

Application of BIM Technology Based on Big Data Analysis in Autonomous Learning of Civil Engineering Teaching

Ya Qin

chongqing vocational institute of engineer, chongqing, 400039, China
qinya816@163.com

ABSTRACT

In the information age, big data, an important modern information technology, has been developed rapidly and has realized the penetration into many fields. The higher education is one of them. In the view of big data, the civil engineering course teaching in Colleges and universities must take the way of intelligent and information development, strive to improve the teaching quality and make the teaching and the development of the times synchronous. Therefore, colleges and universities must carry out teaching reform, explore the effective application of BIM Technology in the view of big data, and strive to achieve the training goal of high-quality civil engineering talents. This paper mainly from the big data perspective, expounds the two concepts of big data and BM technology, discusses the specific strategies of effective application of BIM Technology in civil engineering course teaching, hoping to provide valuable reference for teachers.

Keywords: Big data perspective; BIM Technology; Civil Engineering Teaching

1 INTRODUCTION

In the information society, information literacy has become one of the most popular and necessary abilities in the information age. The information literacy of students is becoming more and more important in the comprehensive quality of students. Without the information-based teachers, there will be no information of education. The new changes in the field of construction investment and the new transformation of production mode have the following characteristics: Informatization - digital, visualization, "digital construction", "intelligent manufacturing"; standardization of "module" thinking, "standard I quasi construction"“ Craftsman spirit - the new requirement of architectural talents, "compound type and specialization". Informatization can promote the transformation of educational ideology and teaching mode, promote the development of quality education, cultivate innovative spirit, be suitable for exploratory learning, stimulate learning interest, change the defects of traditional education and teaching, and it is the way of quality education and innovative education[1].

Among many modern information technology, there is a high degree of consistency between big data technology and civil curriculum teaching. If we can start from the big data perspective and discuss the reform strategy of civil course teaching, then teachers will effectively improve the teaching level of civil engineering courses and better achieve the teaching goal of training high-quality

applied civil engineering professionals[2]. BIM Technology, as an information technology which constructs building model by three digit, has significant significance for the realization of informatization in civil engineering teaching. Therefore, teachers must combine the concept and connotation of big data technology to explore the strategies of using BIM Technology to carry out civil course teaching efficiently, and strive to realize the deep integration of information technology and curriculum teaching to the maximum extent[3].

2 RELATED WORK

Zhonghui Liu et al.[4] proposed optimization of intelligent heating ventilation air conditioning system in urban building based on bim and artificial intelligence technology. Xinhua Wu[5] proposed wireless management system of prefabricated construction materials based on BIM technology. Jianhong Xu[6] proposed truss construction of green fabricated steel structure based on BIM intelligent technology. Biman Kanti Nath et al. [7] proposed a partially backlogged two-warehouse EOQ model with non-instantaneous deteriorating items, price and time dependent demand and preservation technology using interval number. Ivan Mutis et al. [8] proposed the bimbot: mediating technology for enacting coordination in teamwork collaboration. Xiaojing Ding et al. [9] proposed construction cost management strategy based on BIM technology and neural network model.

This paper consists of the following parts. The first part introduces the related background and significance of this paper, the second part is the related work of this paper, and the third part is data analysis. The fourth part is example analysis. The fifth part is conclusion.

2.1 Big data

The key to understand the concept of "big data" lies in grasping the meaning of "big". The "big" here refers to not only the large amount of data in the data set, beyond the scope of the analysis and mining of the general data processing methods and data processing software, but also refers to the large and complex data types in the data set. We can understand "big data" as follows: big data refers to a large number of data sets with complex types of data, and it can not be effectively analyzed by traditional data processing methods. Because big data technology realizes the efficient grasp of a large number of complex data, it can be used in many fields, and it can be used to deal with and analyze the data in different fields[4].

Big data technology and application have gradually become the basic strategic support of the country. The development and evolution, policy system, park construction and talent training of China's big data industry, studied and formulated the hot spot layout of big data development in the fields of software and hardware products, infrastructure and services, combed the three levels of big data industrial ecology, and focused on the new trend of big data industry development. The integrated application of AI technology has become a new method to break through the bottleneck of data governance: at present, data security, personal privacy protection, data transaction and data confirmation have become important contents of data management. Around data transaction, China has explored the transaction carrier, mechanism and technology, and accumulated some experience in realizing data pricing and data confirmation. Improving service efficiency and promoting governance process have become the focus of the new application of government big data: the development of government big data business in China can be roughly divided into four stages: the information construction period "2010" to accelerate integration. Government data aggregation and integration 2014-2016".

