

Research on the Course Design of the "Digital Construction" Course in Higher Vocational Colleges in China

Background and context

China's higher vocational education system has undergone significant reform in recent years, transitioning from a focus on 'technology-skilled talents' to cultivating 'highly skilled professionals' with strong practical abilities by emphasizing practical ability and workplace readiness. This transformation aligns with national policies such as the National Vocational Education Reform Implementation Plan (2019) and the 14th Five-Year Plan for Vocational Education (2021-2025), which emphasize the importance of industry-driven training, hands-on learning, and digital competencies.

The Chinese government prioritises the digital transformation of vocational education, aiming to develop a high quality "Smart Education of China" (Yu, Yan, and Jin, 2024, p. 383). In the last ten years, vocational education in China has actively adjusted to fit economic restructuring and industrial shifts, leading to updates in over 70% of disciplines (Ding, 2022).

The construction industry, a pillar of China's economy, has changed through time, which deeply affects the reform of Architecture, Construction and Engineering (ACE) majors in vocational education. The integration of digital tools, such as Building Information Modeling (BIM) and Artificial Intelligence (AI) has created a skill gap, as many existing construction majors lack adequate training courses about these emerging technologies (Xing et al., 2021). Higher vocational colleges are redesigning curricula to bridge this gap, ensuring that graduates possess the competencies required by modern construction firms (Li and Yang, 2017).

In response to the increasing adoption of BIM, smart construction, and digital project management, the course design of the 'Digital Construction' (used to be 'Construction technology') course has become essential to preparing students for the evolving demands of the industry in majors like construction management, construction estimating, construction technology in higher vocational colleges in China. However, this brings challenges, particularly in adapting conventional construction course to incorporate digital literacy, data-driven decision-making, and smart

construction methodologies while maintaining a strong foundation in practical construction skills (Xu, Mao and Hu, 2024).

To address these challenges, China has emphasized the integration of industry and education in vocational colleges. The Implementation Plan for the Integration of Industry and Education in Vocational Education (2023–2025) was issued with detailed explanation. Partnerships between higher vocational colleges and construction enterprises play a crucial role in course development, providing case studies, internship opportunities, and access to advanced digital facilities (Somantri, and Pramudita, 2024). Initiatives such as modern apprenticeship programs, joint training bases, and industry-recognised certification programs help bridge the gap between academic training and workplace requirements. Although the Chinese government consistently prioritizes the integration of industry and education in higher vocational education, significant challenges remain. (Chen and Yan, 2023).

In addition to curriculum structure, it is critical to compare pedagogical strategies, and assessment methods to understand the responses to evolving socioeconomic environment of vocational education (Yu, Yan, and Jin, 2024, p. 374). The Digital Construction course in some higher vocational colleges has already incorporated problem-based learning (PBL), simulation-based training, and workplace-based learning while the effectiveness of such strategies remains investigation to explore student engagement and skill acquisition. Omrany et al. (2025) suggest the use of virtual reality (VR) simulations, digital twin technology, and cloud-based collaboration platforms can provide immersive, hands-on experiences that reflect modern construction workflows. Additionally, assessment in digital construction education is moving beyond written examinations to include portfolio-based evaluations, real project assessments, and industry-recognized certifications and seeking continuous improvements.

Aim and objectives

This research aims to explore how the Digital Construction course for Architecture, Construction, and Engineering (ACE) majors in higher vocational colleges in China can be improved to better align with industry demands, enhance student learning experiences, and address teaching challenges. By examining employer expectations, student feedback, and teacher perspectives, this study seeks to develop recommendations for optimising the course's curriculum structure, pedagogical strategies, and assessment methods.

Objectives:

1. To evaluate industry alignment: Assess how well the Digital Construction course meets the needs of regional employers in the ACE industry and identify any skill gaps that graduates may have.
2. To analyze student perspectives: Investigate students' views on the strengths and weaknesses of the course, including curriculum content, teaching methods, and practical applications.
3. To examine teacher perspectives: Understand teachers' perceptions of the course's effectiveness, the challenges they face in delivering content, and the support they need for teaching digital construction technologies.
4. To identify best practices in course design: Explore successful models of digital construction education, both domestically and internationally, to inform improvements in curriculum development and instructional strategies.
5. To propose recommendations for improvement: Develop a framework for enhancing the course design, focusing on curriculum content, teaching methodologies, industry collaboration, and student assessment methods.

Main research question:

How can the design of the Digital Construction course for ACE majors be improved in higher vocational colleges in China?

