Teaching Reform and Exploration of Graduation Design for Civil Engineering

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Abstract. The civil engineering graduation design is an important indicator to measure the quality of professional teaching and assess the comprehensive ability of students. Taking the civil engineering major of Haikou University of Economics as an example, using research and statistical analysis methods, the status analysis of the civil engineering graduation design was carried out, the specific problems in the practice process were exposed, and effective improvement measures were put forward. The graduation design teaching provides a certain reference for the civil engineering major of private universities.

1. Research Significance
The graduation design of civil engineering major is the most important comprehensive practical teaching link, and it is also one of the important indicators to measure the quality of professional teaching. It aims to deepen students' understanding of professional knowledge, and cultivate and exercise students' comprehensive abilities in architectural drawing, structural calculation, computer application, and literature review, and improve students' ability to analyze and solve problems which lay a good foundation for going to work. Therefore, how to effectively improve the quality of students' graduation design and practically improve the engineering practice ability of students in private universities with the goal of cultivating applied talents is an important topic of great practical significance. At present, there are many domestic research results on the reform of graduation design teaching for civil engineering majors[1-5], but there are many problems exposed and few effective measures are actually implemented. This article will combine the civil engineering major of Haikou University of Economics to summarize and analyze the specific problems encountered in the graduation design in recent years, and propose interdependent countermeasures.

2. Existing Problems

2.1. Single Topic Selection
Judging from the graduation design of Haikou University of Economics in recent years, most are structural design, with a small amount of construction group design. Usually the students are assigned to instructors in groups, and the instructors make their own topics. The topics are generally the design of reinforced concrete frame structures such as hotels, teaching buildings, office buildings, residential buildings, shopping malls, and libraries, with a single structure.
Taking the 2016 civil engineering major of Haikou University of Economics as an example, there are a total of 320 graduates. Their employment directions include engineering and technical personnel, business and service personnel, other professional and technical personnel, and unemployed personnel. The employment distribution is shown in Figure 1. Engineering and technical personnel include constructors, file clerk, material clerk, cost clerk, quality inspector, supervisor, surveyor, designer, etc., and building structure designers only account for 1.56%. Obviously, there is a gap between students’ graduation design and employment needs.

![Figure 1. Employment Distribution of the 2016 Civil Engineering Graduates](image1)

2.2. Lax Process Management

Most of our graduates work in construction units, and many students think that they will not design in the future, so they do not pay enough attention to this important practical teaching link. Many students usually have low learning enthusiasm, a weak foundation, and a poor understanding of some basic concepts. Therefore, the overall effect of the graduation design is not good. The distribution of the 2016 graduation design results is shown in Figure 2. More importantly, graduates are faced with employment pressure and take up a lot of time to participate in various job fairs. The time and energy devoted to graduation design is obviously insufficient. In addition, the instructor does not strictly supervise students, and it often happens that students are not in school, resulting in the slow progress of the graduation design, low quality, and even plagiarism.

![Figure 2. The Distribution of the 2016 Graduation Design results](image2)

2.3. More Design Content

Take structural design as an example (the following are the same). The design content includes two parts: architectural design and structural design. The structural design involves theoretically strong...
course calculations such as engineering mechanics, structural seismic resistance, concrete principle and design, and foundation engineering. It is indeed difficult for poor students to complete the graduation design. The structure design block diagram is shown in Figure 3.

![Figure 3. Block Diagram of Structural Design](image)

### 2.4. Unreasonable Assessment Method

At this stage, the graduation design score is composed of three parts: evaluation score, instructor score, and defense score, each accounting for 30%, 30% and 40%. Without knowing the students’ learning situation during the entire graduation design period, it is difficult for the defense teacher to have an overall grasp of the students’ design results in a short period of time, and it is easy to have unreasonable score, and even individual students may plagiarize and pass the test.

### 3. Improvement Measures

#### 3.1. Database Construction

In order to strengthen the purpose of the graduation design, the topic selection of the graduation design should be consistent with the level of development in the field of civil engineering, and should be combined with actual engineering as much as possible. According to the employment needs of students, in addition to structural design topics, additional topics such as Construction organization design, budget, BIM, surveying can be added. More importantly, we have actively carried out the construction of the graduation design database, and checked the repetition of the graduation design submitted by the students. The repetition rate meets the requirements before the reply is allowed, which is beneficial to avoid the situation of plagiarism, and assist teachers to carry out graduation design guidance.
3.2. Teaching Staff Construction

In order to improve the engineering practice ability of instructors, we have set up a mechanism to carry out corporate social practice in the summer, so that instructors can continuously update actual engineering knowledge and increase engineering practice experience.

We have also hired first-line engineers with high theoretical level and strong engineering practice as part-time instructors to enrich the teaching staff. In addition, a special graduation design teaching reform team was established, and teaching seminars were held regularly to put forward some new ideas for the implementation of graduation design.

3.3. Whole Process Management

In order to allow students to understand and familiarize themselves with the content of the graduation design as soon as possible, it is necessary to organize an excellent graduation design exhibition in the seventh semester, and hold a graduation design mobilization meeting at the same time to announce the graduation design topic for students to choose, schedule, assessment method, and defense time and other matters. For meeting the needs of the market, the design content is mainly computerized and hand-calculated as a supplement, making full use of structural mechanics solvers, PKPM, EXCEL and other software to assist structural calculations. In terms of graduation design guidance, the mode of large-class unified guidance is adopted. Each instructor is responsible for a sub-project of the large-class guidance. The specific arrangements are shown in Table 1. To achieve full-process management, the graduation design should focus on controlling the opening report, mid-term inspection, and defense. In addition, in order to strengthen the supervision of students during the graduation design period, strict leave and attendance systems are required to promptly detect violations of discipline and provide criticism and education.

| No. | Content                | Implementation Weeks | Weeks | No. | Content                | Implementation Weeks |
|-----|------------------------|----------------------|-------|-----|------------------------|----------------------|
| 1   | Mobilization Meeting   | 1                    | 8     | 8   | Reinforcement Calculation | 1                    |
| 2   | Opening Report         | 1                    | 9     | 9   | Slab Calculation        | 1                    |
| 3   | Architectural Design   | 2                    | 10    | 10  | Stair Calculation       | 1                    |
| 4   | Section Estimation     | 1                    | 11    | 11  | Foundation Calculation | 1                    |
| 5   | Load Calculation       | 1                    | 12    | 12  | Construction Drawing    | 2                    |
| 6   | Internal Force Calculation | 2                  | 13    | 13  | Graduation Defense     | 1                    |
| 7   | Internal Force Combination | 1              | 14    | 14  | Total                  | 16                   |

3.4. Optimize Assessment Method

The graduation design score can be composed of four parts: usual score, evaluation score, instructor score and defense score, each accounting for 10%, 30%, 30% and 30%, with detailed scoring index. The results of the defense will be comprehensively evaluated by the defense team based on the quality of the graduation design and the situation of the defense. Each defense team will set up an external expert. For students whose graduation design is low quality and poor defense, they will be asked to modify within a time limit to participate in the second defense; and they will not be passed if the defense still fails to meet the requirements.
4. Conclusion
Through the whole process management of the graduation design of civil engineering, the graduation design tasks are arranged in advance, and the students select the graduation design topics in a targeted manner. During the implementation process, the key work is to control the opening report, mid-term inspection, and defense, and formulate a reasonable assessment method, to ensure that every student completes the graduation design on time and quality. It not only greatly promotes the improvement of the quality of graduation design, but also comprehensively improves students' engineering practice ability and strives to popularize and apply it in other professional graduation designs.

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