International Educational Research; Vol. 8, No. 4; 2025
ISSN 2576-3059 E-ISSN 2576-3067
https://doi.org/10.30560/ier.v8n4p75

Research on the Construction of the Mode and Mechanism of Collaborative Cultivation of BIM Technology Talents Between Schools and Enterprises

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Received: June 12, 2025; Accepted: July 25, 2025; Published: July 26, 2025

Abstract

In view of the practical problems existing in the current process of cultivating Building Information Modeling(BIM)technology talents in colleges and universities, this paper objectively and systematically discusses the four aspects of talent cultivation paradigm, cultivation system, cultivation path and guarantee mechanism, and explores the effective ways of cultivating BIM technology talents through the collaboration between schools and enterprises. This research accumulates practical experience for the talent cultivation model of BIM technology and also provides reference for colleges and universities to carry out high-quality talent cultivation under the background of new engineering construction.

Keywords: BIM technology, application-oriented, curriculum system

0. Introduction

BIM (Building Information Modeling) is a digital representation of the physical and functional characteristics of a building, established based on the relevant data of construction projects. Through digital simulation, it replicates the real-world information of buildings, featuring visualization, simulation, and drawing capabilities, and is applicable to the entire lifecycle management of construction projects[1]. Its digital and informational approach is profoundly influencing the development of the civil engineering and construction industry, hailed as the "second revolution in the engineering construction field" following the replacement of manual drafting by CAD technology[2]. The market demands BIM technology talents who are not merely "tool users" but "integrators of the engineering value chain." These talents require not only technical hard skills such as software operation, modeling, model management, and collaboration, but also comprehensive soft skills like cross-disciplinary coordination, project and risk management, and professional ethics. However, the traditional training models in universities currently fail to cultivate these multidimensional competencies. Therefore, the training of BIM technology talents in universities should realign with market demands and adopt a development path that emphasizes industry-education collaboration and school-enterprise synergy[3].

1. Problems in the Cultivation of BIM Technology Talents in Universities

1.1 Mismatch Between Talent Cultivation Outcomes and Market Demands

Most universities only incorporate BIM as one or two standalone courses within the traditional curriculum, rather than integrating it throughout design, construction, management, and cost-related courses. As a result, students only grasp basic modeling techniques and lack the ability to apply BIM across the entire project lifecycle. Additionally, the assessment of course competencies is overly simplistic, focusing excessively on software operation while neglecting the interdisciplinary coordination, cost control, and green building skills that enterprises urgently need.

1.2 Persistent Emphasis on Theory Over Practice

In BIM technology courses, the teaching content often emphasizes the introduction of BIM characteristics, theoretical analysis, and software operation, failing to effectively train students in the comprehensive application of BIM to solve professional problems. Furthermore, due to funding shortages, many universities lack advanced training platforms. Data shows that only 35% of universities have BIM collaboration laboratories, with most labs unable to support multidisciplinary practical training.

1.3 Shortage of BIM Technology Instructors

Currently, there is a severe shortage of qualified instructors for BIM technology in Chinese universities. Research reveals that a significant proportion of university faculty consists of young teachers who follow the career path of "graduating from university to teaching at university." While these teachers possess strong theoretical foundations, they often lack practical work experience, a gap that becomes particularly evident in BIM technology instruction. When selecting teaching cases, young teachers, due to their limited practical experience, struggle to connect the material closely with real-world engineering practices. For example, when teaching BIM-related content, they often present idealized scenarios and results for ease of understanding. However, this approach hinders students' ability to comprehend BIM applications in complex engineering contexts and leaves them unprepared to address practical challenges. Consequently, students often feel "incompetent" when entering the workforce and find it difficult to meet actual enterprise needs. Conversely, experienced senior teachers exhibit reluctance toward BIM technology, a rapidly evolving and interdisciplinary field, due to their entrenched traditional teaching habits and resistance to adopting new technologies.

1.4 Superficial School-Enterprise Collaboration

Due to factors such as inadequate incentive mechanisms, loose operational frameworks, conflicting interests, and mismatched capabilities, many universities' efforts to establish collaborative talent cultivation bases with enterprises remain at the stage of signing agreements or promotional activities. Few collaborations sustain long-term, effective teaching practices, limiting their impact on BIM technology talent cultivation.

2. Innovative Practices in School-Enterprise Collaborative Training Models

2.1 Paradigm Shift from "Vague Cultivation" to "Precision Education"

Higher education in China often adopts a "one-size-fits-all" approach to talent cultivation, relying on experience rather than precise insights into industry needs. This results in a gap between students' technical skills and enterprise requirements. With the rapid development of BIM technology, industry demands for talent have grown increasingly sophisticated, rendering traditional training models inadequate. Therefore, it is imperative to shift from "vague cultivation" to "precision education," transitioning from an "experience-driven" approach to one that is "data-driven and industry-integrated."

In this paradigm shift, schools and enterprises must jointly formulate talent cultivation standards to ensure alignment with industry needs. This can be achieved through the following measures:

First, standardize competency achievement: Develop quantifiable evaluation metrics for BIM technology talents in areas such as modeling, collaborative design, and project management.

