

REINVENTING FREEHAND SKETCHING: A HYBRID PEDAGOGICAL FRAMEWORK FOR ARCHITECTURAL EDUCATION

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Abstract

Freehand sketching has remained one of the more fundamental skills in architectural education and professional practice, supporting visual thinking, creativity, spatial reasoning, and the communication of design ideas. Although Computer-Aided Design, Building Information Modelling, parametric modelling, and Artificial Intelligence have transformed architectural representation, manual sketching appears to continue playing an important role during the conceptual stages of design. Existing scholarship, however, largely treats sketching and digital technology as parallel rather than integrated concerns, and offers limited operational guidance on how the two might be sequenced within a curriculum. An attempt is made to address that gap. Drawing on a narrative review of literature published mainly between 2015 and 2026 on design cognition, architectural pedagogy, and digital transformation, it proposes a hybrid pedagogical framework that positions freehand sketching as the entry stage of an integrated analogue-to-digital design workflow. The framework links observational and conceptual sketching to digital refinement, BIM-based development, AI-assisted visualization, and professional practice, and may serve as a practical reference for curriculum designers and studio educators. It is argued that reinventing freehand sketching, rather than retaining or replacing it unchanged, could offer a promising route toward graduates who combine creative intuition with technological competence.

Keywords: Architectural education; Artificial intelligence; Design cognition; Digital design; Freehand sketching; Hybrid pedagogy

INTRODUCTION

Architecture is both an artistic and technical profession that depends largely on visual communication. Long before the emergence of digital technologies, freehand sketching served as the principal medium through which architects translated abstract concepts into visual representations capable of guiding design development and construction. Goldschmidt (2017) suggests that, beyond its representational function, sketching has consistently been

recognised as an intellectual process that stimulates critical thinking, creative exploration, and reflective practice.

Within architectural education, freehand sketching constitutes one of the earliest competencies introduced to students, forming the basis for observational drawing, proportion, composition, and spatial visualization. Goldschmidt (2017) contends that sketching remains one of the more effective cognitive tools for externalizing design ideas and facilitating iterative exploration during conceptual design. Yet the widespread availability of digital drawing software appears to have encouraged many students to depend almost exclusively on computers for conceptualization and presentation, and several schools of architecture have correspondingly reduced instructional hours devoted to freehand drawing in favour of software-based courses (Yıldızoğlu, 2024).

This shift has generated a genuine debate. One position holds that digital technologies have rendered manual drawing less relevant, since professional practice increasingly depends on digital production and documentation. The opposing, and perhaps more widely held, position maintains that freehand sketching remains indispensable, since it promotes rapid idea generation, intuitive thinking, and critical reflection in ways digital technologies may not fully replicate (Goldschmidt, 2017; Menezes & Lawson, 2006). Suwa and Tversky (2002) argued that the physical act of sketching supports creative discovery by enabling designers to engage in continuous cycles of seeing, interpreting, modifying, and refining ideas, a pattern more recently echoed in eye-tracking evidence suggesting that abstract sketches elicit more exploratory, reinterpreted engagement than detailed drawings (Park et al., 2026). Yıldızoğlu (2024) similarly found that architecture students who regularly practised freehand sketching demonstrated stronger creative performance and conceptual development than students who relied predominantly on digital tools, while Xia et al. (2021) showed, more broadly, that sustained design practice tends to strengthen divergent thinking in particular, rather than creative ability across the board.

In professional practice, freehand sketching remains a fast and flexible means of communication during client consultations, site inspections, and collaborative brainstorming, allowing architects to express incomplete ideas while stimulating further development (Lawson, 2018). The emergence of Artificial Intelligence has, if anything, renewed scholarly interest in sketching. Albukhari (2025) notes that AI-powered design tools depend on human creativity for initial prompts and iterative refinement, which appears to encourage hybrid workflows in which manual sketches seed digital modelling and AI-assisted visualization rather than being displaced by it.

The relevance of freehand sketching seems particularly pronounced in developing countries such as Nigeria, where inconsistent electricity supply, software licensing costs, and unequal access to digital infrastructure continue to affect architectural education. In many Nigerian schools of architecture, manual sketching remains one of the more accessible and effective methods for developing creative competence. Adenaike et al. (2020), in their review of Yoruba architectural morphology, showed that sketching and manual documentation continue to play a role in recording indigenous architectural forms, drawing on field documentation and measured drawing to record forms that might otherwise remain poorly archived.

