

Design of the course Building Construction in Architectural, Engineering and Construction majors in higher vocational colleges in China

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1. Background and context

Higher vocational colleges play a crucial role in preparing students for careers in small and medium-sized corporations in industry in China (Li, 2015). The construction industry in China has experienced significant growth, necessitating a skilled workforce to meet the increasing demand for qualified professionals in architecture, engineering, and construction (AEC) (Ministry of Housing and Urban-Rural Development, 2022). However, despite this growth, many higher vocational colleges struggle to keep pace with the evolving needs of the industry, resulting in a mismatch between graduates' skills and employers' expectations.

The AEC sector in China is characterized by rapid advancements in technology, changes in building materials, and evolving construction techniques (Xing et al., 2021). The Industry 4.0 paradigm has introduced numerous advancements, such as Building Information Modeling (BIM), prefabrication, and green building technologies, which are reshaping the construction landscape. Incorporating these elements into the curriculum is essential for producing industry-ready graduates (Li and Yang, 2017).

Current Building Construction course in many vocational colleges often lack practical application and fail to incorporate modern construction technologies, sustainability practices, and project management techniques (Xu, Mao and Hu, 2024). Many of them emphasize theoretical knowledge without sufficient hands-on training, leaving graduates inadequately equipped for real construction project challenges. Additionally, industry stakeholders report that graduates possess inadequate problem-solving skills and a limited understanding of collaborative practices in multidisciplinary environments (Sun, 2023).

The need for an updated, comprehensive course in Building Construction is critical to address these gaps (Zhang et al., 2024). By aligning educational

objectives with industry standards and integrating innovative teaching methodologies, this research aims to develop the course, Building Construction, that better addresses current industry needs, educational standards, and innovative teaching methodologies that not only enhances students' technical capabilities but also fosters critical thinking, teamwork, and adaptability, so as to meet the demands of China's dynamic construction landscape.

Many scholars have explored innovative teaching modes and reforms in relative majors in higher vocational colleges according to national educational policies. Guo (2023) discussed the solution to the “Three Education Reform” in Architecture majors in higher vocational colleges. Chen (2023) studied the drawing skill training for higher vocational Civil Engineering majors under the “1+X” certificate system. Zhang (2021) proposed a research on teaching reform of studio system of Building Decoration majors in higher vocational colleges. Wei (2020) explored the use of Artificial Intelligence in higher vocational Architectural majors. However, a systematic course design in relative majors in higher vocational education in China, including updated industry techniques and effective teaching mode, has not been discussed according to the literature.

Zhang et al. (2024) use the course “Building Construction Process” to illustrate the integration of educational reform with the evolution of the construction industry during the “new construction” era. They focus on creating teaching resources that combine coursework with competition certification and implement stratified and categorized teaching activities. The evaluation and assessment mechanisms are also innovated to align with this approach. Emphasizing a “student-oriented” teaching philosophy, they analyze and understand the learning environment. In the study, curriculum reconfiguration of the Building Foundations is given as an example. However, new technologies like Building Information Modeling (BIM) and green building technologies are not included in the educational reform.

Effective vocational education relies on a balance between theoretical instruction and practical application (Guo et al., 2023). Active learning strategies, including project-based learning, collaborative projects (Chan and Sher, 2014), and industry partnerships, have been highlighted as effective methods for improving student engagement and skill acquisition. These methods and elements will be discussed in the research.

2. Aims and Objectives

2.1 Aims

The primary aim of this research is to design and propose a modernized "Building Construction" course for architectural, engineering, and construction majors within higher vocational colleges in China. This redesigned course seeks to bridge the gap between current vocational education and the emerging demands of the construction industry, thereby improving student competence and employability.

2.2 Objectives

To achieve this overarching aim, the research is structured around several specific objectives that collectively address the current shortcomings of the educational system and pave the way for a more integrated, responsive curriculum. Each objective plays a critical role in ensuring that the research outcomes are both comprehensive and applicable across various educational settings.

