International Education Forum, 2025, Volume 3, Issue 7
http://ojs.bbwpublisher.com/index.php/IEF
Online ISSN: 2981-8605

Research on the Application of Progressive Project Teaching Method in BIM Technology Course

Yue Han*

College of Hydraulic and Architectural Engineering, Tarim University, Alaer 843300, China

**Author to whom correspondence should be addressed.*

Abstract: Against the backdrop of the development of building informatization, the innovation and reform of the teaching mode of the BIM technology course, as an important means to cultivate the practical ability of professional talents, has become an important link in the related education field. Based on this, the paper will, from the perspective of BIM technology course innovation, deeply analyze the application strategies of the progressive project-based teaching method in this paper, hoping to provide some references and assistance to readers.

Keywords: Progressive project-based teaching method; BIM technology courses; Teaching reform

Online publication: August 7, 2025

1. Introduction

With the rapid development of digital technology in the country, digital transformation centered on BIM has become an inevitable trend for innovation and development in the construction industry. In the "14th Five-Year Plan for the Development of the Construction Industry", the Ministry of Housing and Urban-Rural Development of China explicitly proposed to comprehensively promote the informatization of the construction industry and cultivate compound talents with the ability to apply BIM technology. In this context, the teaching quality of BIM technology courses in colleges and universities, as the core carrier of talent cultivation, has a direct connection with the effect of professional talent cultivation. How to effectively solve the problems existing in the current teaching of BIM technology courses has also become a key question for every teacher to think about [1].

2. The application value of the progressive project-based teaching method in BIM technology courses

2.1. Meet the industry's talent requirements

During the critical period of digital transformation in the construction industry, the requirements for BIM

technology talents in related industries have gradually shifted from single-skill operation in the past to full-cycle application and collaborative management of technology. This demand can be met through a graduate project design by integrating progressive project-based teaching methods into talent development.

In progressive project-based teaching, teachers can break down teaching tasks into three stages: "basic projects", "comprehensive projects", and "innovative projects", thereby achieving the refinement and splitting of industry demands. In the "basic project", students can master the core operational logic of BIM software by modeling individual residential buildings; The "integrated project" requires students to use various commercial complexes as a carrier to achieve a full-process practice from building structure to mechanical and electrical coordination. During this process, students can further understand the working mechanism of each specialty under the BIM platform to ensure the smooth progress of future coordination and cooperation [2]. In the "Innovation Project", teachers can introduce more real engineering problems in teaching, such as node optimization of complex and irregular structures or component disassembly of prefabricated buildings, and require students to use BIM technology for scheme innovation and cost optimization. Under this teaching model, students can achieve practical training that would otherwise require a complete engineering project through course learning. Students trained through this method also have a significantly higher rate of meeting job skill standards after graduation compared to those trained under the traditional teaching model [3].

2.2. Breaking through the barriers of traditional teaching

Under the traditional teaching model, BIM technology courses often find themselves in a dilemma of disconnection between theory and practice. This is because teachers mostly impart knowledge centered on the textbook, and students passively accept abstract modeling rules and software operations, making it difficult for them to truly understand the application logic of the technology in actual engineering. The progressive project-based teaching method, with real projects as the carrier, breaks down the teaching content into advanced project tasks. In the process of completing the modeling of individual buildings to the collaborative design of complex complexes, students actively construct a knowledge system, breaking the disconnection between theory and practice [4].

In terms of teaching methods, the traditional model of teacher-centered, lecture-based teaching suppresses students' initiative and creativity. Students have difficulty obtaining personalized learning experiences in the fixed teaching process. The progressive project-based teaching method emphasizes the dominant position of students. As project leaders, teachers encourage students to identify problems and conduct independent exploration during the project implementation. When encountering pipeline integration optimization problems in a project, students need to actively consult specifications and try different solutions. This immersive learning approach not only enhances practical skills but also nurtures innovative thinking and problem-solving skills, breaking the constraints of traditional teaching on students' initiative [5].

