

# Research on BIM Technology in Teaching Reform and Innovation in Civil Engineering Major

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**Abstract:** The strong visualization and information integration capabilities of BIM bring new changes to the development of civil engineering. BIM technology can also bring reforms and innovations to the teaching of civil engineering. This paper analyzes the application goals, models and safeguard measures of BIM technology in the civil engineering teaching to provide some references for BIM teaching in civil engineering specialty.

## 1. Introduction

BIM (Building Information Modeling) was first proposed by Philip Bernstein in 2002 and is an innovation in architectural design. It is based on the model of construction project related information and data to establish the simulation component information of building information through digital simulation, the limitations of breaking the traditional two-dimensional drawings can visually show the project entity after the completion of a three-dimensional appearance. It is the purpose of carrying out construction engineering design, construction and project management in the engineering information model and digital information, to avoid loss of the project, and the parties due to the exchange of too little or not in place due to a conflict later in the project, and can be in the design and construction of project construction, and provide to establish the internal consistency, and operational information. It has the characteristics of information completeness, information relevance, information consistency, visualization, coordination, simulation, optimization and graphics. In recent years, the rise of BIM technology is a highly respected technology means, so it should be applied to university education, for example, in the teaching of Cartography in civil engineering. BIM is indispensable in the development of China's construction industry. In the original civil engineering design drawing and 2D drawing based on the attention to cater to development scheme and reality of architectural design industry trend of cultivating civil engineering drawing teaching, so as to make the university talents appear more in line with the architectural design enterprise needs BIM, to solve the traditional two-dimensional drawings does not show the project completed a three-dimensional entity after the overall effect of the building, but also to focus on integration of model information, but also can achieve the plane drawing effect, this is the field of architectural design has brought new changes. The traditional two-dimensional CAD is the geometric expression of the building. But geometric expression is not the geometric attribute of all the buildings in the building, and the non-geometric attributes are collectively referred to as building information. The combined model is called the building information model.

## 2. Application Objectives of BIM Technology in Civil Engineering Major Teaching

The introduction of BIM technology has made the construction mode of modern civil engineering innovation. As we all know, the rational application of new technology is mainly based on the thinking and skills of technical personnel. Only with high-quality professional and technical personnel can we make full use of the application value of technology and achieve the goal of improving construction efficiency and engineering efficiency. College of civil engineering is the main place of supply talents to the construction industry, BIM skills education in the teaching process,

largely for enterprises to save the relevant skills training cost, and can make the talent employment, quickly adapt to the working environment, to meet the demand for jobs. As a training object, students are very skilled in advanced technology and operation skills. They will become the leader of the industry and stand out in the fierce competition for talents. As an important part of curriculum establishment, the determination of teaching objectives is very important, which is related to knowledge and skills that students understand, understand, master and apply through courses. When setting curriculum objectives, we need to consider comprehensively the application status of BIM technology, the active situation of construction enterprises, such as the demand for BIM technology talents, and set up the goal of curriculum system with professional characteristics combined with the characteristics of university professional development plan. For example, University of Texas in the US has opened a BIM thematic course, which includes BIM technology's principle, evolution mileage, application scope and application method at present stage. It involves many fields such as parameterized sword devil, network technology, design performance simulation and so on. Since BIM has high efficiency and professional collaboration and strong features, so in the study of BIM technology when necessary through a standardized and systematic curriculum system. During project management concept opened by the University, it also involves the application of BIM to the course of digital information management. These more successful teaching models are worthy of reference for domestic colleges and universities.

### **3. Application Models of BIM Technology in Civil Engineering Major Teaching**

#### **3.1 Integrate BIM into Professional Curriculum**

The basic course of BIM introduces the development and engineering application of BIM. Students have a comprehensive understanding of the BIM knowledge system. BIM courses are mainly offered to students in grade 3 and grade four. When students learn new knowledge, they can have a gradual process of attracting people, such as setting up BIM teaching group, communicating and coordinating teaching contents of related teachers, planting part BIM technology content and building information model basic level knowledge. Application is more practical. In the specific teaching process, important BIM knowledge points should be set up corresponding test contents. Students can solve practical problems in engineering by using BIM software. The main parts of BIM are: engineering cost calculation, project cost calculation, schedule system, construction link simulation, cost control and truss and so on. In addition, through interdisciplinary, in view of the BIM curriculum design and graduate design inspiration, improve the students' experiment ability. Expert lecture on engineering construction industry. Expert lectures can provide a new perspective for professional BIM teaching of civil engineering, and provide a new perspective of teaching, through lectures, teaching BIM development of the virtual management, students can understand the impact of engineering application of BIM and the latest development of the construction industry, to stimulate students' learning and application of BIM in the students further clear learning objectives of BIM, three kinds of organization BIM courses are interrelated and mutually reinforcing, through the organic collocation of three kinds of methods significantly improve the professor, the application of BIM teaching effect. In addition, when setting up the content of BIM technology, it must first be based on the existing professional courses.