"Industrial big data + industrial Internet" has jointly established a new green and low-carbon industrial system: in the future, we should further promote the application of a new generation of information technology represented by industry in R & D and design. Improving work efficiency and innovative methods are the new value of the smart party building big data platform:

the application of the smart party building big data platform is the innovation of the concept and working mode of Party building, which can improve Party building. Through data, industry knowledge of algorithms and models, business process data, algorithms and models, install "intelligent brain" system for the whole manufacturing system to form the ability of dynamic perception, agile analysis, overall optimization and intelligent decision-making[5].

It is clearly pointed out that "adhering to innovation driven development, accelerating big data deployment and deepening big data application have become the internal demand and inevitable choice for stable growth, promoting reform, adjusting structure and benefiting people's livelihood. The modernization of government governance capacity" is emphasized "Promote the development and application of big data, establish a new social governance mechanism of precise management and multi-party cooperation in the next 5 to 10 years, build a new operation mode and a new system of serving the people, open up a new pattern of people-oriented and benefiting the whole people, and cultivate high-end intelligence and a new ecology of emerging and prosperous industrial development".

Data security is the basic foundation of the development of digital economy.

2.2 BIM Technology

BIM Technology belongs to modern information technology, which is based on the calculation and the construction of building model by using three-dimensional digital. The building model constructed by BIM Technology has the same or similar characteristics as the real building because of the digital information simulation processing[6], which can simulate the real situation of the building more ideal, and provide convenience for the teaching of various modules such as the architectural engineering planning, the architectural engineering design and the construction engineering construction in the course teaching of Wang Mu. Because the theoretical knowledge involved in civil engineering course is usually abstract and difficult to understand, teachers can effectively improve the vividness of civil course teaching by applying BIM Technology. Because BIM Technology is mainly carried out by digital simulation, there is a high degree of consistency with big data technology. From the perspective of big data, the application strategy of BIM Technology is discussed, which is conducive to promoting the development of civil course teaching towards information.

The concept of BIM Technology Collaborative integration is highly integrated with the idea of integrated construction of prefabricated buildings. The integration of

informatization and industrialization promotes the integrated construction of assembly building. The realization of "integration of design, production and installation" of assembly building requires the application of BIM information technology in the process of design, manufacturing and components.

Based on the sharing and collaborative core value of BIM, under the EPC project general contracting model, with the schedule as the main content and the BIM model as the carrier, the on-site assembly information is shared and integrated through design information and factory production information. BIM information management of prefabricated buildings is based on the building information model as the information source of the project, combined with ERP resource allocation plan at the enterprise level, Internet of things technologies such as cloud technology and RFID and mobile terminal technology to collect and serve the integrated whole process management of EPC project general contracting mode. Build an integrated information management platform based on BIM and a comprehensive information management system platform based on BIM. Information management of EPC project construction. Complete BIM model information and enterprise information related to engineering construction are required as basic data support. Promote the application of BIM Technology in the design and construction of prefabricated buildings, and develop and promote BIM components from the whole information sharing and linkage system of deepening design, factory construction and on-site installation. By the end of 2023, a complete automatic production platform for component models will be established, and efforts will be made to realize the automatic production of receiving component models in more than 50% of the component manufacturing plants in the city.

Deepen the integration of BIM Technology and green energy-saving buildings, study the design, analysis and evaluation algorithms based on BIM, and develop relevant analysis and evaluation software for energy-saving and green buildings. Encourage and support enterprises to make full use of the network performance and computing power driven by 5g and cloud computing to enhance the user experience of BIM Technology; Through the deepening application of BIM Technology, the design and construction efficiency and management level of new infrastructure projects are improved. The technical directors of installation industry associations from provinces and cities in China and nearly 300 representatives of more than 120 companies gathered together to share the exchange results of intelligent construction and new industrialization technologies and the application achievements of BIM Technology, and jointly seek the road of enterprise digital transformation[7]. BIM

Technology, namely building information model construction technology. The theme of this meeting is "BIM gives wisdom and creates the future", which aims to promote the in-depth application of BIM Technology in the installation industry, exchange intelligent buildings and new industrialization technologies, and promote the progress of Industrial Science and technology.

