

Exploration of "Architecture Structure" Application Undergraduate Teaching Reform

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Abstract. The purpose of application-type undergraduate education is to cultivate application innovative talents and enhance the ability to solve practical problems. This article uses the educational concept and teaching reform of the application type undergraduate college as the starting point. Taking the architectural structure course, one of the main courses studied by students majoring in engineering cost in the field of construction in Colleges and universities, as an example, this paper analyzes the problems existing in the teaching of this course. Using the project teaching method, this paper provides new ideas and methods for the application-oriented undergraduate teaching reform of the course of architectural structure from the four aspects of curriculum positioning, teaching goal analysis, curriculum design and curriculum assessment scheme.

Keywords: Architecture Structure; Applied Undergraduate; Reform in Education.

1. Introduction

"Architecture Structure" is one of the compulsory courses of non-structural majors in colleges and universities. This course is widely used in engineering sectors. The structural forms involved include reinforced concrete structure, masonry structure and steel structure. Many colleges and universities have put forward some new ideas and methods for the teaching reform of "Architecture Structure". Peng Yihua and Li Xiaomei [1] with the background of building informatization and according to the talent needs of engineering management specialty, integrated BIM Technology into the teaching of engineering structure, strengthened students' understanding and application of the concept of building informatization, and added the teaching link of BIM practical training of engineering structure. Zhang Yao, Li Sujuan, Liu Liquan, etc.[2] combined with engineering structures, focusing on cultivating students' engineering awareness and craftsman spirit during teaching, with complex cultivation of school enterprises, with extracurricular activities, such as competition, college students innovation Various ways such as entrepreneurial training program projects to improve teaching effects. Liu Jun [3] analyzed the current situation of the course teaching of "Architecture Structure" and the problems existing in the course teaching, and combined with the professional characteristics, put forward the specific methods of adjusting the course system, teaching content, teaching methods and assessment methods. This paper analyzes the shortcomings in the teaching structure teaching, starting from the perspective of engineering practice, using the project teaching method, in the teaching process, the construction drawings of real projects in the process of real engineering projects are carriers, with curriculum design, group discussion, flip classroom, etc. Let students learn theoretical knowledge while completing the specific tasks, to enhance students' interest and engineering practice.

2. Curriculum Orientation

The course "Architecture Structure" mainly describes the theoretical basis of building structure design, material properties and stress characteristics of each component, design calculation and structural requirements. This course mainly includes the component design and calculation methods, structural requirements and structural layout of beam slab structure, frame structure, hybrid structure and other structural forms, integrating theory, materials, components and structure. In the process of talent training, this course mainly improves students' calculation and analysis ability and spatial ability, their mastery of current industry specifications and atlas, their further understanding of structural construction drawings, and requires students to fully master the application, calculation and related structural requirements of various structural forms. Learning this course is very helpful for

students to engage in relevant work in the engineering field after graduation. Posts such as structural design, construction project management, project cost and real estate development all need to use the contents of the course of building structure.

3. Analysis of Current Teaching Situation

1. The teaching hours are limited and the teaching methods are insufficient.

For students majoring in engineering cost, the class hours of "Architecture Structure" are relatively few. This course covers a lot of contents, and some learning contents are still difficult. In addition to the theoretical knowledge of the classroom, teachers should also let students complete the theoretical knowledge in the classroom. Therefore, in order to save teaching time, teachers basically use teaching method and case method in the teaching process, and appropriately arrange classroom exercises according to the actual situation. Such a teaching method virtually reduces the classroom interaction with students, which will make some students feel boring in class and difficult to systematically connect the knowledge points together. Students' learning objectives of the course mainly focus on completing homework and passing the exam, lacking the ability to explore knowledge and the ability to integrate theory with practice.

2. There are deficiencies in the assessment method.

The usual assessment method for the course of "Architecture Structure" is usual score + final examination score. The composition of usual scores is mainly attendance, homework, classroom performance, classroom notes, etc. the final exam is mainly in the form of closed book written examination. This assessment method mainly tests the students' mastery of concept and theoretical knowledge and whether the students' learning attitude is serious, but it can not really assess the students' ability to apply the knowledge learned in this course to practical engineering. The traditional assessment method can not meet the requirements of application-oriented talent training.

4. Analysis of Teaching Objectives

After analyzing the problems existing in the current teaching situation, it is found that when formulating the curriculum design scheme of "Architecture Structure", it is necessary to summarize and sort out the employment direction of the students after graduation, and formulate the corresponding curriculum design scheme according to the post skill requirements. After analyzing the employment direction of graduates majoring in engineering cost, it is found that most students are mainly engaged in the jobs of constructors, cost controllers, documenters and supervisors after graduation. Some students work in real estate companies, and some students choose to start their own businesses. This paper analyzes some jobs related to the course of "Architecture Structure", such as construction worker, cost controller, documenter, supervisor and so on, and briefly summarizes the ability needs of students in each job as follows:

The first is the construction worker. It is required to be able to understand the construction drawings, carry out simple stress analysis and calculation, be responsible for dealing with various problems on the project site and technical disclosure. The cost controller is required to be able to understand the construction drawings, have the ability to calculate the quantities, have the ability to prepare the bidding control price and bidding quotation, and have strong organization, coordination and communication skills. The documenter shall have the ability to understand the construction drawings, and be responsible for the collection and management of project data, drawings and other files. Supervisors are required to be familiar with construction drawings and construction procedures, various construction acceptance specifications, laws and regulations, etc.

