

Study on Teaching Method of BIM Technology in Universities

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Abstract: With the extensive rise of BIM technology, universities at home and abroad have carried out BIM teaching. There is no effective teaching model in China, because the curriculum is independent or requires higher teaching conditions. Foreign teaching carried out a long time, has more experienced experience. The main teaching models are: BIM teaching in a single course, BIM teaching in a series of courses, and BIM teaching in integrated design studio. We draw lessons from the advanced experience of foreign countries, and put forward three suggestions for the teaching method of BIM course to universities in our country: design course teaching Integrating BIM information flow, multi-professional integrated teaching and life cycle simulation teaching.

Keywords: BIM; Teaching; Information integration; Life cycle

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1. Introduction

BIM (Building Information Modeling) is the most revolutionary and promising technology in the areas of architecture, engineering and construction. The precise virtual model completed by BIM technology, which is of all the real information of the building. It can be used in urban planning, architectural design, construction, equipment, management, etc. at any stage of the project process. In recent years, with the development of computer technology, BIM as the representative of information technology has become an important part of the development of modern construction industry, and more and more enterprises began to pay attention to the application of BIM technology. It put forward new requirements to talent cultivation and BIM teaching in colleges and universities. In this context, many colleges and universities at home and abroad carry out the BIM technology as a guide to the teaching practice and innovation for their own development and teaching resources.

BIM courses offered by domestic colleges and univer-

sities are divided into three forms according to their stage or teaching focus. They are divided into three categories: BIM course carried out alone, BIM teaching combined with architectural design classes, BIM teaching combined in school and enterprise. In the first way, BIM is still an extension of CAD, just as a drawing tool. The latter two methods have a higher demand for teachers and business teams. In summary, the domestic BIM teaching has not yet perfect model. We learn from the advanced experience of foreign universities, and then put forward the proposal of BIM teaching in China.

2. BIM Technology Teaching in Domestic Colleges and Universities

BIM courses was generally divided into three forms in domestic colleges and universities, according to their experience in the stage or the focus of teaching different.

2.1 BIM Course Alone

This form is more common in colleges and universities

that have just opened a BIM course. The purpose of the teaching is to extend the computer-aided design course and to teach BIM as a new software technology. It is characterized by time concentration, students concentration, fewer instructors, and short course time, so that students can quickly familiar with the use of the software interface, master the use of software, and learn the output of software conversion. However, IT is also very obvious that the shortcomings of this form of teaching. BIM, tended as a continuation of CAD, is difficult to really establish the concept of three-dimensional design. BIM only become a drawing tool with design thinking followed by the old way of "sketch, Sketchup".

2.2 BIM Teaching in Conjunction with Architectural Design

Based on the development of the first form, the teaching purpose of this form is to combine BIM with architectural design courses. The use of BIM technology combined with the concept of space to complete the design process, to strengthen the BIM participatory teaching and time training, so that the design of teaching has brought impact to the traditional space constitute. As a result of highlighting the role of learning the main body of students, students can effectively improve the enthusiasm of BIM, at the same time, teachers and students can enhance the continuity of interaction and openness. But it requires a higher teacher, who must have BIM knowledge background and technical literacy.

2.3 Combination of School and Enterprise to Set up BIM Teaching

Compared to the first two forms, this form is more focused on the application of BIM technology in practical engineering. The purpose of its teaching is to combine BIM teaching and engineering practice, focusing on the understanding of the BIM concept, especially the synergistic design for each profession. At the same time, students can be familiar with the initial business management of technical documents, corporate BIM technical standards, operational processes, due to direct contact with corporate atmosphere. It makes them a lot of things who are going to work, but need to be matched by the enterprise team with rich BIM engineering practice.

3. The Status of BIM Technology Teaching in Foreign Universities

Foreign colleges and universities set up BIM courses mainly in the following three forms.

3.1 BIM Teaching in a Single Course

West Illinois University has conducted residential and commercial design courses for undergraduate students in construction management using Autodesk Revit. The 17-week course begins with software basics, intervening in guidance on building structures, building materials, and design methods. Eventually the student completes their project presentation. Worcester Polytechnic Institute that applied BIM to civil and environmental engineering courses, as well as more schools such as the Massachusetts Institute of Technology, Texas A & M University, etc., opened BIM course in the design course. This form that is always dominated by the main course with the supplement of BIM technology enable students to understand the basic knowledge and key concepts of the BIM software using, at the same time, will not to focus on the software itself.

3.2 BIM Teaching in a Series of Courses

Unlike professional settings in China, In foreign universities, construction, engineering management and other professional are often set up in the College of Architecture. As a result, many schools set up BIM courses in a series of related courses in architectural design, construction, and management for the role of BIM throughout the project's life cycle. The subject of the BIM course at Auburn University includes topics such as architecture, structure and MEP (including equipment, electrical and water supply and drainage) models, general plans, budget templates and the establishment of the project implementation plan, as well as the knowledge associated with animation and project presentations. This form runs through the curriculum related to the architectural design and construction process, and the role of BIM is fully realized. Students' understanding of the technology and construction process is also more profound.