What is largely missing from this literature, however, is an operational answer to a practical question: if sketching and digital technology are to coexist in a curriculum, in what sequence, and through what mechanisms, should they be combined? Much of the existing scholarship affirms that sketching and digital tools complement one another in principle, but stops short of specifying how a programme might structure that complementarity across a student's training, or how a studio assessment might weigh one against the other. This paper attempts to address that gap by developing a hybrid pedagogical framework, presented in Section 4, that sequences freehand sketching, digital refinement, and AI-assisted visualization into a workable structure for curriculum design and studio practice. Against this background, it is argued that the future of architectural education lies not in replacing freehand sketching with digital technologies, nor in preserving it unchanged, but in reinventing sketch-based pedagogy through an explicit, integrated framework that complements emerging technological tools.

The aim of this study is to examine the significance of freehand sketching in the teaching and practice of architecture and to develop a hybrid pedagogical framework for integrating sketching with digital and AI-assisted design technologies in architectural education and professional practice. To accomplish this aim, the following objectives were set forth:

- i. To examine the cognitive, creative, and communicative significance of freehand sketching in architectural education and professional practice;
- ii. To review contemporary literature on the relationship between sketching, digital technologies, and artificial intelligence in architectural design;
- iii. To identify the challenges currently affecting the teaching of freehand sketching in architectural curricula; and
- iv. To develop and present a hybrid pedagogical framework that integrates freehand sketching with digital and AI-assisted design workflows.

This paper takes the form of a narrative, critically synthesised review rather than a systematic one. The review draws primarily on peer-reviewed journal articles, books, and institutional reports published between 2015 and 2026, selected for their relevance to four broad themes: design cognition and sketching, architectural pedagogy, digital and AI-assisted design tools, and the role of sketching within Nigerian and broader African architectural education. Consistent with what seems to be standard practice in narrative reviews, this range is not applied as a hard exclusion criterion. A small number of foundational texts, including Suwa and Tversky's (2002) account of sketching as external representation and Lawson's (2006) earlier account of design thinking, are retained alongside their more recent counterparts, since these findings appear to have been built upon, rather than superseded, by the subsequent literature. Sources were located mainly through general academic search, using Google Scholar, publisher databases, and citation chasing from key texts such as Goldschmidt (2017) and Lawson (2018), and were included where they addressed sketching, design cognition, or architectural curriculum design directly, rather than mentioning these topics only in passing.

The remainder of the paper is organised as follows. Section 2 reviews the literature on sketching, design cognition, pedagogy, and digital transformation, and attempts a synthesis in Section 2.8. Section 3 examines skills that freehand sketching appears to develop in students

and practitioners. Section 4 sets out a hybrid pedagogical framework sequencing freehand sketching with digital and AI-assisted design tools, both across a student's curriculum and within an individual project's workflow. Section 5 concludes with recommendations and implications for architectural education and practice.

LITERATURE REVIEW

Introduction

The literature on freehand sketching in architecture has evolved considerably over the last decade, reflecting the transformation of architectural education and professional practice brought about by digital technologies. While CAD, BIM, parametric modelling, virtual and augmented reality, and Artificial Intelligence have arguably revolutionized architectural representation, Lawson (2018) maintains that freehand sketching remains indispensable during the conceptual phases of architectural design. Contemporary research increasingly views sketching not merely as a drawing technique but as a cognitive process that facilitates creativity, design reasoning, visual communication, and reflective thinking.

Concept of Freehand Sketching in Architecture

Freehand sketching refers to the spontaneous production of visual graphic representations without the use of mechanical drawing instruments or digital software. In architecture, it involves the rapid depiction of ideas, observations, spatial relationships, forms, and construction details through manual drawing. Unlike technical drawings, which emphasize precision and standardization, freehand sketches tend to be exploratory and interpretative, allowing architects to investigate multiple possibilities before selecting appropriate design solutions (Lawson, 2018).

