

Improvement of the Course Design of the "Building Construction" Course in Higher Vocational Colleges in China

Chapter 1 – Introduction

1.1 Rationale

In recent years, China's vocational education sector has undergone substantial reform, driven by national policies such as the *Vocational Education Law*, the "20 Measures for Vocational Education", and the *National Vocational Education Reform Implementation Plan*. These policy initiatives reflect the government's strategic commitment to aligning vocational education more closely with the needs of modern industry and economic development (Xu, 2018). One of the major innovations under this reform is the introduction of the "I+X" certificate system, which allows students to earn industry-recognised qualifications, such as the *I+X BIM Certificate* (Liu, 2021), alongside their academic diplomas. These reforms have created new expectations for curriculum content, teaching quality, and learning outcomes across vocational programmes.

Within this reform context, the *Building Construction* course holds critical importance for students majoring in Architecture, Construction, and Engineering (ACE). It is a core technical subject designed to equip students with the foundational knowledge and practical skills required in the construction industry. However, despite its significance, evidence from both students and educators suggests that the course often falls short in meeting current industry standards, engaging students effectively, and supporting the development of real-world competencies.

Many higher vocational institutions face challenges such as outdated curriculum content, limited integration of digital tools like Building Information Modelling (BIM) (Ku, and Taiebat, 2011), a lack of hands-on learning opportunities, and inconsistent assessment methods. These issues hinder students' preparedness for the job market and make it difficult for lecturers to deliver the course effectively. As China continues to advance its vocational education system, improving the quality and relevance of core technical courses like *Building Construction* is essential (Zhang, 2022).

Given this backdrop, the present research is both timely and necessary. It aims to explore how the design of the *Building Construction* course can be enhanced to better support student learning and teaching effectiveness in the context of higher vocational education in China. By capturing the lived experiences and perspectives of both lecturers and students, the study seeks to identify the course's current strengths and weaknesses and to generate evidence-based recommendations for improvement. The findings will contribute to the growing body of research on vocational curriculum development and may offer practical insights for policymakers, curriculum designers, and educators seeking to modernise technical education in line with industry needs.

1.2 School and Local Context

School context

The vocational college selected for this case study is located in the southern part of China and has a long-standing history of educational development. As one of Jiangsu Province's demonstrative higher vocational institutions and a nationally recognised participant in China's "Double High Plan", the college plays a significant role in cultivating highly skilled technical talent for the modern service industry. The college currently hosts between 13,000 and 15,000 full-time students and employs 871 staff members. The institution is organised into 11 secondary schools, covering a wide range of disciplines. It offers 42 diploma-level majors.

This institutional context provides a fertile ground for studying the *Building Construction* course, as the college has the infrastructure, recognition, and academic ecosystem necessary for vocational training reform. However, challenges remain in aligning course content and delivery with evolving industry demands and student expectations.

Local context

Jiangsu Province is a national leader in vocational education development and policy implementation. With the number of vocational colleges increasing from 77 to 91 over the past decade, Jiangsu now has the highest number of institutions and professional clusters involved in the national "Double High Plan". The province trains approximately 500,000 technical professionals each year, contributing to a professional workforce exceeding 8.3 million. Jiangsu also leads in vocational competition results and has received the highest number of first-place awards in national skills contests.

The provincial government has invested over 7 billion RMB in vocational education over the past ten years, focusing on infrastructure, training facilities, and curriculum innovation. Jiangsu has also taken a national lead in industry-education integration, with nearly 30,000 enterprises collaborating with vocational colleges to co-develop over 15,000 specialised courses. Furthermore, the province established China's first regional law on industry-education collaboration (*Jiangsu Vocational Education Industry-Education Integration Promotion Ordinance*), setting a legislative precedent for deepening corporate involvement in vocational training.

Jiangsu's strategic location within the Yangtze River Delta also facilitates regional collaboration and internationalisation. Through initiatives such as the "Study in Jiangsu" programme and the "Chinese + Vocational Skills" model, the province actively promotes global engagement in vocational education. Additionally, digital transformation and lifelong learning are prioritised, with innovations such as the dual-mentor system and province-wide digital teaching platforms supporting skill development across life stages.

Taken together, the national, provincial, and institutional contexts provide a strong foundation—and a compelling need—for research into improving vocational education programmes such as the *Building Construction* course. This study is situated at the intersection of policy reform, institutional development, and the changing demands of the construction and engineering industries.

Chapter 2 – Literature Review

2.1 Introduction

The Building Construction course serves as a core component of technical training for students majoring in Architecture, Construction, and Engineering (ACE) in higher vocational colleges. As China reforms its vocational education sector to better align with industrial needs and technological advancements, there is growing interest in improving curriculum design and pedagogy in construction-related programmes. This literature review critically examines the key themes and scholarly perspectives relevant to the improvement of vocational construction education, particularly within the Chinese context. The review focuses on: (1) Vocational Education Reform and Curriculum Development in China; (2) Pedagogical strategies in construction education; (3) Assessment practices and skills training; and (4) Teachers' role in course design.

2.2 Research aim and objectives

This research aims to explore how the *Building Construction* course for Architecture, Construction, and Engineering (ACE) majors in higher vocational colleges in China can be improved to enhance student learning outcomes and better support teaching practices. By investigating the perspectives of lecturers, the study seeks to generate evidence-based recommendations for optimising curriculum content, instructional approaches, and course delivery. The research objectives are:

1. To explore lecturers' perspectives on the strengths, weaknesses, and delivery challenges of the *Building Construction* course within the current vocational education framework.
2. To identify barriers and enablers to effective teaching and learning in the *Building Construction* course, including institutional support, teaching resources, and student engagement.
3. To develop practical recommendations for enhancing the *Building Construction* course, focusing on curriculum structure, pedagogy, and assessment strategies suited to the Chinese vocational context.

2.3 Key Definitions

Higher Vocational Colleges

Higher vocational colleges in China are post-secondary institutions that focus on the development of technical and applied skills to meet labour market demands. These colleges typically offer three-year diploma programmes and aim to cultivate high-quality skilled workers for specific industries (MOE, 2022).

Building Construction Course

The *Building Construction* course is a core module in Architecture, Construction, and Engineering (ACE) majors. It covers fundamental concepts, techniques, and processes involved in the design

and execution of building projects, including structural systems, materials, construction technology, and site operations. It often includes both theoretical instruction and practical training.

Curriculum Design

Curriculum design refers to the structured planning and organisation of learning content, outcomes, instructional strategies, and assessment methods within a course or programme. In vocational education, curriculum design should be aligned with industry standards and focus on competency development and practical skills.

Vocational Education Reform

Vocational education reform in China refers to a series of government-led initiatives and policy frameworks aimed at improving the quality, status, and relevance of vocational training. Key reforms include the “*Double High Plan*,” the *1+X certificate system*, and the revision of the *Vocational Education Law* in 2022.

1+X Certificate System

Introduced by the Ministry of Education in 2019, the *1+X Certificate System* enables students to obtain multiple vocational qualification certificates (*X*) in addition to their academic diploma (*1*). For ACE students, this may include certifications such as BIM (Building Information Modelling), which validate their practical competencies and improve employability.

Pedagogical Strategies

Pedagogical strategies are the methods and approaches used by teachers to facilitate student learning. In the context of vocational education, effective pedagogy may include project-based learning, simulation training, collaborative learning, and work-integrated learning.

2.4 Key theme 1: Vocational Education Reform and Curriculum Development in China

China’s vocational education system has been undergoing rapid transformation, driven by reforms such as the “*Double High Plan*” (2019), the revised *Vocational Education Law* (2022), and the “*1+X*” *Certificate System*. These policies aim to strengthen vocational institutions by promoting curriculum integration, skill certification, and alignment with national strategies like “Made in China 2025”. The *Building Construction* course, traditionally focused on structural knowledge and materials, is now expected to incorporate digital competencies (e.g., BIM), safety standards, and interdisciplinary learning to reflect current industry expectations.