3 DATA ANALYSIS

3.1 *application of BIM Technology to explain the theoretical knowledge of civil engineering course in depth*

By applying BIM Technology, teachers can directly transform the theoretical knowledge of civil engineering course with high abstraction, effectively enhance the vivid and interesting of curriculum teaching, help students better understand the basic theoretical knowledge of civil engineering course, and enable students to construct a complete soil and wood theoretical knowledge system. Specifically, teachers can use BIM Technology to carry out the following aspects of teaching: (1) the application of BIM Technology to carry out engineering drawing teaching. Compared with the traditional application of CAD software to carry out engineering drawing teaching, BIM Technology has the advantages of strong intuition and easy to understand, which can make students feel the existence of architecture in space directly, so as to deepen the students' perception and imagination ability of architectural spatial structure and enhance the students' spatial stereoscopic sense. For example, teachers can use BIM Technology to develop the teaching of building profile drawing, and guide students to build digital model of building profile by using BIM Technology, improve students' spatial perception ability and improve students' understanding and grasp of the internal structure of the building (2) The application of BIM Technology to carry out the teaching of building design: the teaching of housing design belongs to a class of courses with great difficulty and high complexity in civil engineering course, involving many scattered and complex building structures. Therefore, if the teaching method of one-way instilling is followed, it will not be able to effectively help students master the relevant requirements and standards of housing design theory. The application of BIM Technology can effectively change this situation, and can transform the complex housing design theory into a specific image, so as to improve the students' understanding of the internal structure of the house: (3) the application of BIM Technology to carry out the teaching of construction organization design: teachers can also use BIM Technology to

carry out construction organization teaching, Using BIM Technology to simulate the various objects needed in the construction, teachers can effectively present the complex links and strict construction logic in the construction process, and help students grasp the construction as a whole.

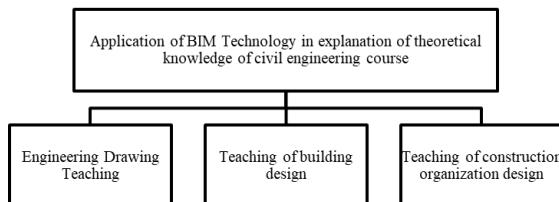


Fig. 1. Application of BIM Technology in explanation of theoretical knowledge of civil engineering course

3.2 apply BIM Technology to cultivate students' corresponding practical ability in civil engineering course

In the course of civil engineering teaching, teachers should help students to form a solid grasp of theoretical knowledge, but also need to improve their practical application ability, so that students can truly achieve learning and practical use, so as to smoothly go to relevant jobs in the future. Specifically, teachers can apply BIM Technology to cultivate students' following aspects of ability: (1) basic ability. Basic ability is the ability that every civil engineering major student should grasp firmly, mainly including engineering budget, project budget, building seismic design, architectural concrete structure design and other abilities. If the basic ability of students is not up to standard, then students will be difficult to grasp other advanced abilities smoothly and apply BIM Technology. Teachers can effectively cultivate students' basic ability. For example, when the first mock exam is carried out in the teaching of housing concrete structure design, in order to intuitively show the distribution and structural characteristics of concrete in the building, teachers can apply BIM technology to build the three digit digital model of buildings, and apply this model to enable students to form a full grasp of concrete structure, so that students can understand the concrete application methods of concrete in the housing structure. The results provide a good foundation for them to apply relevant skills to design concrete structures in the future (2) Post ability. Compared with basic ability, post ability is highly comprehensive. In order to be able to take on the relevant post of civil engineering, teachers must improve students' ability of comprehensive application of relevant computer software. For example, an important ability of civil engi-

neering related posts is the ability to analyze the building structure by using computer software. Teachers can present real analysis cases by using BIM Technology to enhance teaching practicality, let students feel the specific application value and application field of main wood engineering expertise and skills, and promote students to master scientific analysis steps, Then they should strengthen their ability to analyze and grasp the structure of the building[8]: (3) practical ability. Practical ability is an important ability that teachers need to cultivate students in the teaching process. With BIM Technology, teachers can also effectively improve students' practical ability. For example, when guiding civil engineering students to carry out graduation design, teachers can let students first use BIM Technology to establish a three-dimensional model of the target design building, then comprehensively analyze the three-dimensional model established by themselves, grasp its characteristics comprehensively, and then complete graduation design practice, so as to improve the quality of graduation design.

