

# Teaching discussion and reform on civil engineering graduate design trained by excellent engineer

Chen Tie, Ai Qinghua, Li Yuxue

<sup>1</sup>School of Civil Engineering, Shijiazhuang Tiedao University;

<sup>2</sup>Key Laboratory of Roads and Railway Engineering Safety Control of Ministry of Education;  
Beijing's Key Laboratory of Structural Wind Engineering and Urban Wind Environment.

**Keyword:** Excellent engineers; civil engineering; graduation;

**Abstract.** University of Engineering graduation project is completed successfully "Excellence Engineer" training program as well as a vital innovation ability of graduates reflect and challenging Practice. In this paper, based on "outstanding engineers education training plan" issued by the Ministry of Education focused mission requirements, combined with the author guide in Civil Engineering (bridge class) graduate design experiences, to design a common problem currently teaching graduate design exist to explore, and the corresponding the reform proposals designed to participate in the "outstanding engineers" Training of University plans to build Fostering innovation engineering education personnel to provide reference to further enhance engineering graduates innovation and practical ability.

## 1. Introduction

At present, China set up a Bachelor of Engineering reached more than 1,000 colleges and universities. Among them, the creation of civil engineering has more than 540 colleges and universities that, education has become a veritable civil power. In order to meet the strategic needs of the new era of economic development, the state cultivating innovative engineering talent program rose to the core of higher engineering education and to include long-term development of the National Reform Program.

In June 2010 the Ministry of Education launched the "outstanding engineers education training plan" (hereinafter referred to as the "Excellence Initiative"), which is to implement the "Long-term Education Reform and Development Plan (2010 to 2020)" and "Long-term Talent Development Plan (2010 to 2020), "a major reform projects, but also to promote a major move by the Chinese engineering education great country into engineering education power. "Excellence" has three characteristics: First, companies deeply involved in the training process, and second, the school according to common standards and industry standard culture engineering talent and the third is to strengthen the ability of students of engineering and innovation.

Graduation civil engineering undergraduate training program last important teaching is to achieve theoretical knowledge and practical application of the combination of the bridge. A good grasp of the design aspects of civil engineering graduate, improve the quality and efficiency of teaching practice is an effective way to achieve the training objectives of Excellence. In this paper, combined with his years of work experience, Civil Engineering Graduation Design of bridge engineering, for example, put forward some suggestions for improving the design of civil engineering graduate.

## 2. Civil Engineering Graduation Design Problems

### 2.1 Graduation single topic

In recent years, graduate design topics focused on engineering design, many of these topics are fake or duplicate title really made the subject of last year, a single issue. In terms of civil engineering undergraduate, able to read maps, read maps, have a certain construction design is a must master the basic skills, but the current employment situation, graduates from the project will

be more construction closer working relationship, a simple engineering design did not meet employer demand for talent.

## **2.2 Graduation too much content**

Design of civil engineering structures strong correlation to actual engineering design task as a graduation, and asked to complete within the stipulated design class for undergraduate students is far too onerous. Subject to continuous Girder bridge engineering design direction, for example, the completion of a bridge design is more complete design programs include mandatory programs, structural calculations, construction drawings and other processes. Graduation from the previous guidance process often encounter a lot of students did not complete the entire design done, but there are still many parts of the problem, such as checking substandard construction methods not considered comprehensive, and ultimately lead to reach graduation requirements.

## **2.3 Over-reliance on software design process**

Most students in the graduate design using professional design software, is in accordance with its own instance of the software to do, often models are made out of the same instance. Once no instance can refer to, in the calculation and design work will be a lot of difficulties, computing problems encountered are resolved; the students will stop not before, a lot of design time delay. Over-reliance on software design process for a lot of theories, principles and did not understand, designed outcomes and actual touch.

## **2.4 Over-reliance on the design process reference**

Students in the program, it tends not to do practical engineering and geological data to the selection, but according to his own design examples and reference books on hand, some students only on a simple example design reference dimensions do change once problems encountered in the application of professional knowledge needed to solve it at a loss. For example, the results support reaction is negative, I do not know what measures to take; load transverse distribution coefficient Girder not calculation.

## **2.5 Design Process favoritism**

Mechanical design is a very important part of the bridge design content; many students neglect to focus only on the structural design calculation. Construction drawings is not comprehensive, some necessary structure design does not, such as construction joints, drainage system construction, bridge deck structure and the like.

## **3. Graduation Modular System Design**

Architecture graduation project is composed of modules and their relationship to each other by the formation, change the function of each module objectives and implementation of the program will change the whole nature of graduate design and function, it will directly affect the quality of personnel training. Thus, architecture exploration and research for the graduation design: engineering production sector butt actual needs and achieve "Excellence Initiative" on the practice, and innovative training objectives is essential. The modular architecture of the main features is that the modules are independent, so the flexibility to design and organize module content to meet the students' overall development and personality to play the dual considerations. Civil engineering graduate design emphasizes the practical problems facing the project, highlighting the self-exploration, interactive discussions, and perfect design programs to improve the core areas. Thus, the modular system can stimulate students' self-awareness, to mobilize the initiative of student participation, strengthen the interaction between teachers and students, and improve teaching quality. Teachers can take concentrated explain, guide students to actively study, mutual learning and analysis, discussion and research questions, thereby forming students consciously learn, freedom to explore, teacher-student interaction, peer support healthy atmosphere.

Civil engineering graduate design is based on the project for the study, learn to use and access to knowledge, to identify and collect valid data, systematic analysis of the problem, selection of effective methods and techniques, come up with solutions to the problem projects and evaluation of the program and Compare. Through hands-on practice, students not only on the basis of the theory of a more profound understanding and mastery, the ability to solve practical problems is improved,

and showed good communication skills and innovation. For "outstanding engineers education training plan" of the graduation design in approximately by the following seven modules:

First, project profiles, teachers detailed project engineering background, research objectives, specific content and the expected results. When necessary, given research project ideas, lists the name of the project is closely related to the course as well as other important references.