Sub-research questions:

1. To what extent do regional employers think that the Digital Construction course aligns with the ACE industry?
2. What do students perceive to be the strengths and weaknesses of the Digital Construction course?

3. What do teachers perceive to be the strengths and weaknesses of the Digital Construction course?

Proposed plan of work

November 2025 – January 2026	Finalising research design, refining research questions, and completing literature review.
February – April 2026	finalising research instruments (questionnaires, interview guides, observation checklists), and establishing partnerships with the case study college.
May – June 2026	Conducting initial document analysis of curriculum materials, policies, and institutional reports.
July – September 2026	Conducting classroom observations and distributing questionnaires to students.
October – December 2026	Conducting semi-structured interviews with teachers and employers, and focus group discussions with students.
January – March 2027	Qualitative data analysis using content, narrative, and discourse analysis; quantitative data analysis using statistical software.
April – June 2027	Interpreting findings, identifying key themes, and comparing results with existing literature.
July – September 2027	Writing up research chapters, including methodology, findings, discussion, and recommendations.
October 2027	Final revisions, proofreading, and submission of the completed research.

Proposed methodology

This study adopts a pragmatic research paradigm, which emphasises the practical application of research findings and the selection of methods (Clarke and Visser, 2018) and employs a mixed methods approach to explore how the Digital Construction course for ACE majors in higher vocational colleges can be improved. A case study will be conducted, integrating multiple data collection methods to ensure a comprehensive view from stakeholder perspectives. Both quantitative and qualitative data analysis techniques are adopted to ensure thorough understanding of the chosen case (Cohen, Manion, and Morrison, 2018).

The case study will take place at a higher vocational college in Jiangsu, a relatively developed province in China, where where educational reforms and industry-education integration are more advanced. Makwana et al. (2023) suggest a purposive sampling method can ensure the selected participants providing the most relevant information for the research. This approach will enable the inclusion of key stakeholders with direct experience in the Digital Construction course, ensuring a diverse yet focused representation of perspectives.

Participants will include students enrolled in the course, who can offer insights into their learning experiences, perceived strengths, and challenges. Teachers responsible for delivering the course will be selected to provide perspectives on curriculum effectiveness, teaching methodologies, and the difficulties faced in integrating digital construction technologies. Additionally, regional employers and industry professionals from the ACE sector will be included to assess whether the course aligns with industry needs and to identify any skill gaps that graduates may have.

The research will include classroom observations to examine teaching practices, student engagement, and the integration of digital construction technologies in real-time learning environments. Questionnaires will be used to gather quantitative insights from students regarding the course content, course's strengths, weaknesses, and areas for improvement. A five-point Likert scale (South et al., 2022) measures their perceptions. To gain deeper qualitative insights, semi-structured interviews will be conducted with teachers and employers to explore curriculum alignment, industry relevance, and pedagogical challenges (Snoussi, 2019, p.664). Focus group discussions will provide an interactive platform for students and teachers to share experiences and collaboratively suggest improvements (Kevern and Webb, 2001, p.322). Additionally, document

analysis will be undertaken to review curriculum guidelines, course syllabi, and policy documents to assess how digital construction concepts are currently embedded in vocational majors.

For data analysis, qualitative methods will include content analysis to categorize and interpret emerging themes, narrative analysis to examine personal experiences shared by students and teachers, and discourse analysis to explore language patterns in discussions (Skjott and Korsgaard, 2019). Quantitative data will be analysed using SPSS, Excel and other statistical software tools to identify trends, correlations, and significant differences in responses. By combining qualitative and quantitative approaches, this study ensures a holistic and evidence-based evaluation of the Digital Construction course, providing valuable recommendations for its future development.

Ethical considerations are central to this research, ensuring the protection, rights, and well-being of all participants. The researcher holds no official position at the vocational college, does not influence classroom activities, and has no collaborative agreements with enterprises, ensuring neutrality (Murillo, 2024). Informed consent will be obtained through clear communication of the study's aims, procedures, benefits, risks, and the right to withdraw at any time (Creswell, 2013). Participants will receive detailed information before providing written consent. Confidentiality and data protection will be strictly maintained. Identities will be anonymized, and all data will be stored securely on password-protected devices. The study prioritizes participant well-being, ensuring all interactions are conducted respectfully. Follow-up discussions will be available to address any concerns. This research ultimately aims to contribute positively to vocational education by enhancing the 'Digital Construction' course.

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