Second, anchor training in real-world projects: Use actual engineering projects as teaching vehicles to integrate theory with practice, enabling students to enhance their skills while solving practical problems.

Third, customize talent cultivation: Leverage enterprise surveys and big data analytics to monitor industry trends dynamically and adjust training programs accordingly, ensuring precise alignment between talent supply and enterprise demand.

Through these measures, schools and enterprises can co-establish industry academies, share training resources, and build a "community of shared destiny" characterized by "joint talent cultivation, shared outcomes, and mutual responsibility," thereby reshaping the ecosystem for BIM technology talent education.

2.2 Reform of the "Four-Dimensional Linkage" Training System

By establishing a competency framework comprising four primary indicators—"Vocational Skills + Generic Competencies + Developmental Abilities + Professional Ethos"—and 28 secondary elements, this reform of the BIM talent cultivation index system achieves precise alignment between educational objectives and industry demands. The specific cultivation framework is illustrated in Figure 1.

Among these, vocational skills are the core competencies that BIM technical professionals need to possess, including specialized skills such as operating BIM software, model construction, collision detection, and construction simulation. By adjusting teaching and practical training through project-based approaches, students can more quickly master cutting-edge new technologies in the industry.

General competencies include teamwork, communication, and project management. With these abilities, students can provide a foundation for achieving sustainable development in the workplace.

Developmental competencies place greater emphasis on students' innovative thinking and lifelong learning abilities, enabling them to better adapt to the rapid iteration of technology. By offering innovative practical courses and actively encouraging students to participate in research projects, their spirit of exploration is stimulated.

Professional ethics encompass work ethic, craftsmanship, and a sense of responsibility, which serve as the internal driving force for students' career development. Through initiatives such as integrating corporate culture into the classroom and hosting professional lectures, students' sense of professional identity is cultivated.