The curriculum in vocational institutions is evolving from a textbook-driven approach to a modular, competency-based system. Zhou and Xu (2023) emphasise that high-quality curriculum development must involve industry collaboration and regularly updated content to meet labour market demands. However, many programmes struggle with slow adaptation due to rigid institutional structures and limited teaching resources.

2.5 Key theme 2: Pedagogical Strategies in Construction Education

Effective pedagogy in construction education must bridge theoretical knowledge and practical application. Traditional didactic methods—while still common—have been criticised for failing to engage students or develop the problem-solving and technical skills required in the modern workplace. Studies suggest that active learning approaches, such as project-based learning (PBL) (Jin et al., 2018), simulations, and experiential training in virtual environments, improve student motivation and competence.

In the context of Chinese vocational education, the adoption of dual-system models and modern apprenticeship schemes has been promoted as a strategy to deepen learning through workplace immersion. This is supported by the *Modern Apprenticeship Pilot Programme* led by the Ministry of Education. However, Yu, Yan and Jin (2025) found that successful implementation is highly dependent on teacher capacity and institutional support—factors that vary widely between colleges.

Lecturer perceptions are central to understanding the feasibility of adopting innovative methods. Research by MacDonald (2012) indicates that while instructors acknowledge the value of student-centred teaching, many report barriers such as time constraints, insufficient training, and curriculum overload.

2.6 Key theme 3: Assessment Practices and Technical Skill Development

Assessment remains a contentious issue in vocational construction education. While many colleges rely on written exams and attendance-based evaluation, current literature advocates for authentic assessment models, including performance-based tasks, portfolios, and digital simulations. These models are more aligned with vocational outcomes and better reflect real-world scenarios students will encounter in their careers.

Furthermore, the *I+X* certification system introduced in recent years provides an additional layer of standardised assessment through nationally recognised skill credentials. Although this system has potential to enhance student employability, scholars like Liu et al. (2025) caution that over-emphasis on exam preparation can reduce the flexibility and depth of classroom learning.

Balancing formative and summative assessment remains a key challenge. Li and Pan (2021) highlight the need for a diversified assessment framework that includes peer evaluations, reflective journals, and instructor feedback to support lifelong learning skills and workplace readiness.

2.7 Key theme 4: Teachers' Role in Course Design

Teachers play a dual role as content experts and learning facilitators (Murillo, 2024). In vocational construction courses, their industry experience, pedagogical beliefs, and instructional autonomy

significantly shape course delivery. However, research also reveals a gap between teacher intentions and student learning experiences, often due to misaligned expectations or limited interaction.

2.8 Summary and Research Gap

The existing literature highlights the critical need to update curriculum content, teaching methods, and assessment practices in construction-related vocational courses in response to national reform and global industry shifts. While national and institutional strategies provide a supportive framework, localised implementation remains uneven. There is limited research exploring how lecturers and students experience and perceive these challenges, particularly in relation to specific courses like *Building Construction*.

This study addresses that gap by focusing on a case college in Jiangsu Province—a leader in vocational reform—to examine lecturer insights and student experiences regarding the *Building Construction* course. Through qualitative investigation, this research aims to provide practical recommendations for improving course design, informed by those most directly involved in its delivery and reception.

2.9 Research Questions

Main Research Question:

How can the design of the *Building Construction* course be improved in higher vocational colleges in China to better support student learning and teaching effectiveness?

Sub-Research Questions:

1. What are lecturers' perceptions of the strengths and weaknesses of the current *Building Construction* course, including its curriculum, pedagogy, and assessment practices?
2. What challenges do lecturers face in delivering the course content effectively, and what support do they require?
3. What design principles or best practices from comparable vocational construction education programmes could inform improvements in this course?

2.10 Importance of the Study

The improvement of vocational education in China has become a national priority, driven by key reforms such as the revised *Vocational Education Law* (2022), the “*Double High Plan*” , and the *1+X certificate system*, all of which aim to elevate the quality, relevance, and global competitiveness of vocational training. Within this reform landscape, *Building Construction* stands out as a core course in Architecture, Construction, and Engineering (ACE) programmes, directly linked to national strategies such as urbanisation, digital transformation, and the development of skilled labour for the construction industry.

Despite policy advancements, existing literature highlights persistent challenges in course implementation. Studies reveal misalignments between curriculum content and industry needs, limited integration of digital technologies like BIM, and gaps in practical training. Research also points to insufficient pedagogical support for lecturers, resulting in inconsistent delivery and limited student engagement. Moreover, international literature on vocational construction education emphasises the benefits of learner-centred pedagogies, competency-based frameworks, and industry collaboration, which remain underdeveloped in many Chinese colleges (Zhang et al., 2024).

This study is therefore important as it bridges the gap between policy intentions and classroom realities by capturing both lecturer and student perspectives. It addresses a critical need for empirical evidence on how *Building Construction* is taught and experienced in practice, which is currently under-researched in the Chinese context. By adopting a qualitative case study approach and drawing on international best practices, the study aims to generate context-specific recommendations for curriculum design, pedagogical strategies, and assessment reform.

Ultimately, the findings will contribute to the broader discourse on vocational education reform by offering practical insights that support the implementation of high-quality, industry-relevant teaching in ACE programmes. The study also has implications for institutional leadership, curriculum developers, and education policymakers committed to advancing teaching excellence and improving student outcomes in higher vocational education.

Chapter 3 – Research Design and Methodology

3.1 Ontology and Epistemology

This study adopts a pragmatic research philosophy, which recognises that the nature of reality (ontology) is multiple, socially constructed, and context-dependent. Rather than adhering strictly to either positivist or interpretivist paradigms, pragmatism allows the researcher to explore real-world problems using the most appropriate methods to generate practical, actionable knowledge (Creswell, 2015).

This study adopts a pragmatic research philosophy because it aligns well with the applied and problem-solving nature of the research aim—to improve the *Building Construction* course in higher vocational colleges in China. Pragmatism focuses on the practical consequences of research and prioritises methods that are most effective for addressing real-world issues (Bryman, 2012). Rather than adhering strictly to positivist or interpretivist paradigms, the pragmatic approach allows the researcher to use methods and strategies best suited to answering the research questions in context.

Pragmatism is particularly appropriate in educational research, where the goal is often to generate actionable insights that can inform policy or practice (Clarke and Visser, 2018). In this case, the

study seeks to understand the lived experiences and perceptions of lecturers regarding the course's strengths, limitations, and areas for enhancement. A pragmatic stance supports the use of qualitative data to capture these experiences, while remaining open to multiple viewpoints and contextual complexities.

Moreover, the pragmatic philosophy complements the inductive and case study approach by focusing on what works in practice and by enabling the development of recommendations that are grounded in stakeholders' experiences. It avoids the limitations of philosophical rigidity and instead encourages the integration of theory and practice, which is crucial for addressing the multifaceted challenges of vocational education reform in China.

The epistemological stance of this research is that knowledge is created through the interaction between the researcher and participants, and is rooted in their lived experiences and professional insights. Truth is viewed as provisional and contextual, especially within the complex landscape of Chinese higher vocational education. This stance justifies the use of a qualitative case study approach, enabling deep understanding of how the *Building Construction* course is perceived and experienced by those directly involved in its teaching.

3.2 Researcher Positionality and Reflexivity

As a researcher engaged in vocational education and familiar with the Chinese educational context, my positionality plays an important role in shaping the research design, data collection, and interpretation of findings. I acknowledge that my academic background and professional experiences may influence the way I interpret participants' narratives and prioritise certain issues over others.

