The exploration and practice of BIM technology in the teaching reform of civil engineering courses in higher vocational colleges

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Abstract. The information wave has promoted social development, but also promoted a lot of technological innovation. BIM technology is based on the development of computer information technology, virtual simulation of the building entity, so that its digital presentation. The three-dimensional visualization model established by BIM technology can comprehensively display the structural requirements, reinforcement configuration and other parameters of building columns, beams, plates, walls and other components in a three-dimensional way. It is convenient to calculate the steel bar and concrete engineering quantity accurately and compile the project valuation documents. This paper takes the course "Measurement and Valuation of Construction Engineering" as an example, with the help of Glodon BIM software to help the teaching, deepen the teaching reform, and provide reference for the peers.

1 Introduction

BIM (Building Information Modeling) is the building information model, which is an engineering data model based on information technology and integrates various related information of construction projects, and is the digital expression of the entity and functional characteristics of construction project facilities. Its development is divided into three stages: primary stage, intermediate stage and advanced stage. The primary stage is mainly used for design, modeling cost calculation, collision detection and other special applications. Intermediate stage is mainly used in design, construction integration, management, operation and maintenance and other systematic application stage; The advanced stage reflects the construction, operation and maintenance of smart cities and other smart applications. Currently, the BIM technology in our country is in the primary stage from the cognition, understanding and popularization of the concept and gradually transitioning to the intermediate stage of systematic application.

The course "Measurement and Valuation of Construction Engineering" is the core course of the major of construction engineering technology and engineering cost in higher vocational colleges, which is highly practical. The teaching goal is to study this course, can carry out engineering quantity calculation, engineering valuation, mainly train in the

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engineering cost, construction, project management company and other departments engaged in construction budget, bidding and bidding documents compilation and other aspects of senior technical personnel. In the teaching process, according to the project drawings, Glodon BIM civil engineering measurement platform and cloud pricing software are used for modeling calculation and pricing, which can greatly improve the accuracy of engineering measurement and pricing.

2 Application characteristics of BIM technology

BIM technology is a tool to build a three-dimensional architectural model according to the engineering data information of project drawings. Its essence is to use software to establish a two-dimensional model of engineering project through point, line and surface, and carry out three-dimensional presentation of the model. With the help of digital technology, a complete and accurate engineering model consistent with the building entity is provided for the entire construction project to complete the integration and sharing of building information model.

At the same time, through the BIM database, the computer can quickly carry out statistical analysis of various components, greatly reduce the manual operation and potential errors, easy to achieve the engineering information and the design scheme is completely consistent. The accurate engineering quantity statistics obtained through BIM can be used for cost estimation in the preliminary design process and the engineering quantity budget before the construction and the engineering quantity final accounting after the construction.

2.1 Integrity of model parameters

BIM software not only makes attribute editing and parameter description for building foundation, wall, column, beam, board, roof and other components according to project drawings, but also includes complete engineering information description, such as project name, information of participating units, structure type, material attribute, engineering use, engineering characteristics and other basic design parameter information. It can fully reflect all the information of the construction project.

2.2 Correlation of model attributes

All components in the 3D model established by BIM software are automatically identified and interrelated. The software identifies and checks all parameters of each construction of the building model, screens out the wrong and missing items, further summarizes and calculates, and forms the corresponding model and engineering quantity calculation report. If the attributes of a component in the model are modified, the attributes of all components associated with it in the corresponding positions of other graphs will also be automatically changed, and the calculated data of the engineering quantity report will be automatically updated.

Thus, it can be seen that using BIM software to establish a calculation model for engineering quantity calculation, not only can save time, but also can check whether the parameters of components are correct, to achieve the purpose of automatically checking the attributes of components.
2.3 Unity of model attributes

In different stages of the whole life cycle of a construction project, such as design, construction, operation and maintenance management, the attributes of the BIM model are always consistent, and the parameters of the same component do not need to be edited repeatedly in different stages. The parameter attributes of each component in the model only need to be modified or extended in different stages of construction projects without re-establishment, which avoids the problem of inconsistent component attributes.