- To assess the current state and effectiveness of existing "Building Construction" courses in higher vocational institutions in China.
- To gather input from industry stakeholders regarding the skills and knowledge required for graduates in the AEC fields.
- To design a structured course framework for Building Construction, integrating both theoretical and hands-on learning experiences.
- To propose pedagogical strategies that enhance practical skill acquisition and student engagement.

2.3 Research questions

The main research question is “How can the design of the course Building Construction in Architectural, Engineering and Construction majors be improved for vocational universities in China?” And there are three sub-questions as listed below.

- What do regional employers think of the course Building Construction in AEC industry?
- What are the current shortcomings and challenges in the course Building Construction at higher vocational colleges?
- How can innovative teaching methodologies enhance the learning experience in the Building Construction course?

3. Methodology

A mixed methods approach will be utilized for this study, combining both quantitative and qualitative data collection techniques to ensure a comprehensive analysis of the current educational landscape and industry requirements (Cohen, Manion, and Morrison, 2018). Document reviews of existing literature on AEC majors in vocational education and labour market trends in construction industry in China will provide insight into current practices and challenges.

3.1 Research Design

This study employs a case study approach focusing on selected higher vocational college in China. By closely examining the institution, the research will yield detailed insights into current vocational education practices and the effectiveness of "Building Construction" course.

3.2 Case Study

The case study approach involves detailed examination of a higher vocational college in Wuxi, Jiangsu, a typical second tier city of China, chosen based on its industry partnership and typical educational practices. The institution will provide a diverse representative of current approaches to teaching the "Building Construction" course in several different AEC majors. Site visits, course evaluation, and stakeholder interviews will be conducted to gather in-depth qualitative data.

3.3 Sampling

A purposive sampling method (Rai and Thapa, 2015) will be adopted to ensure the selection of participants who can provide the most relevant and insightful information:

- **Institution:** One higher vocational college known for its Architectural, Engineering and Construction programs.
- **Participants:**
 - 50 current students from each major, selected across various stages of their studies to capture a range of experiences and perspectives.
 - 6 faculty members or course designers from the faculty, involved in the development and delivery of the course.
 - 5 industry professionals associated with the college through advisory committees or internship programs, ensuring insights into current industry needs.

3.4 Data Collection

- **Surveys:** Structured questionnaires will be distributed to students and faculty to understand their perceptions of the course's effectiveness, including strengths and areas for improvement.
- **Interviews:** Semi-structured interviews with faculty, curriculum designers, and industry professionals will provide qualitative insights into the curriculum's relevance and alignment with industry standards.

- **Document Analysis:** Existing curriculum documents, syllabi, and teaching materials will be analyzed to identify the presence of modern teaching techniques, technologies, and industry alignment.

3.5 Data Analysis

- **Quantitative Analysis:** Survey data will be analyzed using descriptive and inferential statistics to highlight trends in perceptions of the current course's effectiveness (Snyder and Bish, 1989). Statistical software will be employed to ensure accurate representation of results.
- **Qualitative Analysis:** Interview transcripts and notes from case studies will be coded and thematically analyzed to identify common themes and insights. The NVivo software will be used to organize and support qualitative data analysis (Welsh, 2002).
- **Comparative Analysis:** Findings from different majors or instructors will be compared to identify better practices and common challenges across vocational colleges.

3.6 Ethical Considerations

This research is committed to maintaining the ethical standards of the University of Wales Trinity Saint David. Key ethical considerations include:

- **Informed Consent:** Participants will receive detailed information about the research aims, rights and process. Written consent will be obtained from all participants.
- **Confidentiality:** Participant confidentiality will be strictly protected. Personal data will be anonymized in any published material, and data will be stored with limited access to the researcher.
- **Voluntary Participation:** Participation in the study is fully voluntary, with the option to withdraw at any point of the research.
- **Approval:** Ethical clearance will be obtained from relevant review boards at the partner vocational college and any regulatory authorities as required.

3.7 Validation

The proposed course design will be validated through expert reviews and pilot testing in selected institutions, enabling refinement based on feedback from educators and students.

By integrating these methodologies, the research aims to develop a robust, industry-aligned course framework that addresses current educational gaps and enhances the competency of students in AEC disciplines.

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