2.3. Activate innovative thinking cultivation

Progressive project-based teaching has unique value in BIM technology courses for activating innovative thinking. In traditional teaching, students often complete modeling tasks according to fixed procedures, and their thinking is confined within the framework of standardized operations. For example, when replicating models according to drawings, they only focus on software command execution and ignore design logic innovation. However, progressive project-based teaching guides students to break through conventional

thinking patterns through the design of open-ended project tasks. For example, when setting the theme of "Green Building BIM Application" in the project, students need to independently explore the interaction mode between the energy consumption analysis model and the building structure model. When solving problems such as "how to optimize the natural ventilation path through BIM", they need to break away from the traditional modeling thinking and integrate building physics knowledge with BIM technology. This exploration process can activate the budding of students' innovative thinking [6].

This teaching method provides a stepwise development space for innovative thinking through the progressive setting of project difficulty. Students face new challenges at each stage, from the parametric component design of basic projects to the construction process innovation simulation of advanced projects, and the operation and maintenance management plan optimization of integrated projects. In construction phase projects, students are required to use BIM technology to simulate new prefabricated construction techniques. Students need to creatively combine the 4D progress simulation of BIM with the component prefabrication process and independently design virtual construction plans. This progressive process from imitation to innovation enables students to gradually develop the habit of innovative thinking in practice. At the same time, the group collaboration model in project implementation also provides ground for innovative thinking. When members discuss pipeline comprehensive optimization schemes or structural design innovation points, the collision of different thinking often gives rise to new solutions. For example, a certain group, when dealing with complex node modeling, proposed an innovative construction method of parametric family libraries through cross-professional perspective integration. This collaborative innovation atmosphere can continuously stimulate students' thinking activity and substantially enhance their innovation ability in BIM technology application [7].

2.4. Optimize the teaching evaluation system

In the traditional teaching evaluation system, the final software operation test or single model assignment is mainly focused on assessing students' mastery of basic commands, while the collaborative ability, scheme optimization thinking, and full-cycle application literacy, which are crucial in the application of BIM technology, such as scoring only based on Revit modeling results, are ignored. It fails to reflect students' actual performance in multi-disciplinary collision detection or construction progress simulation, while the progressive project-based teaching method takes the full cycle implementation of the project as the evaluation carrier, deeply integrates process evaluation with outcome evaluation, and builds a multi-dimensional and stereoscopic evaluation framework [8].

The progressive project-based teaching method enables dynamic tracking and evaluation of students' ability development through phased project task settings. In the basic modeling stage, focus on the accuracy and normativity of students' parametric design of components; In the collaborative design phase, assess their ability to integrate models with team members and their efficiency in resolving conflicts among specialties; In the construction simulation phase, the depth of application of 4D progress and cost linkage analysis is evaluated. For example, in the mid-term project review, not only is the fit between the student's building and structural models examined, but also the innovative solutions proposed for pipeline comprehensive optimization are examined. This phased evaluation can precisely capture the growth trajectory of the student in different ability dimensions. At the same time, the evaluation subjects have expanded from a single teacher evaluation to multiple subjects of "teacher + project mentor + team mutual evaluation." Enterprise mentors can evaluate the constructability of students' models from the perspective of engineering practice, and team members can provide feedback on each

other's communication skills and innovative contributions during the collaboration process, such as during the comprehensive project acceptance. This multi-subject evaluation perspective can more comprehensively reflect students' BIM application capabilities based on the actual operation and maintenance scenarios submitted by the BIM model.

3. Strategies for the application of progressive project-based teaching in BIM technology courses

3.1. Preparatory work: Clearly define the teaching objectives and project hierarchy division

When applying the progressive project-based teaching method in BIM technology courses, the preparatory stage should precisely anchor the direction in terms of teaching objectives and project hierarchy division. On the one hand, teachers need to conduct in-depth analysis of the course positioning and talent requirements, closely combine the requirements of the construction industry for BIM technology talents in dimensions such as modeling ability, collaborative design, and construction simulation, and systematically sort out the course knowledge objectives, such as proficiency in operating core software such as Revit and Navisworks, define the specific ability indicators such as 3D modeling and comprehensive collision detection of pipelines in the skill objectives, while emphasizing the cultivation of quality objectives such as engineering thinking and teamwork. Refer to the complete cycle of actual engineering projects from planning, design, to construction and operation and maintenance, and scientifically break down the teaching content into project modules that conform to the laws of ability growth [9]. On the other hand, a progressive project system is carefully designed and a four-level project framework is constructed: the foundation-level projects focus on single software basic operations such as Revit building/structural model creation, corresponding to the software introduction stage in the early stage of the course, to solidify students' tool application foundation; Advanced projects focus on the collaborative application of multiple software such as Revit modeling and Fuzor rendering, promoting the integration of professional knowledge; Comprehensive projects simulate the entire cycle of a complete engineering project, covering the entire process from scheme design to construction schedule simulation, to enhance comprehensive application and practical capabilities; Innovation-level projects, in combination with industry frontiers such as BIM+VR and smart construction sites, encourage students to independently expand application scenarios and stimulate innovative thinking. By precisely matching teaching objectives with project levels, a scientific framework is established for the subsequent progressive project teaching implementation, ensuring that each project module closely aligns with talent cultivation needs and forms a spiral upward path for ability development [10].