Goldschmidt (2017) suggests that sketching constitutes an external representation of thought, enabling architects to visualize incomplete ideas and interact continuously with emerging design concepts. Suwa and Tversky (2002) similarly describe sketching as a form of cognitive dialogue between the designer and the drawing, in which every mark generates new visual information that may stimulate further interpretation and innovation. López-Chao and Rodríguez-Grela (2023) extend this reading to architectural graphics more broadly, showing that freehand drawing appears to deepen the communicative qualities of spatial representation in ways that photographic or purely digital records do not.

Historical Development of Freehand Sketching in Architectural Education

The teaching of architecture has historically relied on drawing as something close to its primary language. During the Renaissance, architects such as Leonardo da Vinci and Andrea Palladio employed freehand sketches to investigate proportions, structural systems, and spatial compositions, using sketchbooks as repositories of ideas and design experiments. The establishment of formal architectural education in the nineteenth century appears to have reinforced this centrality of drawing: the École des Beaux-Arts model, which shaped architectural curricula across Europe, North America, and beyond, emphasized analytical

drawing, measured sketches, and observational study as the foundation of architectural training, a pattern that persisted in many schools well into the twentieth century (Mađanović, 2018).

During the twentieth century, the Bauhaus movement broadened this educational philosophy by integrating artistic creativity with technical knowledge, and freehand sketching became a medium through which students explored materials, abstraction, and visual experimentation; elements of this pedagogy seem to continue informing digital-era design teaching (Anay & Ozten, 2019). The later introduction of CAD marked a further, significant shift in architectural representation, gradually replacing manual drafting for construction documentation, though sketching retained its importance during conceptual design, since early computational tools were arguably less effective for rapid idea generation and intuitive exploration (Kolarevic, 2003). Since around 2015, the emergence of BIM, computational design, and AI-assisted design appears to have redefined sketching's role within hybrid workflows rather than eliminating it: Lawson (2018) argues that sketching now functions as something like the conceptual foundation upon which digital modelling and computational analysis are subsequently developed.

Freehand Sketching and Design Cognition

Design cognition refers to the mental processes involved in generating, evaluating, refining, and communicating architectural ideas. Goldschmidt (2017) proposed that sketching supports a reflective conversation between designers and their drawings, in which every sketch creates visual stimuli that may prompt reinterpretation and the discovery of alternative possibilities. Lawson (2018) similarly argued that sketching facilitates divergent thinking by enabling architects to produce numerous alternative solutions quickly before converging on an appropriate design option, since, unlike digital modelling, which often encourages early precision, sketching tends to tolerate ambiguity and delay premature commitment to a particular solution.

Neurocognitive research offers some support for this account. Van der Meer and Van der Weel (2017) found that handwriting and manual drawing generate stronger neural connectivity than keyboard-based activity, since coordinated hand movement appears to stimulate additional cognitive processing; although their research extends beyond architecture, it is broadly consistent with the educational value claimed for freehand sketching. Xia et al. (2021), more directly, showed that students who undergo sustained design practice, of which sketching is typically a core component, develop significantly stronger divergent thinking than non-design peers, though not necessarily stronger convergent thinking. This is arguably a more precise claim than the common assertion that sketching simply makes designers more creative: the evidence seems to support sketching's role in idea generation and alternative-seeking specifically, rather than in the evaluative, narrowing-down phase of design.

Freehand Sketching as a Pedagogical Tool in Architectural Education

Architectural education has traditionally adopted studio-based learning, in which students acquire knowledge through iterative design exercises, critiques, and visual experimentation.

Within this environment, freehand sketching appears to serve several pedagogical purposes. Ching (2023) argues that it develops observational skills by encouraging students to examine buildings and environments critically, while Menezes and Lawson (2006) suggest that it strengthens visual communication by enabling students to share incomplete concepts during studio critiques. Goldschmidt (2017) further proposes that it promotes creativity by encouraging numerous exploratory sketches rather than single, premature solutions.

Recent studies also suggest that integrating digital tablets into freehand drawing instruction may offer genuine educational benefit, combining something of the spontaneity of manual drawing with the flexibility of digital editing (Şenyapılı & Başa, 2006). Girginkaya Akdag (2018) similarly found that architecture and design students, despite limited prior experience with digital tablets, were able to sketch with sufficient ease that individual originality remained traceable in their digital work, a finding that may partly explain why many schools of architecture now encourage hybrid sketching methods integrating analogue and digital media within studio instruction.