According to the ability requirements of the post, students are required to master the stress analysis and basic calculation methods of components, be familiar with the current atlas and specifications, master the specific structural requirements of components, and master the structural construction drawings of various structural forms in the learning process of "Architecture Structure", so as to

calculate the civil engineering quantities and solve the problems on the project site. Therefore, the teaching objectives of "Architecture Structure" are divided into six specific objectives to achieve the purpose of step-by-step learning, as follows:

Objective 1: students are required to master the basic provisions of "Architecture Structure" design, including the safety level of structure, design reference period, design service life, function classification of building structure, reliability theory and limit state design method.

Objective 2: students are required to master the common materials and corresponding mechanical properties in reinforced concrete structure, masonry structure and steel structure.

Objective 3: master the basic principle, basic calculation method and corresponding structural requirements of reinforced concrete structure, and be able to design and review components independently.

Objective 4: skillfully use the overall representation method of reinforcement plane to express structural construction drawings, and be familiar with the contents of 16g101 atlas; Be familiar with structural construction drawings to prepare for the study of measurement and pricing of subsequent construction projects.

Objective 5: master the basic principles, basic calculation methods and corresponding structural requirements of masonry structure, and be able to design and review components independently.

Objective 6: master the basic knowledge of steel structure materials, components and connections, and be familiar with the calculation principles of some common steel structure components and the characteristics of common steel structure houses.

5. Curriculum Design

Students majoring in engineering cost are highly practical in their posts after graduation. In order to enable students to adapt to the work post as soon as possible after work, in the teaching process of "Architecture Structure", according to the ability needs of the post for students and the decomposed six teaching objectives, provide students with construction drawings, corresponding specifications and Atlas of real projects with different difficulties in stages, and arrange learning tasks from shallow to deep, while completing the task, individuals or groups learn relevant theoretical knowledge points and apply them. Teachers guide the whole process and explain the theoretical knowledge alternately, so that students can be exposed to practical engineering projects in the classroom, cultivate students' practical operation ability and interest in the way of "learning by doing and doing by learning", and highlight the applicability and practicality of the course. See Table 1 for the teaching design scheme of some courses of "Architecture Structure".

Taking Table 1 as an example, first list the post ability requirements corresponding to this part of learning content and the theoretical knowledge points that students must master, so as to arrange learning tasks purposefully, then a set of relatively simple structural construction drawings of frame structure is given, and the learning tasks related to theoretical knowledge points are arranged. Students generally arrange five people to form a study group, taking the group as the unit, and check the relevant construction drawings and specifications with questions to find out the answers to the questions. In the process of completing the task, team members can discuss, students can ask questions to the teacher at any time, and groups can also communicate with each other, then arrange each group to report on the completion of their tasks. In the process of completing the task, the teacher will guide the students, find the students' problems in time, and explain the students' common problems when necessary. According to the course content, we can also arrange the task of flipping the classroom, and invite students to explain their understanding of knowledge on stage. The scoring method of learning task completion can be scored by each team leader according to the performance of team members, or by teachers directly. This learning method can strengthen students' initiative and exploration in knowledge acquisition, enable students to take the initiative to ask questions and find solutions by themselves, and enable students to have more contact with construction drawings in

advance. In addition, it also strengthens the ability of communication and teamwork, so that students feel that the classroom content is more interesting.

Table 1. Teaching design scheme of "Architecture Structure" (part)

Job skill requirements	Theoretical knowledge point	Teaching design
Have basic theoretical knowledge of building structure design and basic mechanical analysis ability.	Teaching target 1: 1. Force transmission path of basic components; 2. Safety level of structure; 3. Design reference period of structure; 4. Design service life of structure; 5. Function of building structure; 6. Structural reliability theory; 7. Structural limit state design method.	Task 1: take the structural construction drawing of a kindergarten project (frame structure, building area of 3200m ²) as an example, take the group as the unit, read the general description of structural design and load code for building structures, and complete the following tasks: (1) Overview the whole set of drawings and analyze the force transmission path of the frame structure; (2) What is the structural safety level of the kindergarten project? What are the damage consequences corresponding to different structural safety levels? (3) What are the structural design reference period and design service life of the project? Think about the difference between the design reference period and the design service life. (4) Think about the permanent load and variable load of the classroom in the drawing? (5) Check the load code, give the permanent load and variable load values of each room on the second floor plan, and compare them with the values in the general description of structural design. (6) Calculate the basic combined load design value of each room floor in the second floor plan of the project.

6. Course Assessment Plan

In response to the shortcomings of traditional curriculum assessment programs, according to the characteristics of application talents, the assessment plan of the "Architecture Structure" can be changed to the whole process assessment, and the traditional closed-volume final test can be canceled. Students' mastery is mainly evaluated from the following aspects: attendance, completion of classroom learning tasks, cooperative relationship with group members, performance of flipped classroom, completion of curriculum design, etc, Conduct an all-round examination of students' ability to integrate theory with practice and their ability of organization and coordination.

7. Conclusion

The design of the course of architectural structure is student-centered. In addition to cultivating students' practical ability and the ability to analyze and solve problems, it also enhances students' interest and motivation in learning, so that they can experience the fun of learning knowledge and study actively. At the same time, cultivate students' serious and rigorous working attitude and teamwork spirit, improve students' communication and coordination ability, and enhance their post adaptability. Through the reform of teaching methods and assessment schemes of architectural structure courses, we can provide some ideas and methods for the teaching reform of application-oriented courses of related courses.

References

- [1] Yihua P, Xiaomei L 2020 Research on the teaching of engineering management courses under the background of building informatization-take engineering structure as an example *Journal of Higher Education* 05 94-96.
- [2] Yao Z, Sujuan L, Lixia L 2020 Teaching design of "Static Friction" and cultivation of core quality *The Guide of Science & Education* 02 116-117.
- [3] Jun L 2020 Discussion on teaching reform of architectural structure course of civil engineering specialty *Education Teaching Forum* 05 156-157.