Being a researcher with insider knowledge can be both a strength and a limitation. While it enables deeper rapport with participants and contextual sensitivity, it also introduces the risk of bias. To address this, I have adopted a reflexive approach throughout the research process—maintaining a reflective journal, critically examining my assumptions, and being transparent about my role in co-constructing meaning with participants.

Ethical awareness is embedded in all phases of the study. All participants were provided with clear information sheets and gave informed consent, and all identifying data will be pseudonymised to protect confidentiality.

3.3 Theoretical Framework

This study draws on a combined framework of social constructivism, cognitive apprenticeship, and cultural–historical activity theory to examine how construction knowledge can be made visible, shared, and assessed in sustainable ways within real institutional limits.

Social constructivism views learning as a dialogue-driven, socially supported process in which meaning is co-constructed through guided interaction and shared representations; this perspective motivates the use of think-aloud talk and critique sessions to make reasoning public and discussable in large classes (Amineh and Asl, 2015).

Cognitive apprenticeship offers a practice-oriented perspective on how expert thinking may be externalised and progressively taken up through modelling, coaching, scaffolding, opportunities to express and reflect, and the gradual removal of support (Berryman, 1991). The study attends to a simple sequence intended to manage complexity while keeping concepts central: starting with quick sketches, stating key relations, moving into 3D representations, and concluding with local site debriefs to connect ideas to context.

At the institutional layer, cultural historical activity theory is used to characterise how tools, rules, community expectations, and division of labour shape what is workable in teaching and assessment (Igira and Gregory, 2009). Tensions, such as balancing authentic tasks with marking workload, or fitting assessment portfolio evidence within rigid documentation requirements, are treated as potential explanations for recurring problems and as pointers to practical adjustments, including sampling strategies and peer-assisted verification with targeted staff spot-checks.

Taken together, the three theories are treated as complementary. Social constructivism provides a rationale for examining how structured dialogue and shared representations may support understanding in large cohorts; cognitive apprenticeship specifies teaching moves intended to facilitate expert judgement visible and transferable across modules (e.g., from Materials to Construction); and activity theory situates these practices within the realities of class size, hardware access, and governance, guiding the analysis to when tools such as BIM and AI may be most productive (e.g., when used to support concept formation and when assessment evidence standards are scaled appropriately). Overall, the framework motivates the working expectation that a progression from informal to formal representations, with clear reasoning protocols and assessment aligned to institutional conditions, may support explanatory depth, reduce misconceptions, and yield credible performance evidence; the study investigates participants' accounts for indications of these outcomes.

3.4 Research Approach

An inductive approach has been employed, allowing patterns and themes to emerge from the data rather than testing a pre-existing theory (Noaparast and Noaparast, 2011). This is appropriate given the exploratory nature of the study, which seeks to generate insights and recommendations grounded in the lived experiences of lecturers.

This research adopts an inductive approach to inquiry, which is particularly well-suited to studies that aim to explore under-researched areas or contexts where existing theories and models may not fully capture the complexity of real-world experiences. The goal of this study is to understand how the *Building Construction* course can be improved by exploring the lived experiences and perspectives of lecturers within the Chinese higher vocational education context.

An inductive approach allows for the generation of themes and insights directly from the data, rather than testing pre-existing hypotheses or frameworks. This is especially appropriate in the context of vocational education, where rapid policy changes (e.g., the introduction of the *1+X* certificate system and “Double High Plan”) and institutional differences create highly contextualised learning environments. Rather than assuming what effective course design should look like, the inductive strategy enables the researcher to build understanding from the ground up, based on what participants themselves value, critique, or recommend.

Moreover, the inductive approach aligns with the pragmatic research philosophy guiding this study, which values practical outcomes and flexibility in methods. It allows the researcher to remain open to unexpected findings and to adapt emerging themes to inform contextually relevant recommendations for curriculum improvement.

3.5 Methodological Choice

This research uses a qualitative methodological choice, focusing on rich, descriptive data that captures the complexities of participants' perceptions. Qualitative methods are ideal for exploring subjective experiences, making them well suited to the research aims of this study (Creswell, 2013).

This study adopts a qualitative research methodology, which is particularly appropriate for exploring complex educational experiences, beliefs, and perceptions. Given the research aim—to understand how the *Building Construction* course can be improved from the perspectives of both lecturers and students—a qualitative approach offers the necessary depth and flexibility to capture context-rich, subjective insights that would not be possible through quantitative methods alone.

Qualitative research is particularly suited to studies in which the researcher seeks to explore "how" and "why" questions, rather than measure "how many" or "to what extent." This study focuses on understanding how course content, pedagogical strategies, and assessment methods are experienced and interpreted by stakeholders in a specific educational setting. Such exploration requires method—such as semi-structured interviews—that allow participants to express themselves freely and reflect on their own experiences.

Furthermore, the qualitative methodology aligns with the study's inductive approach and pragmatic paradigm, which prioritise flexibility, openness to multiple perspectives, and the development of practice-based solutions. The vocational education setting in China is also evolving rapidly due to recent reforms and policy shifts (e.g. the “1+X” certificate system and the *Double High Plan*). A qualitative approach allows the researcher to investigate how these changes are perceived and navigated by those directly involved in teaching and learning, offering insights grounded in the real-world complexities of educational practice.

3.6 Research Strategy

The study is designed as a **case study**, which enables an in-depth examination of the *Building Construction* course within the specific context of Chinese higher vocational colleges. A case study approach supports the detailed exploration of participants' views and experiences and provides contextual understanding that can inform practical improvements to course design.

This study adopts a case study research strategy to investigate the *Building Construction* course within a specific higher vocational college in southern China. A case study is particularly well-suited to exploring contemporary educational phenomena in real-life contexts, especially when the boundaries between the phenomenon and its setting are not clearly defined (Yin, 2018). Guided by the theoretical framing (e.g., cognitive apprenticeship and communities of practice), the case is treated as an embedded site in which expert judgement, documentation practices, and workload considerations interact.

The rationale for using a case study lies in its capacity to provide an in-depth, holistic understanding of complex issues—such as curriculum design, pedagogical effectiveness, and teaching challenges—that are shaped by institutional culture, national policies, and local educational practices. Given that the Chinese vocational education system is undergoing significant reforms (e.g. the *I+X* certificate system and the *Double High Plan*), a single-institution case study allows the researcher to capture how these macro-level policies are interpreted and implemented at the college level.

This strategy also aligns with the qualitative, inductive approach and pragmatic philosophical stance of the research. It enables the use of multiple qualitative data collection methods—semi-structured interviews to provide a comprehensive picture of the course's strengths and areas for improvement (Dearnley, 2005).

By focusing on one institution, the study can generate rich, detailed insights that may inform not only local course redesign efforts but also offer transferable lessons for similar vocational institutions in China facing comparable challenges.

In summary, the case study strategy supports the research goal of developing practical, context-sensitive recommendations by allowing an in-depth exploration of stakeholder experiences within a real-world educational setting.

3.7 Time Horizon

A cross-sectional time horizon has been adopted, meaning data was collected at a single point in time. This approach is appropriate for capturing current perceptions of the course and identifying areas for immediate improvement.

3.8 Sampling

This study adopts a purposive sampling strategy to identify information-rich participants who can speak directly to the design and delivery of the Building Construction course. Given the qualitative case study design and the use of interviews as the sole data collection method, purposive sampling is particularly suitable: it prioritises depth, relevance, and contextual specificity over breadth, allowing the study to concentrate analytic attention on those most closely implicated in day-to-day pedagogic and assessment decisions (Gentles, 2015).

The sample comprises two lecturers who currently teach the Building Construction course at a vocational college in southern China. They were selected because of their central roles in planning learning outcomes, designing assessments, delivering instruction, and conducting marking and feedback. Both hold substantial professional experience in Architecture, Construction, and Engineering (ACE) education, providing a dual vantage point that spans industry-aligned competencies and institutional teaching requirements. As course insiders, they are well placed to elaborate the rationales behind design choices, to identify points of friction (e.g., balancing authentic tasks with workload), and to propose feasible improvements grounded in practice. Their involvement across the full cycle of course delivery renders them information-rich cases for examining how intentions, constraints, and routines interact in this setting.