3.3 BIM Teaching in the Integrated Design Studio

At the College of Architecture at Delft University of Technology, the studio has been organized with BIM for building integrated design. Unlike domestic design students who focus exclusively on architectural design, each role in the studio is randomly assigned and assigned to the architectural design, the structural design of the students and equipment design. Hired lecturers include industry experts from different fields of expertise, who are responsible for simple knowledge and software training to ensure the completion of the project. This form of teaching that build the design phase of the professional interdisciplinary simulation platform is conducive to stu-

dents to understand other professional design principles, and deeply understand the role of BIM in the multi-professional collaborative design, so that they can understand the essential difference between the three-dimensional design and two-dimensional drawing.

4. Suggestions on BIM Technology Teaching of Chinese Universities

In the 1980s, CAD computer-aided design changed the traditional way that architects used specific language and symbols to express building components, but did not fundamentally change the way expressed by symbols. When the construction project becomes more complex and flow, this geometric-based expression is gradually unable to meet the requirements. But BIM technology is different. It is object-oriented expression that can support more complex form and more areas of work, including the complete information of the building information model to provide the platform of information exchange and sharing for all aspects of the project stakeholders, which have brought a transformational impact not only to the designer, but also to the construction enterprises, owners, government departments .

Although there are a lot of papers and research on BIM technology, but how to carry out in the field of teaching, there are not recognized teaching plans and methods either at home or abroad. In this context, for the characteristics of BIM technology and learning from foreign advanced BIM teaching Experience, the domestic of BIM teaching can focus on the next three points combined with China's university architecture disciplines set.

4.1 Design Course Teaching Integrating BIM Information Flow

BIM teaching abroad is always carried out in conjunction with professional courses. The teaching focuses on its own attributes and avoids avoided as an extension of computer-aided drawing. For domestic architecture students, the biggest change brought by BIM technology is the upgrade of the way of design thinking and the simplification of the design process.

Compared with the traditional design process, the application of BIM technology allows the designer to change the original method, which is to transform the design platform between 2D drawings and 3D models. This approach thinking directly on the three-dimensional platform from the beginning of design focuses on the program itself; also because the BIM technology integration class including

a variety of performance simulation software, make the program optimization seamlessly spliced into the design process; at the same time, BIM model can achieved data linkage, and can be output directly, saving the process of drawing and three-dimensional expression, so that the design time can be greatly increased. Therefore, that BIM technology assist the design in the design class should always be the focus of the architectural faculty to carry out BIM teaching.

4.2 Multi-Professional Integrated Teaching

BIM is not just BIM of the design, but a large part of its application potential is in other related professional out of design. BIM teaching abroad keep more emphasis on the BIM application experience in the field of construction professional, not just keep BIM as a goal to achieve. In order to achieve this goal, based on the concept of BIM, integrating BIM related courses should be the focus of teaching. In China, due to the limitations of university disciplines, architecture, structure, water heating equipment, project management are generally located in different colleges with low interoperability. Therefore, it is necessary to break the barriers between professionalism and realize the multi-disciplinary integrated teaching and encourage the combination of stakeholder roles in the project. This form enables students to understand the design principles of the relevant professional, to understand the technical support provided by BIM for collaborative design, and to adapt quickly to the new construction employment environment after work.

4.3 Life Cycle Simulation Teaching

It can be seen that the owners initiate the commission in the traditional project organization and are responsible for coordinating the connection between the designer and the builder. This way of doing business to a certain extent hindered the exchanging and reading of information between each other. The building information model built by BIM technology provides a single, accurate, dynamic, continuous, building information database for project stakeholders, and users in all areas can read their own information in the model and add professional information to ensure the accuracy of the project delivery results and consistency, but also makes the BIM can play a role in the design cycle, the construction cycle and the management cycle. Therefore, the conditional construction institutions can cooperate with well-known enterprises, take the "actual project + software simulation" approach, and organize students to BIM life cycle simulation teaching. The accumulation of practical experience based on BIM technology

will let them better understand BIM application strategy and think about the challenge of BIM to the construction industry future.

5. Conclusion

In recent years, the application of BIM has grown rapidly. The construction projects of BIM has the following characteristics: architectural design quality, construction quality and labor productivity have been significantly improved; the economic benefits of building enterprises have been significantly improved due to a significant reduction in rework and waste, and a decline in construction costs. China's government has been pushing for the development of BIM, which has revealed that BIM will have a revolutionary impact on the construction industry. Ultimately, the new construction system using BIM will replace the old construction industry, leading the construction industry into the new BIM era. It is expected that BIM will also have a tremendous impact on architectural education.

Due to the lack of a large number of teachers who know BIM technology, it should pay attention to the training of young teachers. The architecture colleges and

universities should attach importance to this issue, using a variety of forms to strengthen the training of teachers. The focus of training is especially the architecture design teacher, so that they learn BIM design software to guide students.

BIM's goal is to support a wider range of work. We can take use of BIM technology in the city planning, architectural design, schedule control, visual simulation and other aspects, can also guide students through the team of professionals with the work to explore the software innovation. This is a great way to enhance their understanding of BIM technology and make better use of BIM technology.

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