3 Application of BIM technology in the course teaching of building engineering measurement and valuation

3.1 Selection of project cases

According to the course content and teaching standards, the case teaching method is adopted. The selected project case is: the construction project of an employee dormitory. Project description: the construction area is 1107.91m², the building has seven degrees of seismic fortification, the structure form frame structure, the civil building engineering design grade 3, and the building design service life is 50 years. The building has three layers. The height of the first ~ third layer of the building is 3.30 meters. The total height of the building starts from the outdoor natural floor to the roof cornice 10.350 meters, and the indoor and outdoor height difference of the building starts from the outdoor natural floor to the indoor 0.450 meters. Indoor environmental pollution control class is Class II, mainly used for dormitory, project No. 2019J-98.

3.2 Creating a project

First of all, according to the engineering drawings, create the project by using the BIM civil engineering measurement platform, edit the engineering information, the project overview, the number of floors, the storey height setting, the property editing of reinforcement and concrete materials, and complete the engineering information setting and the establishment of the shaft network.

Secondly, the foundation, column, beam, plate quantity calculation, this part of the quantity calculation is the weak link of learning, students because of the lack of engineering practice experience, no intuitive perceptual understanding, can not correctly understand the geometric characteristics of the component, more can not correctly read the structure of the construction drawing of the reinforcement configuration and anchorage, lap. According to the drawing calculated steel and concrete engineering quantity deviation is large.

The foundation is modeled by using the civil construction measurement platform of Guanglian BIM. Through 360 degree rotation of the model, the actual state of the foundation is presented in three dimensions. The parameters and attributes of the reinforcement configuration of the foundation as well as the requirements for the lap and anchorage of the details are randomly checked from different angles and different parts, and all geometric characteristics of the foundation are visually displayed in an all-round way without dead corners. Help students correctly read the basic construction drawings, establish three-dimensional space model, greatly change the students' cognition of "boring, obscure" learning content, reduce the deviation of engineering quantity calculation.

In the study of the structure of the main stress component column, beam, plate reinforced concrete engineering calculation, reinforcement engineering calculation is the priority among priorities, but also difficult, and the correct reading structure construction...
drawing is the premise of accurate calculation of engineering. The traditional construction drawing of building structure is composed of point, line and surface elements. Students often cannot correctly read the structure construction drawing. In order to understand the construction drawing, they must have strong basic professional knowledge, or need experienced construction technicians to interpret and disclose. BIM technology converts 2D drawings into 3D visual virtual models, making point, line and surface elements in drawings virtually displayed as solid components such as foundation, wall, column, beam and board, greatly reducing the difficulty of reading structural construction drawings, cultivating students’ spatial imagination and thinking ability, and reducing the difficulty of reading drawings.

In practical operation, the structure model of column, beam and plate is established by using the civil construction measurement platform of Guanglian BIM (Figure 1). From different dimensions, it can be seen in detail whether the configuration of steel bars in the construction of column, beam and plate structure meets the design requirements of the construction drawings, and whether the link mode, joint position, joint length and anchorage requirements of steel bars meet the standards and specifications. Whether the deduction and increase are correct in the calculation of steel bar engineering quantity.

![Structure model of column, beam and plate.](image)

**Fig. 1.** Structure model of column, beam and plate.

### 3.3 Timeliness and convenience of project pricing documents

Project pricing is affected by regional differences, quota prescription, government pricing and material market price fluctuations. Moreover, students have not been exposed to the construction industry market and do not understand the basic cost information of engineering projects and the policies and regulations of project pricing issued by the
government and related industries. Therefore, it is difficult for students to make the pricing documents to be operable.

The Glodon BIM cloud pricing platform can be used to update the price of materials in real time and inquire the relevant provisions of the latest pricing policy; It can timely reflect the price information changes of labor, materials and machinery platforms in the industrial market of various regions and the requirements of the pricing documents issued by relevant government departments, so as to ensure the timeliness and market competitiveness of the project pricing documents compiled.

4 Conclusion

In order to solve the difficulty of calculating the quantity of structural construction drawing, crack the difficulty of reading structural construction drawing, correctly calculate the quantity of reinforced concrete and compile the engineering valuation document in the course of "Measurement and valuation of Building Engineering".

The BIM technology is organically integrated with the identification and calculation of structural construction drawing, and the three-dimensional model of construction drawing of building structure is established through BIM technology to display the configuration parameters of steel bars in structural components in detail. The previous single 2D drawing is transformed into a three-dimensional teaching mode based on information technology to display the solid model of building and enrich the image, which ADAPTS to the needs of contemporary information and digital development.

Reference

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