

Exploration on Teaching Reform of Civil Engineering Construction Organization Course Based on BIM Technology

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Abstract: Civil engineering construction organization is a professional core course of civil engineering major. This paper analyzes the characteristics of civil engineering construction organization course and the existing problems in the current teaching process. It puts forward the idea of integrating BIM technology into the course teaching process and explores from the aspects of course teaching content reform and teaching method reform.

1. Introduction

Civil engineering construction organization is a professional core course of civil engineering major. This course is to study the basic laws of engineering construction organization and the scientific management of construction site, to solve the problem of space arrangement and time arrangement, to deal with the distribution of human and material resources and the relationship between various aspects[1]. Through the study of this course, students are required to master construction preparation, principles of flowing water construction, network planning technology, basic methods and technologies of construction organization and design. It plays an important role in the cultivation of students' comprehensive vocational ability and professional quality.

Building information modeling (BIM)[2] is the integration and collaborative application of 3d digital models, information and knowledge resources in all stages of project design, bidding, construction and operation. Since the release of opinions on the development and reform of the construction industry by the national ministry of housing and urban-rural development in 2014, it was first proposed to promote the application of building information model (BIM) and other information technologies in the whole process of engineering design, construction, operation and maintenance, so as to improve comprehensive benefits[3]. In 2015, guiding opinions on promoting the application of building information model BIM were issued, proposing to popularize and deepen the application of BIM in the construction field, improve the work quality and efficiency of all participants in the whole life period of engineering projects, and guarantee the quality, safety, environmental protection and energy conservation of engineering construction[4]. 2016 "construction industry informatization development plan in 2016-2020", put forward to comprehensively improve the level of informatization construction, strengthen BIM, big data, intelligent, mobile communications, cloud computing, Internet of things, such as information technology integrated application ability, digitalization and networking, intelligent construction industry breakthrough, form a group with strong innovation ability of the information technology and the information application has reached the international advanced level of construction enterprise and construction information technology enterprise with key independent intellectual property rights[5]. At present, BIM technology has been developing rapidly in China's construction field. The application of BIM in teaching has become a trend[6].

2. The Characteristics of Civil Engineering Construction Organization Course

2.1 Strong Comprehensiveness.

The teaching content of civil engineering construction organization course mainly includes the

outline of construction organization, principle of flowing water construction, network planning technology, general design of construction organization, organization design of unit engineering construction and so on. And this course requires students to compile a complete construction organization design document on the basis of mastering certain basic knowledge, principles and methods.

Construction organization and design document is a technical and economic document to guide the overall construction. It involves the basic contents of technical, economic and management courses in various fields, such as building materials, construction structure and map recognition, construction technology, measurement and valuation of construction projects. Only by learning these subjects well and laying a solid foundation can we work out more reasonable construction organization and design documents.

2.2 Strong Practicality.

This course requires students to be able to flexibly master the methods of preparing construction plans, construction schedule plans and resource plans according to the characteristics of different types of engineering projects, so as to better serve the future work. The content framework contained in the construction organization design document is basically fixed and students can remember it quickly. However, how to work out targeted and reasonable schemes according to different engineering projects requires more in-depth practice, understanding of the architectural characteristics of different layers of structures, and understanding of the applicable environment of various construction methods and so on. This course plays a good guiding role in helping students to organize, implement and manage construction projects.

2.3 Many Influencing Factors.

The course of civil engineering construction organization takes professional ability as the core and practical enough as the limit, which fully reflects the subject status of students. It adopts the principle of combining theory with practice to strengthen students' operational ability, so as to better meet the needs of future engineering project practice. Therefore, the learning of this course will also be influenced by students' learning interests, thinking characteristics, teaching methods, practical content and many other factors[7], and teachers should pay more attention to the teaching process.

3. Problems Existing in the Current Teaching Process

3.1 Changes in Teaching Content Lag Behind.

In the traditional teaching method of civil engineering construction organization course, students mainly learn the principle of flowing water construction, network planning technology and simple construction organization design scheme. It pays little attention to some new technologies, methods and theories in the field of construction organization and design, and updates the course content slowly. Therefore, there is a certain lag with the cutting-edge discipline knowledge. The content of the course changes relatively little, and some new application methods in actual posts are not timely supplemented and improved. In particular, BIM construction management, which is strongly advocated by the state, has not been integrated into the classroom.

3.2 The Setting of Course Practice Links is too Few.

Traditional teaching methods basically use most of the class hours to understand and learn theoretical knowledge and cope with the exam, while students are relatively passive to accept knowledge. However, when a case is given, there are relatively few introductions about how students should think and how to proceed. The flexibility of students is generally poor. The practice part is mainly based on traditional case operation. Students draw horizontal track diagram, network diagram and two-dimensional construction plane layout. This method lacks a visual and interactive experimental platform[6], and most students cannot understand the actual situation in depth. In recent years, due to the great reduction of class hours in the teaching reform, the original training part of the course has been cancelled. Therefore, students don't know how to start a project after

learning the theory.

3.3 Course Evaluation System is Single.

Under the traditional teaching mode, students are assessed mainly through daily attendance, homework and final examination results, while there are relatively few classroom activities. It mainly lacks the investigation of students' individual operation ability, teamwork ability, organization and leadership ability. Teachers can not understand the actual learning situation of students from many aspects, even many times can not name the students, can not be one-to-one correspondence.

