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Exploration of Bridge Engineering Course Practice and Teaching Methods Based on Structure Design Contests

Xiangwei Hao, Jianxi Yang

School of Civil Engineering & Transportation , Northeast Forestry University, Harbin , Heilongjiang ,150040

Abstract: Bridge engineering is a compulsory course for civil engineering majors.Under the background of engineering education professional certification,how to enhance students'interest and ability in engineering practice in course teaching is a problem that needs to be considered at present.Taking the bridge structure design contests as the platform,the bridge engineering course teaching and structure design contests are combined to solve the problems existing in the current teaching process,which can stimulate students'interest in learning and make students take the initiative to learn.This paper mainly explores the course practice and teaching methods of bridge engineering based on structure design contests,summarizes the promotion effect of bridge structure design contests on course teaching,and points out the existing problems and solutions.This exploration of course practice and teaching method can provide reference for related course teaching.

Keywords: Bridge engineering;Structure Design contests;Practical teaching;Reform method

1. Introduction

Bridge engineering is a compulsory course for civil engineering majors.Under the background of Engineering Education Professional Certification,how to improve students'interest and ability in bridge engineering courses is a problem that needs to be considered at present.For bridge engineering courses,the following problems usually occur in the actual teaching process:(1) the combination of theory and practice is not enough.In the process of learning,students tend to only care about theory and ignore practical problems,and cannot apply theoretical knowledge to practical engineering.(2)Students'understanding for course theory is not deep enough,students only know what the teacher is talking about,but do not know why to say it,and do not know how to apply it;(3)Students do not pay enough attention to the experiment and cannot apply the knowledge learned in class to practical projects.In this regard,bridge structure design contests should be fully used in the course of teaching to stimulate students'learning interest and ability.At present,universities all over the country organize a number of bridge structure design contests every year.These contests are organized and carried out by colleges and universities.The contents of the contests involve many disciplines and are comprehensive and challenging to a certain extent.At the same time,these contests are often completed in the laboratory,which can closely combine the teaching process with the experiment.For example,2015 National College Students Structure Design Contest,2017 China College Students Engineering Science and Technology Contest,2018 National College Students Engineering Design Contest,2019 National College Students Structure Design Contest,etc.These contests are organized with the background of bridge engineering,which is comprehensive and challenging to a certain extent,and can effectively stimulate students'interest and enthusiasm in learning bridge engineering courses.In practice,through these contests,students can be familiar with and master the relevant knowledge and can apply them to practice.

2. The Current Situation of Practical Teaching of Bridge Engineering Courses

Bridge engineering is one of the most important professional courses in civil engineering major.It mainly studies the design,construction and maintenance of bridge structure,and cultivates students'ability to solve practical problems in bridge engineering.Under the background of professional certification of engineering education,schools begin to pay attention to the cultivation of students'practical ability and innovative ability.In the traditional teaching method,teachers mainly give lectures,and students passively receive knowledge,lack understanding and application of knowledge.However,during the teacher's explanation

process,it is easy to have the phenomenon of reciting the textbook,which is difficult to stimulate students'interest in learning.In addition,traditional teaching methods will make students feel boring in the process of learning,easy to produce weariness of learning emotions.Therefore,under the background of professional certification of engineering education,it is an inevitable trend to reform the teaching of bridge engineering.Based on the present teaching situation of bridge engineering and the characteristics of structure design contests,the paper explores some reform of bridge engineering teaching.

3. The Characteristics of Bridge Structure Design Contests

The structure design contests are contests in which students are the main body and the goal is to complete the design task,through which students independently design and make,and win awards in the contests.There are two main forms of structure design contests. One is the structure design contests organized at or above the provincial level.The second is the structure design contests organized by colleges and universities,such as"Tsinghua Cup"National College Student Structure Design Contest held by Tsinghua University and"Tongji Cup"National College Student Structure Design Contest held by Tongji University.The biggest difference is the software used in the contests.On the whole,the two use roughly the same software,but it is different that the software used in the specific design.