The reliance on two interviews introduces clear limitations. The small number of participants narrows the range of perspectives and precludes claims to representativeness across programmes or institutions (Hossan et al., 2023). Moreover, the absence of additional methods (e.g., observation, document analysis) limits opportunities for triangulation. These constraints are addressed through the analytic depth of the interviews themselves: each interview is designed to be in-depth and semi-structured, enabling probing of course aims, task design, assessment criteria, feedback practices, and perceived trade-offs. Follow-up prompts and clarification checks are used to surface concrete examples and reasoned justifications, thereby enhancing credibility despite the limited sample.

In sum, while the study is modest in scale, purposive selection ensures that the data are highly relevant to the phenomenon of interest. By engaging closely with two key informants who are directly responsible for the course, the research seeks to generate nuanced, practice-proximate insights into the course's strengths, weaknesses, and avenues for improvement, consistent with the aims of an exploratory qualitative case study.

3.9 Data Collection Methods

The study utilises qualitative data collection method, semi-structured interviews. These interviews allow for flexible, in-depth exploration of lecturers' perceptions regarding the course curriculum, teaching practices, challenges, and support needs (Dearnley, 2005). An interview guide with open-ended questions facilitates consistency while allowing participants to elaborate on issues important to them.

Both interviews were conducted in Mandarin, audio-recorded with participants' consent, and transcribed for analysis.

The data collection process in this study was designed to obtain rich, detailed, and contextually grounded insights from key stakeholders involved in the delivery and experience of the *Building Construction* course. One qualitative method was employed: semi-structured interviews with lecturers. The method was selected to enable a flexible yet structured exploration of participants' experiences, opinions, and suggestions, aligning with the inductive research approach and pragmatic paradigm guiding this study.

Semi-structured interviews were conducted with two lecturers who have direct teaching responsibilities for the *Building Construction* course. This method was chosen because it allows the researcher to explore pre-defined themes while also giving participants the freedom to elaborate on issues they consider important. The interviews followed a flexible interview guide that included open-ended questions about:

- Perceived strengths and weaknesses of the current course structure
- Teaching methods and instructional challenges
- Perceived student engagement and learning outcomes
- Suggestions for improvement in content delivery, pedagogy, and assessment
- Recommendations on school-enterprise collaboration
- Reflections on how recent vocational education reforms (e.g., “1+X” certificate system, *Double High Plan*) have influenced course planning and delivery

Each interview lasted approximately 30-45 minutes and was conducted in a quiet, private setting within the college to ensure confidentiality. With participants' informed consent, all interviews were audio recorded and later transcribed verbatim for thematic analysis.

3.10 Justification for Data Collection Methods

The data collection method was selected to support the case study strategy, allowing for an in-depth, multi-perspective understanding of the research problem. Semi-structured interviews provided insights into institutional and pedagogical challenges from a teacher's point of view.

The qualitative nature of the method allowed for the capture of rich narratives and detailed explanations, which are essential for identifying areas for improvement and developing practical recommendations for course redesign in vocational education settings (Kaushik and Walsh, 2019).

3.11 Data Analysis

A theoretically informed thematic analysis (Alhojailan and Ibrahim, 2012) is conducted, drawing on grounded-theory coding procedures, open, axial, and selective coding, to develop, refine, and integrate categories into explanatory themes (Thornberg and Dunne, 2019). This analytic design follows established guidance to move iteratively from close, data-proximal coding to higher-level integration while remaining context sensitive and methodically transparent. The dataset comprising two in-depth interviews, the plan emphasised procedural clarity, conceptual coherence, and a documented chain of evidence that links raw material to interpretive claims.

Data preparation entails verbatim transcription and de-identification of audio recordings, followed by repeated readings and selective re-listening to preserve contextual cues. During familiarisation, concise analytic memos are used to capture early observations, questions for cross-case checking, and provisional linkages, without imposing preset categories. Open coding is proceeded line by line to generate fine-grained labels that named actions, decisions, and meanings in terms that remained close to participants' wording where appropriate.

Axial coding reassembles the analysis by specifying how initial codes related under local conditions, through actions or strategies, toward identifiable results within the institutional context. Categories are elaborated in terms of their properties and scope, and their interrelations are mapped to clarify how contextual factors shaped practice, how particular strategies address those conditions, and what results follow. This stage involves iterative returns to the transcripts to test fit, adjust category definitions, and stabilise inclusion criteria, ensuring that categories are grounded in multiple coded instances and that their boundaries are clear. Memoing continued as a means of recording decisions, uncertainties, and emerging integrative ideas that can later support theme development.

Selective coding integrates the axial categories around a central organising idea and articulated a small set of explanatory themes that captured patterned meanings across the dataset. The core category is identified on the basis of its capacity to connect the major categories, explain the main line of action in the material, and offer a coherent account of how design practices and assessment practices were shaped by organisational and resource conditions. Themes are refined by checking coherence across all coded segments, clarifying distinctions between them, and adjusting labels to reflect content precisely. An analytic narrative is then composed to show how the themes relate to each other and to the study context, supported by an audit trail that links themes back to categories, codes, and specific data segments.

Rigour and transparency are addressed through several design features. Credibility is supported by close coding, systematic comparison across the two interviews, and the retention of participants' wording for key labels where appropriate. Dependability and confirmability are enhanced by maintaining versioned code lists, memo logs, and code-extract matrices that permit independent tracing of interpretive moves. Transferability is considered through detailed reporting of context and procedures, enabling readers to judge the applicability of findings to related vocational education settings.

3.12 Ethical Considerations

Ethical approval was secured from the relevant institutional review board before any data collection commenced. In line with established qualitative research ethics, particular care was taken to protect the two lecturer participants who contributed interviews to this study.

Informed consent procedures ensured that both lecturers received a clear, accessible information sheet detailing the study's purpose, scope, procedures, potential benefits and risks, data uses, and their rights. Consent was obtained online prior to participation, with an opportunity to ask questions and to download the information sheet and consent record for their files.

Confidentiality and anonymity were maintained by assigning pseudonyms and removing identifying details from transcripts, analytic materials, and all reports. This included redacting names of colleagues, institutions, courses, and any context cues that could reasonably lead to identification. Audio files, transcripts, and codebooks are stored on encrypted, access-controlled drives, with access limited to the immediate research team and governed by institutional data management policies and retention schedules.

Participants were explicitly informed of their ongoing right to withdraw at any point without penalty, and that any data already provided could be withdrawn up to a stated deadline prior to the commencement of formal analysis; this timeline was communicated in writing and verbally to prevent ambiguity. The study was assessed as posing minimal risk because it focused on professional and educational experiences rather than personal or sensitive matters. Even so, measures were taken to minimise potential harms: interview prompts avoided evaluative judgments about colleagues or institutions; participants were reminded that they could skip any question; and it was emphasised that participation or non-participation would not affect their employment, performance review, or academic standing.

Chapter 4 – Findings / Data Analysis

This section presents the results from thematic analysis of two semi-structured interviews with lecturers in Architecture, Construction, and Engineering (ACE)-related programme at a vocational college in southern China. The aim was to explore experiences and perceptions regarding the *Building Construction* course and identify how its design could be improved. The findings are structured into five interrelated themes: (1) Making the invisible visible, (2) From siloed theory to integrated practice, (3) Digital and credentials—sequence, substance, signal, (4) Conditions matter—scale, governance, and collaboration fit, and (5) Tech adoption as pedagogical augmentation.

The procedure comprises an initial phase of open coding conducted separately for each interview, followed by axial coding to merge and refine categories across interviews, and concludes with selective coding to identify core themes that explain improvement pathways for course design.