4. Teaching Content Reform based on BIM Technology

4.1 Design Ideas of BIM Construction Organization Course.

The core content of civil engineering construction organization course is the compilation of construction organization design documents. The introduction of BIM technology is mainly to combine theoretical study, practical operation and BIM. Through the multi-dimensional and three-dimensional visual effects of BIM, our students can fully understand the principles, concepts and ideas of construction organization design, and why to design like this.

4.2 Reform of Teaching Content.

The core content of construction organization design is "one case one drawing one table". Aiming at the construction scheme design, the teacher used BIM software to simulate various construction schemes in the process of explaining the scheme formulation. The construction process of the construction scheme was dynamically displayed in three dimensions, and the rationality of the construction scheme was compared and analyzed, so as to present the scheme more clearly, intuitively and vividly to the students. Especially when encountering some nodes with complicated design and not convenient for students to imagine in space, students can be deeply impressed by such a demonstration.

Aiming at the design of construction plane layout plan, the teacher introduces BIM field layout software in teaching, and introduces the principles and methods of graphic element layout combined with different engineering environments. Let students draw components in a two-dimensional state, and display the positions of these elements in a three-dimensional virtual way, so as to feel the construction site environment more vividly and intuitively. Use the roaming function to walk in the construction site, check whether the layout of the diagram elements is reasonable, whether there is something not in line with the standard and logic, so as to modify and improve. All of these are for students to really master how to arrange the construction site according to the characteristics of the actual project, so as to achieve the combination of theory and practice.

For the preparation of construction schedule plan, students can use BIM schedule plan software to complete the reciprocal conversion of time scale logic diagram and horizontal track diagram of the corresponding case project, draw resource curves such as human resources and machines according to the engineering data, and the generated final result file can be directly imported into BIM5D software for data analysis and extraction. Students can correlate the progress plan with other data, check whether there is any imbalance or unreasonable, and make adjustments in time. Students can also compare and analyze the actual project data with the prepared schedule to see the progress of the project at any time, and can make timely measures to meet the deadline when the project is delayed.

5. Course Teaching Method Reform based on BIM Technology

5.1 Adopt the Teaching Method of Project Type and Case Type.

Teachers use BIM technology to assist themselves in the complete course teaching. Before class, teachers can collect a large number of abundant case resources of project construction organization

using BIM technology in engineering practice, integrate and form a resource database, and upload them to students' cloud class based on course content, so as to provide students with extracurricular reading and understanding and keep up with the forefront of the industry in time. In class, the teacher can break the chapter structure of the original textbook, reorganize the course content, introduce practical engineering cases, and lead the students to use BIM software in the study of the theory of flowing water construction, network planning technology, plane layout and other theoretical knowledge. Let students find and solve problems during the completion of case projects, so as to achieve the understanding and mastery of knowledge. After class, answer questions about the operational problems in the process of preparing the progress plan, BIM field layout, BIM5D comprehensive application software, etc., so that students can understand how to effectively combine the theories we have learned with BIM software. The teacher then gives real engineering cases according to students' completion conditions as homework, which requires students to carry out in-depth study, digestion, consolidation and improvement.

5.2 Use the "Race for Learning" Model.

Due to the strong comprehensiveness of construction organization courses and the great difficulty of learning, students are often tripped by various complex logical relationships in the process of drawing network diagrams, and they cannot realize the purpose of learning in time, thus reducing their interest. In order to enhance students' enthusiasm and initiative in learning this course, we encourage them to actively apply for various BIM application skills competitions and BIM graduation design competitions sponsored by China construction education association and co-organized by several organizations every year[8]. With the benefit brought by winning the competition as an attraction, more and more students will pay attention to the competition, have more clear and clear goals, and want to know, participate and get involved. As one of the key examination subjects of competition software, construction organization is also what everyone must learn and learn well. In this way, students are transformed from passive learning to active learning, so that students can better master professional knowledge, at the same time, innovative thinking, practical ability, comprehensive application ability, teamwork ability and other aspects are exercised and improved.

5.3 Accelerate the Construction of Experimental Platform.

In recent years, with the rapid development of BIM technology, engineering software has been updated with each passing day. If we want our students to have a promising career, we cannot teach today's students what yesterday's knowledge will teach tomorrow's. Therefore, we should pay more attention to the forefront of software update development, timely configure and upgrade the new software, and apply BIM cases for teaching.

5.4 Improve the Curriculum Evaluation System.

The final assessment of this course is obtained by adding multiple items. It includes daily attendance, classroom interactive discussion, brainstorming, questionnaire survey, group tasks, various project assignments, after-class cloud material learning, examination and other parts. It combines phased assessment with result-oriented assessment, and teachers' grading with students' mutual assessment, enriching the original assessment content. In order to increase their experience value, students have also improved their initiative.

6. Conclusion

The teaching reform of civil engineering construction organization course is a long-term process of constant exploration. Based on the existing problems in the current teaching process, this paper discusses how to better integrate BIM technology into the classroom, improve the teaching effect, and ensure that students learn more and more useful knowledge. At the same time, it also hopes to play a certain reference role in the teaching reform of civil engineering construction organization course in colleges and universities.

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