Bridge structure design contests are closely related to course teaching.Bridge engineering is a required professional course for civil engineering,and its importance is self-evident.In the professional certification of engineering education,higher requirements are put forward for students'engineering practice ability.The contests can improve students'interest and enthusiasm in bridge engineering knowledge and skills,stimulate students'participation in course learning and improve their learning ability.

Taking contests as the platform to carry out teaching cannot only combine teaching content with contests,but also improve students'learning interest and participation.By participating in structure design contests,students discover their shortcomings in practice and then summarize them during the process of contests,thus gaining valuable experience.This teaching method can improve students'enthusiasm and initiative in course learning and practical ability,and can mobilize students'enthusiasm in learning.At the same time,by participating in the structure design contests,students can broaden their horizons,exercise their thinking ability,analysis and problem-solving ability,and cultivate their teamwork spirit and innovation ability.

4. The Promoting Effect of Bridge Structure Design Contests on Teaching

The content of the bridge structure design contests mainly involves the bridge superstructure,the substructure,the calculation and analysis of the superstructure,and the construction of the structure.When explaining teaching content,teachers should combine theory and practice,combine teaching content with practical engineering,and enable students to deeply understand theoretical knowledge through bridges in practical engineering.

Through the combination of practice and theory,it can stimulate students'interest in learning.By learning the relevant knowledge of bridge structure design contests,students can have a systematic understanding of bridge design.In this process,students have a deep understanding of bridge design,which helps to enhance their interest in learning and practice.There will also be some difficulties and setbacks in the contests,if the students cannot face these problems correctly,it will affect their learning motivation.In this way,students can form a correct cognitive concept,and establish the qualities of courage to face difficulties,overcome difficulties,and perseverance. At the same time,it can also cultivate students'teamwork spirit and innovation ability.In the actual process of contests will also encounter some problems and setbacks that can promote them to solve the problem through practice.

5. The Existing Problems and Solutions

Through the combination of bridge structure design contests and course practice,the teaching effect of bridge engineering course has been significantly improved,but some problems have been found in the implementation process.Firstly,the enthusiasm of students to participate in the structure design contests is not high,and there are even students afraid to do the questions of structure design contests.It is mainly because in traditional teaching.Teachers do not guide students how to design a reasonable structure model,and students need to master this modeling method through a lot of practical training.Therefore,in the actual teaching,teachers should actively guide students to participate in the structure design contests.Teachers should guide students to participate in the structure design contests to exercise students'practical ability.Secondly,it is difficult that the questions of structure design contests. It is difficult to complete the teaching task in the limited class hours.At present,the teaching content of bridge engineering course is compiled according to the teachers'experience and teaching content for many years,and the practice of bridge engineering is mainly the theoretical analysis and practical calculation of bridge structure.In order to solve this problem,teachers can bring some difficult problems to class for explanation and analysis,and students can complete these problems in groups.The third is to put forward higher requirements for teachers.Teachers should actively participate in the course construction and improve their theoretical level and practical ability through participating in the course construction.

6. Conclusion

Through the analysis of the current situation of practical teaching of bridge engineering course and the study of the characteristics of bridge structure design contests,we can clearly see the promotion of bridge structure design contests to teaching.It not only improves the students'practical ability and innovation ability,but also brings new ideas and methods to the teaching of bridge engineering course.However,we should also see the existing problems in the current practice,such as the unequal distribution of resources,the lack of teachers,etc.,which need our joint efforts to solve.

Looking forward to the future,the practical teaching of bridge engineering course should pay more attention to the integration with bridge structure design contests,make full use of the advantages of contests,and integrate the spirit of contests into teaching.At the same time,we should pay attention to the development of new technologies,such as intelligent construction,3D printing,etc.,to provide more practical opportunities for teaching.In addition,we also need to strengthen the construction of teachers,improve the practical ability and teaching level of teachers,and provide a better practice environment for students.In short,the future development of practical teaching of bridge engineering course should pay attention to the cultivation of students'comprehensive quality,make full use of contest resources,pay attention to the development of new technologies,strengthen the construction of teachers,and make contributions to the growth of students and the development of bridge engineering field.

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