introduce enterprise and industry experts into the campus to
optimize the teacher structure and improve the overall professional level and practical ability of teachers.

Acknowledgement
This research was financially supported by the Educational Reform Foundation of Guizhou University of Engineering Science (2017JG028, 2018JG130), Joint Fund of science and technology department of Guizhou Province (LKB[2012] 11) and (LH [2015]7589).

References