3.2. Teaching implementation: Advance project-based teaching in stages

When implementing project-based teaching in phases, the four-level project system should be the framework, and the teaching should be carried out in an orderly manner according to the logic of ability growth. In the foundation-level project stage, taking the teaching building in "Single building model creation" as an example, students are required to complete parametric modeling of components such as the axis network and walls. In the teaching, the core concepts such as BIM parametric design and the software operation logic are emphasized. The operation proficiency is strengthened through "teacher demonstration—student imitation—error correction and optimization." The standardized process manual and family library template are accompanied, and learning

is standardized by indicators such as model integrity. At the advanced project stage, select cross-disciplinary projects such as "Pipeline integration in Commercial complexes", adopt a group cooperation model, each group is responsible for professional models such as architecture and mechanical and electrical, simulate engineering meetings through collaborative meetings, introduce the BIM collaborative design platform and professional conflict coordination mechanism in teaching, and analyze pipeline collision solutions in combination with actual cases. Cultivate the ability to integrate multiple professional technologies [11]. In the comprehensive project stage, real projects such as the renovation of university libraries are introduced. Students are required to complete the application of BIM throughout the entire cycle from design, construction, to operation and maintenance. The value of the BIM application at each stage is explained in the teaching. National standard specification model information is introduced. The mastery of the entire process is evaluated through "result presentation + simulated acceptance by the client" to enhance comprehensive practical ability. In the innovation-level project stage, open topics such as "BIM + AR Construction Inspection" are set up to guide students to consult cutting-edge literature, explore the integration path of BIM with Internet of Things and other technologies, encourage participation in subject competitions, invite enterprise engineers to guide and provide practical training platforms such as VR to achieve a leap in ability from technology application to innovative practice. The projects at each stage are interlinked to promote students' ability to advance from tool operation to engineering innovation [12].

3.3. Teaching support: Construction of resources and evaluation system

In the construction of the resource and evaluation system for teaching support, it is necessary to form a teaching loop from the dimensions of hardware resource integration, school-enterprise collaboration, and multi-dimensional evaluation. At the resource construction level, on the one hand, school-based teaching materials based on progressive projects should be compiled, including BIM application cases of different types of projects such as residential buildings and Bridges, along with standardized modeling process manuals and component family library templates to provide systematic textual support for teaching; On the other hand, an "on-campus training base + enterprise virtual project platform" was established, introducing industry mainstream software such as Glodon BIM5D and Bentley, as well as VR virtual simulation systems, to create a training environment close to engineering practice [13]. In terms of school-enterprise cooperation, educators will jointly build internship bases with construction enterprises, invite engineers to participate in project design and teaching guidance, transform real enterprise projects into teaching cases, and ensure that the teaching content is in line with the technical requirements of the industry. The construction of the evaluation system needs to break through the single assessment model and establish a three-dimensional evaluation mechanism: process evaluation accounts for 60%, track students' model creation progress, group collaboration contribution and problem-solving ability at each stage of the project, and dynamically record the learning trajectory through regular training logs, group mutual evaluation, etc. Outcome evaluation accounts for 30%, with deliverables such as complete BIM models and application reports as the core, to assess the accuracy of technology application and the innovativeness of solutions [14]. Industry feedback evaluation accounts for 10%, inviting enterprise experts to review the project results from the perspective of engineering practice, such as the degree to which the model conforms to industry standards, the feasibility of construction simulation, etc., and incorporating industry evaluation into the teaching quality assessment system. The collaborative construction of resources and the evaluation system not only provides hardware and intellectual support for progressive project-based teaching but also ensures the effective

achievement of teaching objectives through multi-dimensional feedback mechanisms, promoting a virtuous cycle of "teaching-learning-evaluation" [15].