#### **3.2 Offer an Independent Course of BIM**

Through the learning of the simple application of two years' basic knowledge BIM technology, a BIM technology course has been set up in the junior high school, focusing on the application of BIM technology at various stages. For example, parametric design stage; analysis includes the analysis of building thermal engineering, building acoustics, building optical content such as the performance of the building; construction progress simulation, collision detection, scene simulation and construction of curtain wall, steel structure design and simulation; operation and maintenance management, asset management and other stage. Through the study of these contents, each student can grasp the

application of the BIM technology of the life cycle. The examination paper is based on the basic knowledge of BIM related software. It is biased towards the content of BIM certification examination. BIM modeling for self-built villas is conducted to investigate students' practical operation ability. Application of BIM technology on the school of civil engineering of Yu industry, can be individually set a course to teach, as required or elective courses, according to the circumstances to set school. The content can be divided into two stages to design, the first stage is the foundation of teaching BIM, mainly introduces the basic component of BIM software interface and basic principle. It can be the foundation of modeling simple, another extension of teaching the stage is mainly concentrated in the function of BIM software, the BIM training, combined with the BIM modeling of the previous study, plus cost management and project management knowledge. In this way, students can have a simple and systematic study of BIM software. For the assessment of the course, can take the usual assessment and final assessment method combining regular assessment to strengthen students usually learn and supervise each part of the knowledge of the inspection, examination can arrange students to do a small project, to test students on this part of the knowledge of the comprehensive ability and widely used. Because of the good application prospect of this course or technology, it is suggested that the school can combine the examination of this course with student's textual research. At present, we can get the vocational qualification certificate of building information model in this field.

### **3.3 Launch Expert Lectures of BIM**

BIM industry experts with rich experience can provide new perspectives and new knowledge for the BIM teaching of civil engineering. BIM course teaching process, if can use as much of the real case, the simulation of the whole process of project implementation from design, construction, schedule, cost calculation, cost management simulation, will be able to enhance the students' understanding of BIM technical knowledge, improve the ability of practice. In recent years, the school invited industry experts and scholars have made the report mainly involved in construction site management, large-scale public project design and construction management of high-rise residential projects, large commercial monomer design management, through the professional learning of the report, so that students have a more deep understanding of knowledge in this field, and the School Department of construction engineering management also invited administrative management personnel to the school to do the lecture, to enable students to understand some of the countries in the field of engineering construction promotion policies and requirements for graduates in the future better in providing the necessary guidance. To adapt to the development of the new era, to realize the goal of cultivating applied talents, our school in the teaching process, for civil engineering, project management related majors in the teaching and actively encourage students' autonomous learning BIM knowledge and related software related topics also with professional teacher, led the students practice. In addition, the teacher also actively guides students to participate in relevant skills contest. In all kinds of engineering laboratory with the support of university students' innovative experimental or innovative entrepreneurship program and all kinds of competition as the carrier, to the forefront of academic lectures for the pilot, building the scientific training system of students' autonomous learning and teacher guidance, through research and training, and effectively improve the students' practical ability and innovation consciousness training, enhancing students' professional quality and innovation ability.

## **4. Safeguard Measures of Application of BIM Technology in Civil Engineering Major Teaching**

### **4.1 Safeguard Measures of Teaching Environment**

We should continuously improve the experimental teaching environment, equipped with high performance computer and the corresponding BIM software. We use BIM related software to realize digital engineering design, virtual construction, debugging and anti-operation. BIM software is more suitable for virtual simulation of engineering construction. With this technology, the integration of professional school of civil engineering and established the engineering simulation platform for

practice teaching, students through this platform, and make full use of BIM software, simulation animation of the key construction process of civil engineering, received a good simulation effect of engineering simulation. Compared with the single course, the interdisciplinary curriculum system is very complex, and the system integrates multidisciplinary and professional knowledge. However, due to the differences in professional characteristics and teaching objectives of different disciplines, it is necessary to set up relevant departments to plan and plan for different disciplines. Professional teachers use this platform to design virtual projects for real projects. At the same time, through arranging students' operation, they can really encounter problems that may arise in the process of engineering implementation, and put forward effective solutions with the help of BIM technology. Market demand promotes the demand for talents, and at the same time promotes the demand for education and training. To cater to the market demand, universities must update their talent training programs and make new teaching plans in due time.

#### **4.2 Safeguard Measures of Teaching Talents**

The establishment of BIM teaching system focuses on the implantation of related courses in the system, which requires teachers of related courses to master the corresponding BIM knowledge and related engineering experience. BIM technology has just been in the promotion stage in China, and most of the teachers are not familiar with it. So, the first focus of the establishment of the BIM curriculum system is the construction of the BIM teacher team. We should set up BIM technology teaching and Research Center, and train relevant teachers. At the same time, we can improve BIM skills of related teachers through visiting, training, studying degrees and accepting social training. The collaborative work module of BIM can completely solve the above problems. In the collaborative work mode, each subject will be able to communicate through visual three-dimensional display. Update the modified model at any time. The establishment of BIM interdisciplinary collaborative curriculum helps students to have a comprehensive understanding of the detailed working process of building structure and improve the learning efficiency of students' professional knowledge and skills. To do a good job in the teaching reform of the building information model course, we should provide a suitable teaching platform. In view of this, the school has strengthened the training of young teachers and the investment of instruments and equipment in recent years. Teachers are also a major difficulty in the training of BIM technical talents in civil engineering. Teachers should not only have strong BIM engineering practice ability. Teachers can also take part in BIM technical training classes, BIM technical lectures and other related BIM technology training activities to improve their self-level.

#### **5. Conclusions**

BIM is currently the most advanced information technology in the construction industry. It has a significant role in promoting the development of new building industrialization. We introduce the BIM modeling software into the civil engineering drawing course, which is the first step to enable students to get in touch with new technologies. As the BIM modeling software can express the shape of the building image, it can be used as an auxiliary teaching tool for drawing, which makes the boring two-dimensional drawings easier to understand.

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