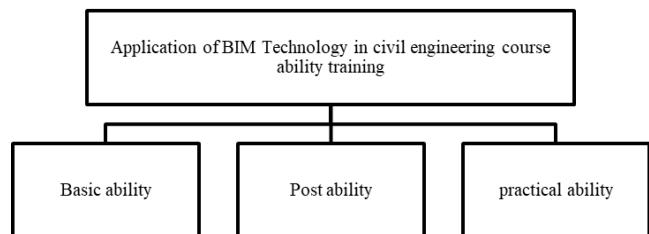


Fig. 2. Application of BIM Technology in civil engineering course ability training

4 EXAMPLE ANALYSIS

From the perspective of big data, teachers should also improve the teaching methods of civil engineering course, introduce the innovative teaching method of project integration teaching method, and realize the deep integration of project integration teaching method and BIM Technology Application, so as to better carry out theoretical knowledge explanation and ability training. The so-called project integration teaching method is to extract the project theme from the target teaching content, then design specific project tasks around the extracted project theme, and then let students get the practical solutions of project tasks through independent thinking and group discussion, so as to effectively cultivate their good habit of autonomous learning and comprehensive practical ability ° ° . Using BIM Technology, teachers can restore the real architectural situation as the background of project teaching. Situational teaching

can make students have a better learning experience, mobilize students' learning initiative, and enhance students' interest in the main wood course. For example, in the teaching of architectural engineering drawing, teachers can use BIM Technology to present the specific architectural conditions represented by different engineering drawings for students[9], so as to create a project teaching situation, so that students can deeply think about engineering drawing and carry out corresponding autonomous learning, and then let each learning group try to carry out engineering drawing independently, In order to fully mobilize the students' learning initiative, and promote them to form a good habit of autonomous learning. In addition, teachers can also design and arrange some BIM related assignments to enable students to independently apply BIM Technology to complete the building digital model modeling work, so as to further improve students' ability to grasp the building structure, and enable students to effectively master BIM Technology, an important civil engineering related design auxiliary technology, To cultivate students to form a good habit of BIM Technology in civil engineering design, so as to enhance the accuracy of their architectural design and improve their architectural design ability. The concept of BIM Technology Collaborative integration is highly integrated with the idea of integrated construction of prefabricated buildings. The integration of informatization and industrialization promotes the integrated construction of assembly building. The realization of "integration of design, production and installation" of assembly building requires the application of BIM information technology in the process of design, manufacturing and components.

Based on the sharing and collaborative core value of BIM, under the EPC project general contracting model, with the schedule as the main content and the BIM model as the carrier, the on-site assembly information is shared and integrated through design information and factory production information. BIM information management of prefabricated buildings is based on the building information model as the information source of the project, combined with ERP resource allocation plan at the enterprise level, Internet of things technologies such as cloud technology and RFID and mobile terminal technology to collect and serve the integrated whole process management of EPC project general contracting mode. Build an integrated information management platform based on BIM and a comprehensive information management system platform based on BIM. Information management of EPC project construction. Complete BIM model information and enterprise information related to engineering construction are required as basic data support. Promote the application of BIM Technology in the design and construction of prefabricated buildings, and develop and promote BIM components from the whole information sharing and linkage system of deepening design, factory construction and on-site installation. By the end of 2023, a complete automatic production platform for component models will be established, and efforts will be made to realize the automatic production of receiving component models in more than 50% of the component manufacturing plants in the city.