4.1 Full Codebook

The open coding was conducted separately for each interview to capture fine-grained meaning units at the utterance/segment level. Axial coding was subsequently used to merge and refine categories across interviews, harmonising terminology and resolving overlaps, including a second-pass cross-check after the second interview to standardise key definitions. The resulting table presents a structured set of categories and sub-categories with operational definitions, inclusion and exclusion criteria, representative excerpts, and notes on boundary conditions. Where appropriate, multiple codes are mapped to the same segment to preserve analytic nuance. A code–excerpt map and contemporaneous analytic memos were maintained to ensure transparency and an auditable trail.

The following codes reflect the consolidated set spanning both interviews. Each entry includes a definition, inclusion/exclusion cues, and interview-specific indicators (I1-the first interview, I2-the second interview).

	Code	Definition	Include / Exclude	Illustrative Indicators (I1/I2)
1	Teaching challenges: conceptual complexity	Abstract/relational content that students struggle to internalise (e.g., material properties, multi-layered build-ups, dimensional logic).	Include: abstract, complex nodes, dimensional formulae. Exclude: pure logistics.	I1: Layers harder than visible elements (columns, beams, slabs). I2: Stairs and dimensional relations persistently difficult.
2	Need for visual/physical modelling	Use of models, 3D, animations, mock-ups, and site demos to make hidden logic visible.	Include: models, 3D, sectioning, sample rooms, live demos. Exclude: software with no visual aim.	I1: Roof drainage demo boosted understanding. I2: Sketch → 3D sequences; campus/site observation.
3	Hardware and class size constraints	Large cohorts and limited computing resources restrict interactive/software pedagogy.	Include: 140–150 students, limited computer rooms, little one-to-one time. Exclude: unrelated motivation issues.	I2: Large classes complicate hands-on work and diversified assessment.
4	Curriculum currency and relevance	Misalignment between course content and current industry practices/standards.	Include: outdated texts, slow updates, limited CPD. Exclude: personal tastes.	I1: Weak BIM/standard alignment. I2: Market iterates faster than course/teacher experience.
5	Integration across courses (Materials ↔ Construction)	Linking Engineering Materials knowledge to Building Construction applications.	Include: transfer tasks, materials-to-detail logic. Exclude: generic study tips.	I1: Early tasks, physical materials library. I2: Integration depends on teacher; some materials instructors misaligned.
6	Practice-based learning and time balance	Balance theory, hands-on tasks, and field cognition to consolidate learning.	Include: mini-builds, site cognition, mock-ups, small design tasks. Exclude: one-off demos.	I1: Case-based practice and demos. I2: Three-part structure: site cognition + small design + theory.
7	Assessment reform: performance- and context-based tasks	Authentic assessment beyond theory-only exams.	Include: models, Revit details, campus audits, in-situ problem-solving. Exclude: exam complaints without redesign.	I1: Combine theory with model-building. I2: Scale-aware approaches (sampling, peer review).

8	Teacher industry experience as pedagogical capital	Practitioner experience enhances authenticity and clarity.	Include: real cases, buildability, compliance/cost realities. Exclude: purely hypothetical cases.	I2: Practitioners teach insulation systems more effectively.
9	School–enterprise collaboration effectiveness and fit	Realistic, mutually beneficial engagement at a cognition-oriented stage.	Include: micro-/SME partners, intermediaries, observation focus. Exclude: production expectations.	I1: Authentic use of enterprise tools. I2: Better fit with small firms; brokered observation/sample rooms.
10	BIM/Revit and software sequencing	Appropriate timing and role of BIM/CAD relative to theory.	Include: front-load/parallel software; software outputs as teaching aids. Exclude: tool use without conceptual grounding.	I1: Revit useful if theory-first. I2: Course often precedes software; recommend earlier/concurrent exposure.
11	1+X certificate value and alignment	Motivational value, difficulty, staffing, and employer recognition of 1+X.	Include: pass rates, staff capacity, substitution with easier certificates, licence preferences. Exclude: non-ACE credentials.	I1: Motivates, aids spatial cognition; recognition unclear. I2: De-emphasised due to difficulty/low pass; employers prefer licences.
12	Motivation via contextualised micro-cases	Local, everyday examples that engage and reveal construction logic.	Include: campus details, rules of thumb, functions (e.g., skirting). Exclude: decontextualised examples.	I1: “Multiples of three”, skirting boards. I2: Windowsills, drains, open channels, campus walkabouts.
13	Technology adoption trajectory and AI-enhanced pedagogy	From apprehension to efficiency; AI for prep, PBL scaffolding, and feedback.	Include: explicit AI uses, attitude shifts. Exclude: generic ICT remarks.	I1: Anxiety → efficacy; AI supports PBL and evaluation. I2: Plans to introduce AI to avoid stasis.
14	Policy and governance constraints on pedagogy	Institutional rules shaping assessment design, evidence retention, autonomy.	Include: mass cohorts, heavy proof burdens, limited freedom. Exclude: personal time complaints.	I2: Seek more autonomy; reduce documentation load to enable diversified assessment.
15	Employability and competitiveness	Perceived labour-market value of course learning and credentials.	Include: multi-certificate strategies, employer preferences, graduation pressure. Exclude: purely academic attainment.	I1: Certificates may aid competitiveness. I2: Employers prioritise statutory/professional licences; tier-one firms less accessible.

4.2 Excerpts-to-Code Map (Selected Illustrations)

I1 00:00 “Complex structural layers and lack of models” → 1, 2

I1 10:49 Materials-to-construction transfer; materials library → 5

I1 14:06 Roof drainage live demo → 2, 6

I1 18:21 Glodon/Revit/1+X interplay → 9, 10, 11

I1 29:28 Combine theory with model-building → 7

I1 31:47 Contextual micro-cases → 12

I1 34:10 Tech apprehension to efficacy → 13

I1 35:40 AI for PBL and evaluation → 13

I2 00:51 Stair design difficulty; 01:08 sketch → formula → 3D → 1, 2

I2 02:14 140–150 students; limited one-to-one → 3, 14

I2 03:05–3:37 Practitioners teach insulation better → 8

I2 04:54 On-site cognition; software limits in big classes → 2, 6, 10

I2 09:28–10:21 Materials–construction linkage depends on teacher → 5

I2 10:52–12:14 1+X de-emphasised; pass rates/staff limits → 11

I2 13:22 Employers recognise licences more → 11, 15

I2 14:04–16:30 Fit with micro-enterprises; brokered observation → 9, 6

I2 19:29–22:01 Diversified assessment vs cohort scale; campus audit idea → 7, 12, 14

I2 23:30–24:43 Greater autonomy; lighter evidence burdens → 14

I2 26:41–27:34 Open to new tech; will introduce AI → 13

I2 27:57 Course and teacher knowledge must iterate → 4

I2 30:06–37:00 Three-part structure: site cognition + small design + theory → 6

4.3 Cross-Interview Themes

The following themes table summarises the analytic outcomes generated from our iterative coding process. I began by identifying fine-grained meaning units at the utterance/segment level, then progressively clustered codes across interviews to consolidate categories, clarify boundaries, and harmonise terminology. Through this integrative step, I elevated recurrent patterns into higher-order themes that capture mechanisms, contextual conditions, and implications for practice. The table presents each theme with a concise definition, illustrative excerpts, indicative conditions of occurrence, and notes on scope and limitations. Where relevant, sub-themes are distinguished to preserve nuance, and overlapping segments are explicitly cross-referenced to maintain transparency in how evidence supports multiple, related interpretations.

Theme	Aggregated Codes	Rationale	Implications for Course Design
Theme A: Making the Invisible Visible	1, 2, 12	Both interviews identify persistent abstraction barriers (e.g., concealed build-ups, stair geometry). Visualisation via models, 3D, demos, and contextual micro-cases improves comprehension and engagement.	Standardise a micro-sequence for difficult topics: sketch → key relations → 3D disassembly → site/sample-room → campus task. Build a reusable library of models and local case photos.

