Research Review on the Teaching Reform of the Civil Engineering Courses Based on the BIM Mode

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Abstract: The three aspects of the civil engineering construction site layout, project management, construction site simulation were applied to the classroom teaching of the civil engineering on the BIM technology. Let the students fully understanding and application of the BIM technology, and achieved the full unity of the theory and the practice. Through the BIM technology to manage the construction project, finally it was be applied to the teaching reform based on the results of the study process, and to improve the teaching effect.

Key words: BIM mode    Civil engineering classes    Curriculum    Teaching Reform

1. Preface

It can be seen from the above figure 1, due to the application of the BIM technology promotion, since 2014 the trend of Chinese journal of BIM related technical and academic attention have began to accumulate, and civil engineering industry of the application of BIM technology was growing rapidly and that the application of BIM technology was also accelerating in the related industry. Especially for the rapid development of the vocational education today, the teaching reform in the civil engineering more emphasis on the application of BIM


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technology, increasing the effect of the professional teaching, really let the BIM technology application in classroom teaching and practice for the teachers and students, and it made the combination of the theory and the practice better.

Through the survey found, there were more theory knowledge in the civil engineering courses of the colleges and universities. The students needed to have a strong space imagination ability. Linked with site construction was good for the students to understand, while the students lack of the practical experience. The spatial ability was poor, so the teaching effect was not ideal. To solve this phenomenon, it is necessary to thoroughly teaching reform based on the new technology. If we could make the construction site in classroom teaching, and attaches importance to students' practical operation ability, it would improve the students' interest in the learning, and compensate for the defects in its space imagination ability, thus it could improve the teaching effect and student's learning effect.

BIM is short for Building Information model. If the CAD to replace hand-painted was the first construction change, that the BIM instead of CAD will be the second revolution in the industry. The change of the BIM technology brought about by the construction industry has long been recognized by the society. The technology for building model as a carrier of the construction of information, it was to be applied to the engineering construction project from the project to completion acceptance and operation maintenance throughout the project life cycle. The various project participants from the building model to extract the information that needed to work together, it could significantly improve the efficiency of the production building, especially on the large projects the effect is more obvious.

From the perspective of teaching, the BIM technology with vivid appearance and visibility, which made it to have the property of natural teaching. Using the information processing and the characteristics of the dynamic simulation, the written information was converted to a vivid three-dimensional field simulations, which could be interactive construction site. It could be able to get a part between theory and practice of the civil engineering classes and the problem of poor students' space imagination ability, especially suitable for the civil engineering teaching. This would be to promote the curriculum reform.

2. Research overview

At present, the construction engineering college has built the BIM training rooms, equipped with 50 sets of computers, all equipped with relevant civil application software were based on the vision bank of the BIM, it had provided a good hardware basis for this project. It could promote the application of the BIM technology to the classroom teaching. At the same time, it fully embodied the trend of education principle of real integration about the teaching development and reform.

This study would provide the class of the 2016 for the construction engineering technology professional students as the research subject, at the same time, with the "construction project construction organization design" course as the main research course.
3. The research process

In the construction colleges and universities, the "construction project construction organization design" course was the one of the construction class specialized core curriculum, which was the focus of the course. Each construction class colleges and universities attached a great importance to the teaching effect of this course, but the effect was not very ideal, such as the teacher attached a great importance to this course in the project management course. Investigate its reason, the actual project and the teaching process were still a two-dimensional shape, and the students lacked the experience on the construction site. Traditional teaching of the teachers would show some pictures, the rest of the students still needed to have a strong space imagination ability, and the students' ability of space imagination was very limited. It was extremely difficult to understand for beginners. The students found it difficult, lack of interest in learning, form a vicious circle, which caused a serious impediment to the development of students' interest in learning.

To improve the curriculum teaching present situation, we must increased the implementation of the project based on the BIM technology teaching reform. At the same time of the teaching, it had improved the students' ability of BIM. Given the strong demand for talent of the BIM in construction corporation, lets the students in the course of learning in the process of contact with the application of the BIM technology, proficient in the application of BIM technology, even in the future to student's employment and industry was more extremely advantageous. It included the preparation stage, implementation stage and evaluation stage based on the teaching reform of the BIM technology.

3.1. the preparation stage

At First, we set up the teaching of projects and tasks. The "Construction project construction organization design" course were divided into four projects, and the completion of each project was subdivided into three tasks. At the same time we set the task list for each task for the students in class or after class is complete. Secondly, a clear teaching target and content was set based on post needs set up the teaching goal. The actual work content into the teaching task of knowledge points, which realized the teaching content from jobs and services of the teaching idea. Final the BIM model was created from the comprehensive nature of the job skills and continuity requirements. A project could not carry full knowledge of the teachers needed to speak, you needed to choose other project to complete the knowledge system.

3.2. the stage of implementation

The teachers in accordance with the preparation for design services on teaching, the teaching contents and teaching recognition of the BIM model would be built and used in teaching. The students' was no longer abstract at first glance, but the image of a 3D model would be fully understood, and it could improve the teaching effect. The students learning group of based on task driving method, which caused the students to complete the task list.
The students completed the task in the list, at the same time, they used the BIM virtual simulation technology to construction field. At the same time of using the BIM technology network diagram, it had improved the BIM application ability of students. The BIM project has the information correlation between team members that could work together. As shown in figure 2.

![Figure 2. The BIM technology site layout.](image)

### 3.3. Evaluation phase

This phase was the key stage of teachers to check out the BIM application abilities of the students. The teachers could through the completion of each task list to conduct assessment on students' learning situation, also could let students group between mutual task list. But only on the basis of task list to assess the BIM application ability was a poor. It could be done to test their application ability by the students for examination and assessment of the condition of the BIM model. Assessment can be applied in the process of the BIM software information. It could be application software will be the team to complete the output of the BIM model results with the results of standard BIM model built by the teacher. The BIM information software could not only quickly and accurately complete measurement, but also it was still evaluate process. It could be more comprehensively and accurately to evaluate students' learning.

The model has been actively promoted in the our school. The some teachers have been trained in the our school. It was embodied in the teaching plans. The teachers and the students all reflected that the teaching effect was quite good, which has laid a solid foundation for the follow-up professional course learning.

The model can also be applied to other civil engineering classes, and which will be only combining course features a slight adjustment based on the BIM technology in civil engineering curriculum project teaching reform.
Summary

This article expounded the teaching status quo of civil engineering courses, and it set the "architectural engineering construction organization design” course as an example. It discussed the BIM technology application in the project of teaching reform in civil engineering courses. The three aspects of the civil engineering construction site layout, project management, construction site simulation were applied to the classroom teaching of the civil engineering on the BIM technology. Let the students fully understanding and application of the BIM technology, and achieved the full unity of the theory and the practice. Through the BIM technology to manage the construction project, finally it was be applied to the teaching reform based on the results of the study process, and to improve the teaching effect.

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