Second, the task is arranged, in order to prevent adverse plagiarism graduation, a person should do a title. Teachers based on the actual project necessary changes and adjustments. Students can choose to study topics according to their interests.

Third, data acquisition, students need to independently find information on the project, collecting and collating work on this issue on the basis of a preliminary analysis of the study, and then put forward research ideas and vision.

Fourth, independent thinking, thinking about the study drawn up within the selected range of data further study, study, master the basic theory and key technology and methods.

Fifth, to examine the completion of all preparatory work, start related calculations, tests, graphics and other work and research projects. At the same time work, either the teacher's guidance, but also interact with other students, to explore, to facilitate the timely correction of errors during the study and vulnerabilities. For information on books and on controversial or unclear questions, teachers can arrange for students to go to the project site answering.

Sixth, the results will be compiled in the initial results of student research projects include integrated computing instructions, computer programs, drawings, etc., to enable teachers to reviewers. Students have any unresolved difficult to seek help of a teacher in a timely manner.

Seventh, project review and reply, complete research projects in all aspects of student and research reaches the preset target, the teacher or teachers organize the relevant professional and technical staff from the engineering frontline defense project review group, project studies submitted for all students results of analysis and evaluation (including research ideas, methods and means, to submit a research report) or the actual progress of the project on the future development and presentation and student exchanges, this part of the work for the student to flaws and shortcomings and to adapt to future work Requirements to play a positive role in guiding.

To encourage participation, stimulate interest and inspire thinking, encourage innovation, to be focus on the following points: 1, the design topics and practical project seeks to integrate, rather than arranged an exercise; 2, students propose solutions to problems in the design process ideas and programs, teachers should be carefully considered, we cannot choose to suppress, they cannot turn a blind eye, but should actively guide students through their own efforts to solve problems, gain knowledge and skills.

#### **4. Optimization of organizational form Graduation**

People "Excellent engineer education training plan" should be to foster the kind of university has made clear that, as a graduate design talent training plan to achieve the end of the chain, its importance is evident. Graduation modular design optimization of organizational forms to do the following tasks:

First of all, in particular the importance of appropriate and comprehensive knowledge of the layout. To achieve the core values graduation must attach great importance to a comprehensive and rational layout of the knowledge points. Among them, the comprehensive knowledge layout mean it reflects the basic structure of the discipline reflects the overall quality of students' knowledge of the requirements for the comprehensive development and taking into account the intrinsic link between knowledge and relevance. Rationality knowledge layout means the basic knowledge should meet the needs of practical engineering ability and quality of "excellent engineer" professional development. Also, pay attention to the different subjects of mutual penetration of knowledge, updating integration and use of knowledge, to achieve overall optimization graduate design architecture, promote comprehensive, coordinated development of the students the basic knowledge, ability and quality.

Secondly, the capacity-building throughout the graduation design process. As previously

mentioned, "Excellence" for excellence in a variety of capacity-building engineer a clear goal. Therefore, in the interior design of the system to cultivate the ability to graduate as one of the important goals to implement. Ability originated in the active participation of students, and student participation depends on the curiosity and enthusiasm, curiosity about the unknown and believes that they achieve results achievement. In order to exercise the student's ability to play through the following ways Graduation function: After the completion of the general student teacher in project tasks, timely add free space to play with a sub-topic. Such title is an effective way to exercise the knowledge students have learned and integrated use of a variety of ability. Completed projects require students to think independently and to obtain relevant information, develop his ability to work independently and research; after the formation of basic research ideas, need to take the initiative in seeking solutions to practical problems, capacity he hands to solve the problem; of course, If the study found more efficient and simple solution to the problem, then the student's innovation ability has been improved. In addition, research projects, teachers can often in the form of project workshops to facilitate communication between teachers and students as well as students, students self-expression, listening and communication skills.

Finally, we cannot ignore the role of field practice. To the project site training is an important part of the graduation project. You can go on-site training: first, to meet the need of each student interest, beneficial character development; second, content, form, timing and other flexible; third, students have full autonomy, you can choose to participate according to their own ideas ; fourth, direct hands. Field practice is an important measure "excellent engineer" training. Students through on-site training can make up for classroom learning deficiencies, make good use of the opportunity to customize the site to learn to choose their own direction, to improve their ability in practice.

## 5. Conclusion

Through civil engineering graduate design students faster and more fluent in the whole process of bridge design and design methods, and lay a solid foundation for future work faster adaptation. In full consideration of students 'employment and social needs of the premise, should focus on the topics of design tasks, theory and reality; take the instructor and joint guidance of outside experts, to strengthen objective evaluation of efforts to improve students' level of computer applications and other measures to stimulate students' enthusiasm for learning and research. By graduation in all aspects of training to enable students to improve the overall capacity for the training of qualified professional and technical personnel of civil engineering construction services.

## Reference

- [1] Sun Qiang, Hu Yan. Innovation in Civil Engineering (excellent engineer) training model [J]. Xi'an University of Architecture & Technology: Social Sciences, 2012,31 (S):6-9.
- [2] Fu Xudong, Turnout Xu Lihua, etc. Engineers Civil Engineering Excellence Training Program Research and Practice [J]. Journal of Architectural Education: 2014,23 (3):17-21.
- [3] Lin Jian. "Excellent engineer education training plan" common standards developed [J]. Higher Engineering Education Research, 2010 (4):21-29.
- [4] Lin Jian. Innovative engineering training model focused on the essence of excellence in engineering education [J]. Chinese higher education, 2011(6):19-21.