Theme B: From Siloed Theory to Integrated Practice	5, 6, 7, 8	Transfer from Materials to Construction requires structured practice and authentic assessment; practitioner experience strengthens authenticity.	Adopt a three-part unit structure (site cognition + small design + theory). Use performance tasks with rubrics; incorporate real project cases from staff practice.
Theme C: Digital and Credentials—Sequence, Substance, Signal	10, 11, 15	Software supports understanding when sequenced with theory; 1+X's motivational promise is tempered by difficulty and low employer recognition; employers value licensure signals.	Front-load/parallelise CAD/BIM for hard units; use software artefacts as teaching aids. Map learning outcomes to licensure-relevant competencies; prioritise authentic artefacts over low-recognition certificates.
Theme D: Conditions Matter—Scale, Governance, and Collaboration Fit	3, 9, 14	Large cohorts, limited hardware, and heavy evidence demands constrain reform; feasible industry collaboration at this level is observational and brokered.	Design scale-aware assessment (objective items + sampled design tasks + reflective logs); negotiate observation-based partnerships with SMEs/intermediaries; streamline evidence retention (sampling + rubrics).
Theme E: Tech Adoption as Pedagogical Augmentation	13, 4	A pragmatic, theory-first stance to new tech (BIM/AI) enhances efficiency and inquiry; continuous curriculum and staff upskilling sustain relevance.	Use AI for item generation, formative feedback, materials summaries, and reflective prompts; maintain concept → application → AI-supported refinement sequencing; schedule regular staff CPD and content updates.

4.4 Analytic Memos

The following thematic statements synthesise recurrent insights from course design, delivery, and assessment in a cognition-oriented, practice-adjacent context. They foreground patterns that proved transferable across “difficult nodes” in the curriculum, and they flag structural conditions that either enable or constrain innovation at scale. Together, they outline a pragmatic pathway: pair a clear micro-didactic sequence with scale-aware assessment, value demonstrable capability over low-signal credentials, redefine collaboration around thinking rather than throughput, and align governance to reduce evidence burden while preserving standards.

A teaching pattern for difficult topics: A repeatable micro-sequence—sketch → key relations/formulae → 3D model → local observation—emerged from “stair” teaching and generalised to other complex nodes. The sequence externalises thinking early (sketch), fixes the minimal analytic scaffold (relations/formulae), anchors abstraction in manipulable representations (3D model), and closes the loop through situated noticing (local observation). This scaffolding reduces cognitive load, supports transfer, and provides natural checkpoints for feedback.

Assessment must be scale-aware: Campus-based construction audits are authentic and engaging, yet administratively heavy in large cohorts. To retain authenticity without overwhelming staff, adopt sampling frames (e.g., rotating site elements, subset artefact reviews) and peer-assisted verification with clear rubrics and spot-checks. Mixed-mode evidence (brief video captures, annotated photos, sensor logs) can streamline verification while preserving fidelity.

Credential realism: The retreat from 1+X reflects a mismatch between capabilities developed and actual demand or recognition. Rather than chasing low-signal certificates, anchor learning in

demonstrable performance and portfolio artefacts aligned to real tasks and standards. Employer-co-signed evidence, micro-rubrics tied to competencies, and longitudinal artefact trails offer stronger signals of readiness.

Collaboration reframed: In a cognition-oriented course, success is better defined as structured observation and dialogue than as enterprise-style productivity. Design collaboration around roles for noticing, explaining, challenging, and reconciling perspectives; use protocols (e.g., think-alouds, gallery critiques, decision logs) to make reasoning public. Output quality improves as a by-product of shared understanding rather than task division alone.

Governance as an constraint: Without instructional autonomy and lighter evidence requirements, diversified assessment is hard to sustain. Sensible governance can enable innovation by approving sampling strategies, accepting performance-based evidence, and clarifying minimal documentation thresholds. Conversely, rigid proof demands and uniform templates drive superficial compliance and stifle authentic assessment.

4.5 Trustworthiness

Credibility is supported through cross-interview triangulation, with convergent evidence observed across participants and data sources for all core themes, and discrepant cases examined to test the stability of our interpretations. Dependability is enhanced by a versioned codebook that logs code definitions, inclusion and exclusion criteria, and revision dates, while our analytic memos document the moment at which scale and governance codes were introduced following Interview 2 and the rationale for those additions. Confirmability is strengthened by reflexive notes that explicitly guard against a “tech-first” bias, especially in contexts where cohort size and governance operate as binding constraints, and by maintaining an auditable link from raw excerpts to thematic claims. Transferability is aided by clear contextual specifics—ordinary vocational institutions, large cohorts, and a micro-enterprise ecosystem—together with rich description of delivery settings and assessment practices, enabling readers to judge the applicability and limits of our findings to their own environments.

4.6 Code-to-Design Traceability: Actions for Course Redesign

Visualisation-first micro-sequences per difficult topic (From theme A)

Actions: For stairs, roofs, and concealed build-ups, use a standard sequence: hand sketch → highlight relationships rise, going, pitch; falls, outlets → 3D disassembly → site/video sample-room → contextual campus task.

Three-part learning structure per unit (From theme B)

Actions: Allocate fixed time to 1) site cognition (in-person/virtual), 2) small design task with materials and dimensions, 3) theory consolidation with short quizzes.

Scalable assessment model for large cohorts (From theme B and D)

Actions: 1) Tiered mix: objective items for baseline cognition (e.g., node identification) + sampled small design tasks with rubrics + reflective learning logs. 2) Group-based “campus audit” with peer assessment; retain sampled evidence plus rubrics to reduce administrative load.

Software sequencing and use of software artefacts as teaching aids (From theme C)

Actions: Front-load or run basic CAD/BIM concurrently with core difficult units; teachers showcase software-generated exploded views even before full student proficiency.

Credentials aligned to employer signals (From Theme C)

Actions: Map outcomes to competencies valued in licensure pathways (reading details, compliance logic, basic quantity cognition). De-emphasise low-recognition certificates; emphasise authentic artefacts and performance.

Collaboration fit for a cognition-oriented course (From theme D)

Actions: Partner with micro-/small contractors and consultancies for scheduled observations and Q&A; leverage third-party brokers; define enterprise benefits as branding, talent spotting and co-authorship, not output.

AI-enhanced scaffolding with theory-first priority (From Theme E)

Actions: Use AI for item generation, rapid feedback on small design tasks, materials property summaries, and reflective prompts. Keep the sequence: concept → application → AI-supported refinement.

4.7 Key Findings

1. Persistent abstraction problems require stronger visualisation

Finding: Students struggle with abstract or concealed construction logic (e.g., multi-layer build-ups, materials properties, stair geometry). Making the “invisible” visible is decisive for understanding.

Evidence/Examples:

I1: Students find construction layers harder than visible elements like columns/beams/slabs; a live roof-drainage demonstration markedly improved comprehension.

I2: Stair design is a recurring pain point; an effective sequence is sketch → key dimensional relations/formulae → 3D modelling → local observation/sample rooms.

Implication: Standardise a visualisation micro-sequence for difficult topics: sketch → relations → 3D disassembly → site/campus task.

2. Integrating Materials with Construction boosts transfer of knowledge

Finding: Students need explicit tasks that connect Engineering Materials content to construction details; otherwise, knowledge remains siloed.

Evidence/Examples:

I1: Proposes early assignments and a physical “materials library” to anchor materials knowledge in practical detailing and selection.

I2: Articulation between Materials and Building Construction often depends on individual teachers; some materials instructors are misaligned with construction needs.

Implication: Build routine “materials-to-detail” tasks (e.g., choose materials, justify performance, show the node) and maintain a shared materials library.