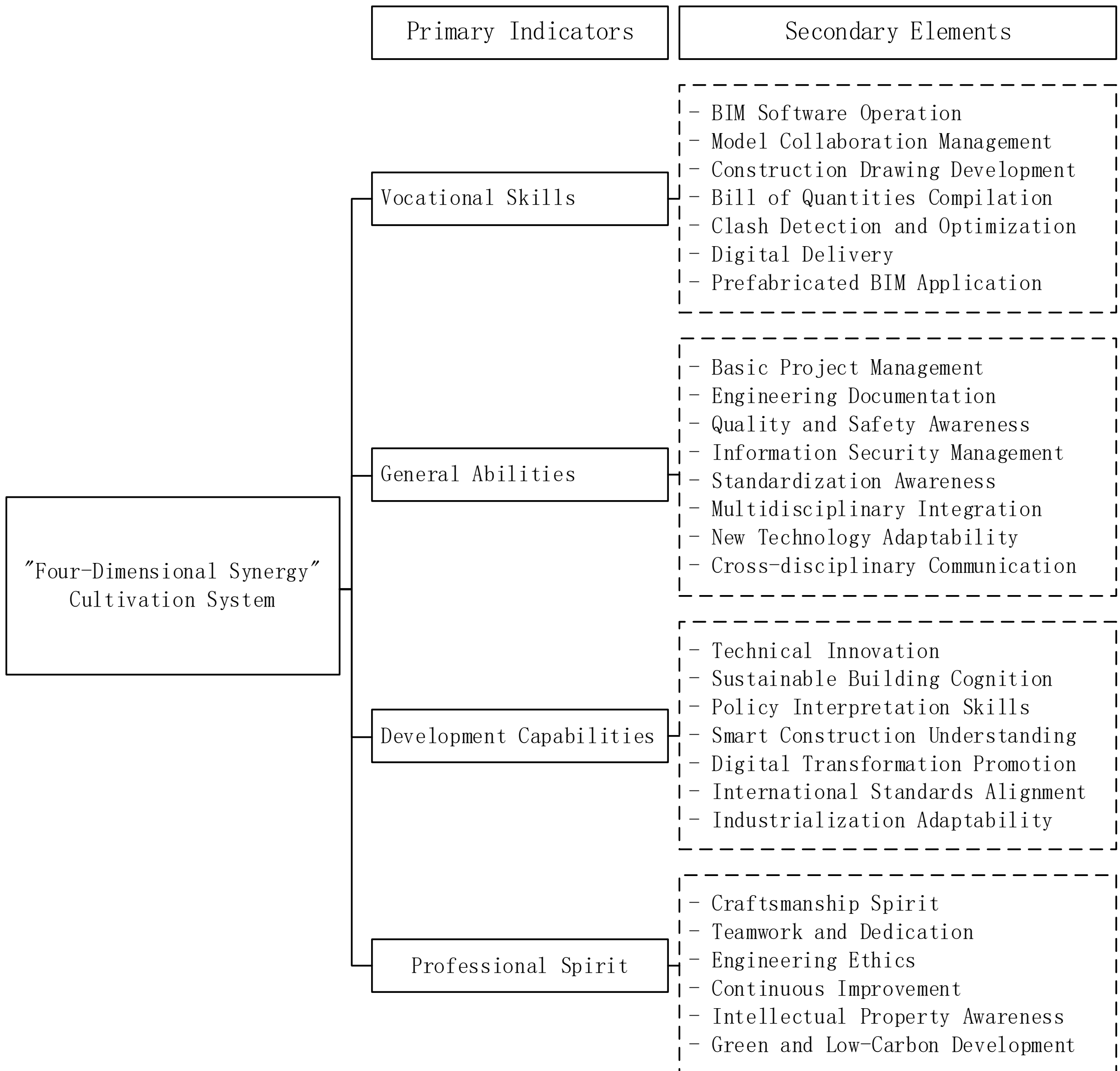

Figure 1. Framework of the Four-Dimensional Competency Index System

2.3 Progressive Training Pathway Reforms

(1) Tiered Progressive Teaching

Courses are structured into foundational (basic and specialized courses), applied (practical courses), and advanced (comprehensive practical courses) tiers, embedding BIM technology into the curriculum topology. Real-world case studies and teaching resource libraries enhance students' ability to solve practical engineering problems, shortening the adaptation period for graduates.

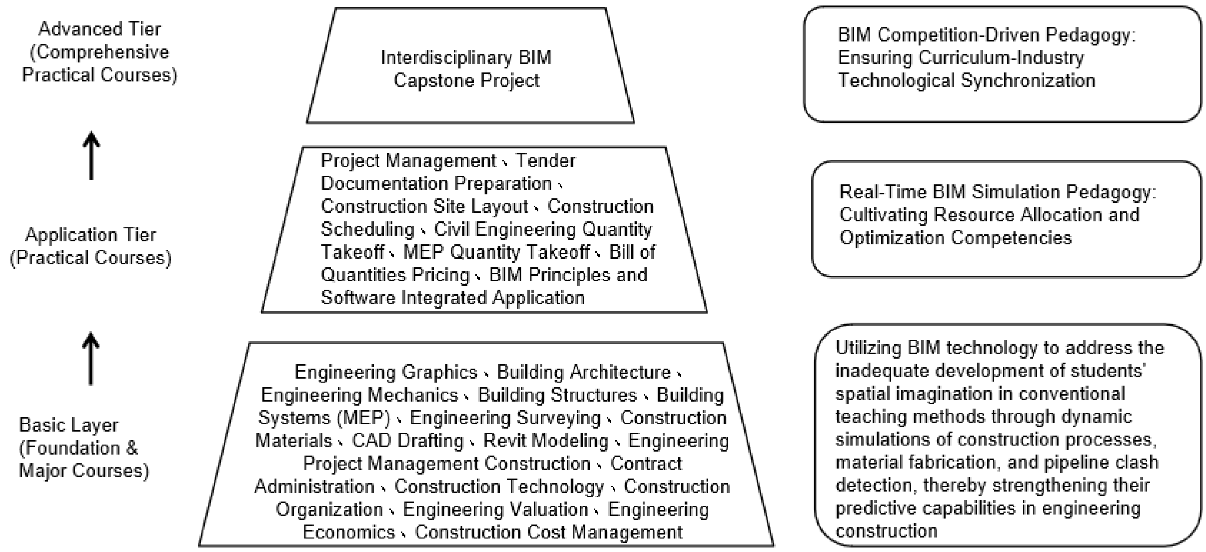

Figure 2. Tiered Progressive Teaching Framework

(2) "3+1" Phased Training Model

The first three years focus on theoretical learning, software training, and project practice, integrating competitions with teaching and developing modular courses through reverse design. In the fourth year, students validate their learning by participating in national BIM graduation design competitions, engaging in at least seven months of project-based work (e.g., modeling and post-application) to enhance their comprehensive skills.

2.4 Shared School-Enterprise Instructor and Training Platforms

(1) Dual-Quality Faculty Development

On one hand, university teachers participate in enterprise BIM projects and technical training to enhance their teaching and research capabilities. On the other hand, industry experts are invited to teach the latest practical cases, improving students' hands-on skills.

(2) Co-Building and Sharing Training Platforms

Schools and enterprises collaborate to integrate hardware and technology, establishing shared training bases such as smart construction virtual simulation centers. These platforms incorporate BIM lifecycle management systems and smart construction site models, aligning teaching resources with real enterprise data. Cloud-based collaborative platforms enable remote access to project models, facilitating cross-regional training.

3. Conclusion

By implementing a "theoretical teaching-software training-project practice-BIM graduation design" closed-loop training model, this research explores school-enterprise collaborative approaches to BIM technology talent cultivation. It bridges the gap between education and industry chains, addressing the misalignment between talent supply and industry demand.

Acknowledgments

This paper was supported by the 2022 Hunan Provincial Education Science "14th Five-Year Plan" Project: "Research on the Reconstruction of Civil Engineering Teaching Paradigm Based on BIM Technology and OBE Concept" (No. XJK22BGD008).

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