Deepen the integration of BIM Technology and green energy-saving buildings, study the design, analysis and evaluation algorithms based on BIM, and develop relevant analysis and evaluation software for energy-saving and green buildings. Encourage and support enterprises to make full use of the network performance and computing power driven by 5g and cloud computing to enhance the user experience of BIM Technology; Through the deepening application of BIM Technology, the design and construction efficiency and management level of new infrastructure projects are improved[10]. The technical directors of installation industry associations from provinces and cities in China and nearly 300 representatives of more than 120 companies gathered together to share the exchange results of intelligent construction and new industrialization technologies and the application achievements of BIM Technology, and jointly seek the road of enterprise digital transformation[11]. BIM Technology, namely building information model construction technology. The theme of this meeting is "BIM gives wisdom and creates the future", which aims to promote the in-depth application of BIM Technology in the installation industry, exchange intelligent buildings and new industrialization technologies, and promote the progress of Industrial Science and technology. Example analysis is shown in Fig 3.

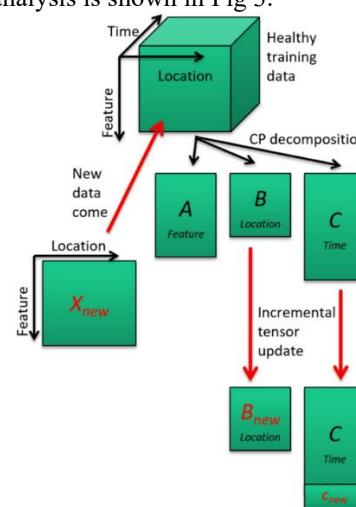


Fig. 3. Example analysis

5 CONCLUSION

The core of the transformation and upgrading of construction enterprises is digital integrated management. There are two trends of transformation and upgrading: pay more attention to hard specialty + soft specialty; Pay more attention to "brain + computer". Taking the curriculum reform of civil engineering technology as an example, this paper discusses the specific implementation process. Theory guides practice, and then verifies theory through practice, so as to unify theory and practice. The results are universal and can be popularized, which makes the science and feasibility highly unified. Specifically, from the perspective of big data, teachers can mainly apply BIM Technology to explain the theoretical knowledge of civil engineering courses, to cultivate students' practical ability, and to arrange project assignments for students. Teachers should actively update their teaching ideas, summarize the teaching experience, and strive to explore a better BIM Technology Application Mode, so as to achieve the goal of cultivating high-quality applied civil engineering talents.

REFERENCES

- [1] Liu Zejun, Zhang Zhengkai, Zhao Jun, et al. Application of BIM Technology in civil engineering teaching from the perspective of big data [J]. Strait science and technology and industry, 2016 (10): 140-141
- [2] Wang Jiahui. Application of BIM Technology in civil engineering teaching from the perspective of big data [J]. science and information, 2017 (19): 21
- [3] Wang Xiaoying, Xiang Lin. discussion on the application of BIM Technology in civil engineering teaching from the perspective of big data [men. Nanfang agricultural machinery, 2018 (21): 237
- [4] Zhonghui Liu, Gongyi Jiang:Optimization of intelligent heating ventilation air conditioning system in urban building based on BIM and artificial intelligence technology. Comput. Sci. Inf. Syst. 18(4): 1379-1394 (2021).
- [5] Xinhua Wu:Wireless management system of prefabricated construction materials based on BIM technology. EURASIP J. Wirel. Commun. Netw. 2021(1): 116 (2021).
- [6] Jianhong Xu:Truss construction of green fabricated steel structure based on BIM intelligent technology. Int. J. Crit. Infrastructures 17(1): 54-70 (2021).
- [7] Biman Kanti Nath, Nabendu Sen:A partially backlogged two-warehouse EOQ model with non-instantaneous deteriorating items, price and time dependent demand and preservation technology using interval number. Int. J. Math. Oper. Res. 20(2): 149-181 (2021).
- [8] Ivan Mutis, Adithya Ramachandran:The Bimbot: mediating technology for enacting coordination in teamwork collaboration. J. Inf. Technol. Constr. 26: 144-158 (2021).
- [9] Xiaojing Ding, Qiulan Lu:Construction cost management strategy based on BIM technology and neural network model. J. Intell. Fuzzy Syst. 40(4): 6669-6681 (2021).
- [10] Bayu Utomo, Achmad Teguh Wibowo, Mujib Ridwan, Muhammad Andik Izzuddin, Agustinus Bimo Gumelar, Sirajul Arifin:Enhanced of Attendance Records Technology used Geospatial Retrieval based on Crossing Number. Int. J. Interact. Mob. Technol. 14(16): 101-116 (2020).