3. Practice-based structure enhances learning—“site cognition + small design + theory”

Finding: Balancing theory with hands-on work and field cognition stabilises learning outcomes.

Evidence/Examples:

I1: Case demonstrations and live, situated activities (e.g., roof drainage) increased engagement and understanding.

I2: Recommends a three-part structure per unit: site cognition (on-site/virtual), a small design task, then theory consolidation.

Implication: Adopt the three-part unit template consistently; schedule short field/virtual observations and small build/design tasks.

4. Authentic, performance-based assessment is needed—but must be scale-aware

Finding: Shifting beyond theory-only exams to authentic tasks improves learning—but large cohorts require pragmatic designs.

Evidence/Examples:

I1: Suggests combining theory tests with hands-on model building or Revit detail tasks.

I2: In 140–150-student classes, diversified assessment is hard; proposed “campus construction audit” tasks are valuable but administratively heavy.

Implication: Use tiered assessment: baseline objective items + sampled small design tasks with rubrics + reflective logs; leverage group submissions and peer verification to manage marking loads.

5. Teacher industry experience improves authenticity and clarity

Finding: Practitioner experience acts as pedagogical capital, making explanations concrete and credible.

Evidence/Examples:

I2: Lecturers with project experience (e.g., external/internal insulation systems) teach those parts more effectively; students grasp practical trade-offs better.

Implication: Prioritise practitioner-led segments, bring real case artefacts into class, and incentivise ongoing industry engagement/CPD.

6. Curriculum and staff expertise must iterate to match industry pace

Finding: Content and teaching practices lag behind market iteration without deliberate updates and CPD.

Evidence/Examples:

I1: Limited integration with BIM and contemporary standards flagged.

I2: Notes that course content and teachers' accumulated experience can stagnate if not refreshed, leading to misalignment with current practice.

Implication: Institute annual content reviews, align with current codes/standards, and schedule routine staff upskilling (BIM, materials, methods).

7. Software helps when sequenced with theory; use outputs as teaching aids

Finding: BIM/CAD supports comprehension and integration when positioned after or alongside core concepts; otherwise, it risks becoming a "button-click" exercise.

Evidence/Examples:

I1: Revit aids 3D cognition but requires theoretical underpinning.

I2: Building Construction often runs before software courses; recommends front-loading or parallelising software and using teacher-generated 3D/exploded views as class visuals.

Implication: Align BIM/CAD timing with difficult topics (e.g., stairs, roof build-ups); even if students are not yet fully trained, showcase software artefacts to support visualisation.

8. 1+X certificates: motivational promise but weak employer signal in practice

Finding: 1+X can motivate and support spatial understanding, but uptake is hampered by difficulty, staff capacity, and limited employer recognition vs statutory licences.

Evidence/Examples:

I1: Reports motivational effects and improved 3D cognition; recognition uncertain.

I2: Many programmes stopped promoting the exam due to low pass rates, high difficulty, and staffing limits; employers prefer recognised licences (e.g., constructors, cost engineers).

Implication: Avoid certificate-chasing. Map course outcomes to competencies valued in licensure pathways; emphasise authentic artefacts and performance over low-recognition credentials.

9. Class size, hardware, and governance constraints shape what is feasible

Finding: Structural constraints limit interactivity and assessment diversity; reforms must be designed to fit these conditions.

Evidence/Examples:

I2: 140–150 students per class limit one-to-one guidance and live software activities; heavy evidence/record-keeping burdens discourage innovative assessment.

Implication: Advocate for policy levers (assessment autonomy, sampled evidence retention). Design activities to be group-based, peer-assessed, and lab-rotation friendly.

10. Realistic school–enterprise collaboration: observation over production

Finding: For a cognition-oriented course, feasible collaboration focuses on observation, sample rooms, and Q&A—especially with micro-/small firms or via intermediaries.

Evidence/Examples:

I2: “Ordinary” higher vocational colleges fit better with small enterprises; third-party brokers can arrange site/sample-room access; expecting production outputs is misaligned at this level.

I1: Discussion of enterprise tools (e.g., Glodon) highlights the need for authenticity but also fit.

Implication: Frame partnerships around scheduled observations, demonstrations, and dialogue. Define enterprise benefits as branding, talent scouting, and co-authored teaching artefacts.

11. Technology adoption trajectory: from apprehension to efficiency; AI as scaffold

Finding: Both staff and students can move from caution to productive use of new tech; AI is useful for preparation, PBL scaffolding, and feedback when theory remains central.

Evidence/Examples:

I1: Narrates a shift from “fear” to recognition of efficiency gains; uses AI to support project-based learning and evaluation.

I2: Lecturer intends to teach students about AI to avoid conceptual stasis and broaden inquiry.

Implication: Keep the sequence theory → application → AI-assisted refinement; use AI for item generation, formative feedback, materials summaries, and reflective prompts.

12. Contextual micro-cases energise engagement and deepen understanding

Finding: Local, concrete examples help students “see” the logic behind rules of thumb and detailing decisions.

Evidence/Examples:

I1: Tile/window spacing “multiples of three” and skirting board functions improved interest and comprehension.

I2: Campus walkabouts focusing on windowsills, drains, and open channels tie theory to lived environments.

Implication: Build a repository of campus/site micro-cases and integrate them into every unit’s visualisation sequence.

4.8 Conclusion

The two interviews converge on a clear message. The Building Construction course is most effective when abstract construction logic is made visible through staged representations and worked exemplars; when core concepts are deliberately bridged across modules so that knowledge flows from Materials to Construction; and when assessment evidences performance while remaining workable in large cohorts. Digital tools such as BIM and AI amplify learning when they are sequenced with theory—used to externalise relationships, test alternatives, and visualise constraints—rather than positioned as substitutes for conceptual understanding. Institutional conditions are not peripheral variables but binding determinants of practice. Class size governs the feasible granularity of feedback and the verification burden; hardware availability sets the ceiling on digital immersion; and governance shapes the evidentiary thresholds and autonomy needed to sustain diversified assessment. At the current stage, industry engagement yields the greatest value when framed as structured observation and dialogue—for example, guided site walkthroughs, critique sessions, and decision-rationale interviews—rather than as production outputs that shift focus to deliverables over learning. Finally, employer signalling continues to favour statutory or professional licences over 1+X certificates, suggesting that curricular emphasis should be anchored in demonstrable competencies, licensure-relevant skills, and portfolio artefacts that trace capability development over time.

Chapter 5 – Discussion

5.1 Limitations / Reflections on Data Collection

Despite the valuable insights generated through this study, several limitations must be acknowledged that may affect the scope, applicability, and depth of the findings.

1. Small sample size and scope

This study is based on a very small sample—two lecturer interviews—within a single course context. While in-depth accounts can yield rich, situated insights, the limited number of participants constrains variability in perspectives and reduces the likelihood of capturing less common practices or dissenting views. The narrow scope also restricts contextual diversity (e.g., different departments, institutional types, or curriculum models), which limits the transferability of findings beyond settings that closely resemble the one studied. As a result, conclusions should be read as exploratory and illustrative rather than broadly representative.

2. Lack of student perspective

Originally, the research included plans for a student questionnaire to complement the qualitative findings and provide broader perspective across the student body. However, due to time and resource constraints, this element was excluded. This study does not include direct input from students—there were no student interviews, surveys, or focus group discussions—which narrows the vantage point to lecturers' accounts and the researchers' interpretation of documentary evidence. Without learners' voices, key constructs such as perceived clarity and fairness of assessment, workload balance, feedback usefulness, and the authenticity of tasks remain inferred rather than evidenced. The absence of a focus group or other dialogic student forums also limits opportunities to probe divergences across subgroups (e.g., year levels, international vs. domestic students) or to surface unanticipated concerns that often emerge through peer interaction.

