Civil Engineering Design Practice Competition in College Major Education

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Abstract. It is of positive significance for civil engineering major to develop engineering design practice competition with major courses to improve teaching quality and train students' vocational skills. The engineering design practice competition can stimulate the enthusiasm and motivation of college students, and enable them to have direct contact with design engineers and real practical engineering cases from the front line of engineering through participate the competition, so as to improve students' professional quality and drawing design skill.

1. Introduction

Building environment and energy application engineering major (one civil engineering major) education began to recruit students in North China University of Technology in 2007. As the traditional civil engineering majors, to achieve the goal of personnel training, just complete the courses learning in the program teaching and experimental teaching is not enough, still should organize competition activities to motivate students to learn a variety of disciplines, broaden students' horizons, train students' professional skills [1][2][3].

2. The necessity of design competition activities

Belongs to the building environment and energy application engineering undergraduate students mainly work in design institute and construction companies, preliminary engineering design ability has always been a basic skill required in the undergraduate stage of this major.

Relatively boring and rigid civil engineering design, emphasizing learning civil design regulations and norms, students are more interesting to make major invention and small product, not to design engineering [4][5].

For civil engineering majors, basic engineering design skills are one of the most important professional abilities, it is necessary to carry out engineering practice training activities (engineer design competitions, etc.) to train professional and technical engineer who really meet the job requirements of the engineering construction industry.

3. Design competition activity content setting

At present, there are many kinds of student competitions in colleges and universities, so it is necessary to carefully set up the competition links according to the particularity of design competitions [6][7][8][9]. At present, there are three main types of academic contests for college students in China:

1) Knowledge contests, which mainly based on written test or on-the-spot knowledge contests.
(2) Science and technology competitions, which use scientific and technological production or invention to select winners.

(3) Engineer design competitions, submit engineering design drawings and then appraise through comparison.

According to avoid occupying students' too much time, the engineering design practice competition will be applied more stages and more forms. At the same time, the competition content and questions should be more confrontational and interesting. The competition consists of the following sections:

(1) Engineering drawing design:
   Each team is required to submit the major curriculum design completed in each college for review. Such coincidence arrangement can effectively improve the completion quality of major curriculum design of each participating college, reduce the burden of competition student and save student’s time that spending on the competition.

(2) Test of professional basic knowledge:
   Multiple-choice written test of engineering thermodynamics, heat transfer, fluid mechanics, built Environment and other courses, and assessment of students' knowledge level of professional basic courses.

(3) Major drawing software operation:
   Software operation competition, it can assess students' mastery level of basic working software for future jobs, and increase on-site antagonism in the competition.

(4) On-site competition question answer:
   On-site competition for answers to major practical engineering questions, consisting of complex construction drawing identification questions, construction drawing error correction questions and engineering scheme demonstration questions, etc., it guides students to improve and enhance their learning of professional knowledge and skills in college.

(5) Fast design of major engineering:
   Fast design of major engineering is to let students test their true independent working level through the competition, recognize the shortcomings of their professional ability, and make clear their future career goal.

4. Competition Implementation effect

The above air conditioning design competition has been successfully carried out and achieved the expected purpose. Through competition activities, problems and deficiencies in classroom teaching work were also exposed:

(1) Poor performance in competition on major engineering questions, especially poor answers to construction drawing recognition and error correction questions, which indicates that students' major knowledge learning is not enough, and teachers' classroom teaching is not closely connected with actual projects.

(2) The performance of fast design is poor, which shows that students are not able to think independently and undertake engineering work independently. In school, major curriculum design is often conducted in groups, and the design is completed with the teacher's explanation and guidance. Accurately and on time is the training content that needs to be strengthened in classroom teaching.

5. Conclusion

The student competition activity has the positive auxiliary function to improve the classroom teaching quality, and to exercise the student's vocational skills. This type of competition can make students better meet the needs of engineering work. Teachers should make a careful summary of the shortcomings and problems exposed by students in the competition, and make timely improvement in classroom teaching.

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