4. Conclusion

To sum up, the application of progressive project-based teaching methods in BIM technology courses is an important move to meet the talent demand for digital transformation in the construction industry. Through phased project design, systematic resource support, and diversified evaluation systems, it builds a teaching loop of "ability progression—practice deepening—innovation activation", providing an effective path for cultivating compound talents with full-cycle BIM application capabilities. To this end, university teachers should deeply integrate the application of cutting-edge technologies with teaching projects, continuously promote the reform and innovation of BIM technology course teaching, and inject more high-quality talent impetus into the informatization development of the construction industry.

Funding

Foundation of BIM Technology for the construction of First-Class undergraduate courses at Tarim University

Disclosure statement

The author declares no conflict of interest.

References

[1] Song JN, Zhang YD, Zeng QW, et al., 2025, Research on Curriculum Reform and Ideological and Political Education of BIM Technology Application in the Context of Intelligent Construction. Modern Vocational Education, 2025(14): 101–104.

[2] Fang J, 2024, Exploration and Practice of the "Concrete Structure" Course Based on BIM Technology and the Integration of "Position, Course, Competition and Certificate". Journal of Chizhou College, 38(6): 154–156.

[3] Zhang C, 2024, Research and Development of School-based loose-leaf Teaching Materials for the Integration of "1+X" Courses and Certificates: Taking the Course "Application of BIM Technology" as an Example. Industry and Technology Forum, 23(22): 205–207.

[4] Xu Y, Yang ZP, Shao M, 2024, Research on Task-driven BIM-based Curriculum Reform of Technical Standards. Modern Vocational Education, 2024(32): 117–120.

[5] Jiang JY, 2024, Research on the Application of Progressive Project-based Teaching Method in BIM Technology Curriculum. Industry and Technology Forum, 23(18): 176–178.

[6] Guo RH, 2024, Research on the Diversified Teaching Mode of "BIM Technology Application" Course in the Context of Application-oriented Talent Cultivation. Forestry Science and Technology Information, 56(2): 254–256.

[7] Song YY, Liu Y, 2024, Research on the Curriculum Reform of "BIM Technology Application" Based on the Cultivation of Comprehensive Abilities. Real Estate World, 2024(4): 59–61.

[8] Chen YB, Xiong Y, 2024, Project Teaching Method in the Numerical Control Technology Course in Higher Vocational Application. Marine Vocational Education, 12(1): 31–33.

[9] Wang Y, 2024, Research on Teaching of Architecture Courses in Higher Vocational Education Based on BIM Technology. New Curriculum Research, 2024(3): 13–15.

[10] Zhou W, Zhang SX, 2024, Exploration of BIM Technology Courses under the Concept of "New Engineering". Urban Development, 2024(1): 108–109.

[11] Xiang YF, Yang Q, Chen YY, et al., 2023, Research on the Construction of BIM Technology and Surveying Application Courses in the Context of Engineering Education Accreditation. Chinese Journal of Multimedia and Network Teaching (Upper Ten-month), 2023(11): 169–172.

[12] Qiu YH, 2023, Research on the Teaching Reform of Construction Technology Course under BIM+ Industry-Education Integration. Proceedings of the 2023 Symposium on Digital Transformation of Education and the Development of Intelligent Education, Peking University Press.

[13] Yu Y, Wu DN, 2023, Based on Vocational Ability Standard of Project Teaching Method in the Application of Electronic Technology Course. Computer and Telecommunication, 2023(7): 86–89.

[14] Li LP, 2022, Progressive Type of Project Teaching Method in the Numerical Control Technology Course Practice. Mechanical And Electrical Technology, 2022(3): 116–120.

[15] Huang DQ, 2021, Exploration of BIM Curriculum Teaching Reform Based on CDIO Concept and TBL Model. China Residential Facilities, 2021(9): 23–24.

[16] Wu NN, 2017, Project Teaching Method in the Application of Computer Network and Practical Technology Course. Journal of Fujian Computer, 2017(7): 61–62 + 64.