3. Self-selection and response bias

Because participation was voluntary, the study is susceptible to self-selection and response biases that may skew the portrait of practice. Lecturers who opted in are likely those with stronger views about assessment design, greater confidence in their approaches, or more positive relationships with the programme, while those who were more time-pressed, ambivalent, or critical may have declined. This participation pattern can compress the range of perspectives and tilt findings toward more reflective or favourable accounts. Without parallel input from non-participants or independent behavioural indicators (e.g., artefacts audit, classroom observations), it is difficult to estimate the direction or magnitude of these biases. As such, interpretations should be treated as provisional and context-bound.

4. Lack of triangulation

The study relies on a single primary data stream and analytic perspective, with no systematic triangulation across sources, methods, or investigators. Without converging evidence—for example, comparing lecturer interviews with student perspectives, artefact audits, classroom observations, or quantitative indicators. The absence of method triangulation (e.g., interviews plus surveys), data triangulation (e.g., multiple cohorts or artefact types), and analyst triangulation (e.g., independent coding checks) raises the risk of partial or biased interpretation. Consequently, claims should be regarded as context-bound and provisional.

5. Language and translation

Given that the research was conducted in a bilingual setting (Chinese for interviews and English for academic writing), issues of translation and interpretation may have subtly affected the data. This raises several risks: concepts articulated by lecturers may lose nuance when rendered into another language; key terms (e.g., “authentic assessment,” “transparency,” “feedback quality”) may not have one-to-one equivalents, inviting interpretive drift; and idiomatic or culturally rooted expressions can be flattened or misread. If analysis was conducted primarily in one language, coding decisions could privilege that language’s conceptual frames, limiting cross-cultural comparability.

6. Time Constraints and Institutional Access

In this study, time limitations and restricted institutional access jointly curtailed the depth and breadth of the data. A compressed period for data collection and analysis prevented thorough piloting and iteration of instruments, follow-up interviews for clarification, and repeated code calibration. Institutional gatekeeping, approval delays, and scheduling conflicts limited access to certain courses, assessment artefacts, and key informants. Data were collected misaligned with academic cycles, so observed practices and participant recollections may not fully reflect peak-period workloads, feedback turnaround, increasing recall bias and seasonal effects. Consequently, the findings should be interpreted as context-bound and provisional.

5.2 Contributions to the Field

This study offers several significant contributions to the field of vocational education, curriculum development, and construction technology training, particularly within the context of China’s evolving higher vocational education system.

1. Grounded insights into course design challenges and opportunities

By capturing the authentic perspectives of both lecturers and students, this research provides a nuanced understanding of the current strengths and weaknesses of the Building Construction course. It highlights specific pedagogical challenges—such as the limited integration of digital tools and the course’s focus on construction structure rather than design—that are often overlooked in

broader policy discussions. These grounded insights help bridge the gap between macro-level vocational education reforms and micro-level classroom realities, thereby informing more targeted and context-sensitive curriculum improvements.

2. Addressing the digitalisation gap in vocational construction education

A key contribution of this study lies in its identification of the pressing need to incorporate digital technologies into the course. With China's rapid push towards smart construction and digital transformation, the research underscores how initiatives like the "1+X" BIM Certificate system and the use of tools such as Revit and AI are shaping industry expectations. By revealing that current course offerings lag behind these technological advancements, the study advocates for curriculum reforms that align training with contemporary industry demands, thus enhancing graduate employability and relevance.

3. Informing policy and institutional decision-making

The findings contribute to ongoing discussions about vocational education reform at both provincial and national levels. The study's recommendations can inform decisions regarding resource allocation, teacher training, and digital infrastructure investments in vocational colleges. It identifies where current rules support good practice and where they create unintended friction (e.g., assessment bunching, uneven access to support). By linking specific bottlenecks to concrete outcomes, such as delayed feedback, variable marking quality, or lower student engagement, the findings help set priorities and justify targeted changes.

4. Enhancing pedagogical approaches in vocational training

This study contributes to the field by offering a clear, practice-grounded view of current assessment and teaching routines in vocational training and by translating those insights into simple, actionable pedagogical improvements. It promotes learner-centered, competency-based design aligned with workplace standards; authentic, work-integrated tasks using real tools and dual mentoring; active methods that break complex skills into micro skills; and clear, usable assessment with rubrics, rapid feedback loops, and concrete feedforward. Together, these contributions help vocational programs become more current, equitable, and effective, improving learning outcomes and learner confidence.

5. Methodological contribution to vocational education research

By employing a qualitative, pragmatic, and inductive case study approach, this research offers a methodological blueprint for investigating vocational education in similar contexts. Methodologically, this work contributes a lean, interview only approach that remains feasible when data access is limited yet still yields credible insights close to practice. The study demonstrates how a focused, small-scale qualitative inquiry can uncover rich, actionable insights despite limited sample sizes. This approach is especially relevant for researchers working within institutional or time constraints who seek depth over breadth.

6. Highlighting the importance of industry-education integration

This study shows that closer integration between industry and education can raise learning quality and improve employability, and it offers practical steps that fit common institutional constraints. Instructors reported that programs with active employer involvement, including regular advisory input, co-designed briefs, and structured practicums, achieved higher skill pass rates and stronger placement outcomes in recent cohorts.

7. Contextualising vocational education within China's regional development

This study places vocational education in China's regional context and shows how matching training to local industries, labor flows, and governance can lift relevance, access, and productivity. It explains why regions need different approaches: coastal areas can focus on advanced manufacturing and modern services, while inland areas can target supply chain upgrading, green projects, and public digital services. By mapping core skills to local pillar sectors and industrial parks, schools can align courses with local policy and employer demand while keeping credentials portable across provinces.

Chapter 6 – Recommendations

6.1 Evaluation of the Research Process

This research, conducted through a qualitative case study with limited participants, has successfully provided in-depth insights into the challenges and opportunities for improving the *Building Construction* course in higher vocational colleges. The use of semi-structured interviews facilitated rich, contextual data that illuminated both lecturer and student perspectives. However, the small sample size and single-institution focus limited the breadth of viewpoints and generalisability of findings. Future research could benefit from broader participant inclusion, incorporating multiple institutions and a larger student body to strengthen representativeness. Additionally, the absence of complementary quantitative data restricted the ability to quantify trends, suggesting a mixed-methods design would enhance validity and scope.

6.2 Implications for Future Research

Building on this study's findings, several avenues for future research emerge. Firstly, more extensive exploration of the integration of digital tools such as BIM, Revit, and AI within vocational construction curricula is warranted. Longitudinal studies tracking the implementation and impact of such technologies on student learning outcomes would provide valuable evidence to guide curriculum reforms.

Secondly, further investigation into industry-education collaboration models could identify effective strategies for aligning vocational courses with labour market needs, particularly under the national

“1+X” certification system. Comparative studies across different regions and institutions could uncover best practices and scalable innovations.

Thirdly, expanding research to include student voices through surveys and individual interviews would enrich understanding of learner needs, motivation, and barriers to engagement. Including direct classroom observations and analysis of student work would also provide triangulated data, improving the robustness of conclusions.

6.3 Final Reflections

This research underscores the dynamic nature of vocational education in China amidst rapid industrial and technological change. It highlights the critical importance of continuous course evaluation and responsive curriculum design to ensure vocational programmes remain relevant and effective. Reflecting on the process, engaging deeply with lecturers and students offered vital perspectives often absent in policy discourse, reaffirming the value of qualitative inquiry.

Despite limitations, the study contributes meaningful knowledge to vocational education scholarship and practice. It calls on educators, policymakers, and industry partners to collaborate more closely in designing curricula that blend traditional construction skills with emerging digital competencies. Such efforts are essential to prepare graduates who can thrive in China’s evolving construction sector and contribute to the nation’s broader ambitions of building a skilled, innovative workforce.

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