Freehand Sketching in Contemporary Architectural Practice

Although digital technologies dominate architectural documentation, professional architects appear to continue relying extensively on freehand sketching during the conceptual phases of design. Initial client consultations frequently involve rapid sketches that may communicate design intentions more effectively than complex computer models, and interdisciplinary design meetings can benefit from quick visual explanations that facilitate collaborative decision-making (Lawson, 2018). In urban design, conservation, and heritage documentation, sketching remains particularly valuable, arguably because it encourages careful observation of architectural character and cultural context. Adenaike et al. (2020), in their documentation review of Yoruba architectural morphology, illustrate how field-based recording continues to preserve indigenous architectural knowledge in regions where comprehensive digital archives remain limited.

Digital Transformation and Artificial Intelligence

The rapid development of artificial intelligence and computational modelling has encouraged scholars to reconsider sketching's role within integrated design environments, rather than treating it simply as a competitor to digital tools. Oxman (2017) traces how successive computational paradigms have reformulated design thinking itself, from early rule-based schemas toward the parametric and generative models now common in practice, a shift that, it suggests, reframes rather than eliminates the designer's conceptual role. Albukhari (2025) argues that computational intelligence should augment rather than substitute human creativity: while AI can generate multiple design alternatives, meaningful architectural concepts continue to depend on human judgement, contextual understanding, and creative imagination. Castro Pena et al. (2021) and Li et al. (2024) similarly document a growing body of generative-AI tools in conceptual design that take sketches, rather than text prompts alone, as their starting input, which appears to reinforce, rather than displace, the sketch as the first step in a design sequence. This emerging paradigm may reflect a broader shift from technological substitution toward technological integration.

Synthesis of the Reviewed Literature

Table 1 synthesises the literature discussed in the preceding section. Two broad patterns seem to emerge from it. There is fairly strong convergence on sketching's cognitive function, that is, externalizing thought, supporting divergent idea generation, and tolerating productive ambiguity, across studies using quite different methods (theoretical analysis, neurocognitive measurement, design-training comparison). At the same time, the literature appears considerably less developed on the operational question of sequencing: most sources assert that sketching and digital tools should coexist, but relatively few specify how they might be combined within a curriculum or a project workflow.

Table 1. Synthesis of key reviewed literature

Author(s) / Year	Focus	Key Finding / Argument	Relevance to This Study
Goldschmidt (2017)	Design cognition	Sketching is a reflective conversation between designer and drawing that generates new design possibilities.	Theoretical basis for sketching as cognitive, not merely representational.
Suwa & Tversky (2002)	Design cognition	Sketches generate visual information that prompts reinterpretation and innovation.	Supports the case for sketching as iterative reasoning.
Lawson (2018)	Pedagogy & practice	Sketching supports divergent thinking and remains central to professional communication.	Basis for sketching as the entry stage of the proposed framework.
Yıldızoğlu (2024)	Pedagogy	Students who sketch regularly show stronger creative performance than those relying on digital tools alone.	Empirical support for retaining sketching in curricula.
Xia et al. (2021)	Design training (psychology)	Design training strengthens divergent, but not convergent, thinking.	Refines the creativity claim to a specific cognitive mechanism.
Şenyapılı and Başa (2006)	Digital pedagogy	Hybrid digital-tablet sketching preserves spontaneity while adding digital flexibility.	Evidence for the digital-refinement stage of the framework.
Albukhari (2025)	AI in design	AI functions best as a design assistant dependent on human conceptual input.	Basis for positioning AI as a downstream stage, not a replacement.
Mađanović (2018)	History of education	Beaux-Arts drawing pedagogy shaped architectural curricula internationally from the 19th century.	Historical grounding for sketching's curricular centrality.
Adenaike et al. (2020)	Nigerian/African context	Field documentation of Yoruba architectural morphology preserves indigenous architectural knowledge.	Basis for the framework's relevance to under-resourced settings.

SKILLS IN THE TEACHING AND PRACTICE OF ARCHITECTURE THROUGH FREEHAND SKETCHING

Introduction

The acquisition of architectural skills extends beyond the mastery of drawing techniques and digital software. It encompasses cognitive, creative, technical, communicative, and professional competencies that enable architects to conceive, develop, communicate, and execute design ideas. Freehand sketching appears to remain one of the more influential instructional tools in architectural education, arguably because it develops several of these competencies simultaneously (Lawson, 2018; Goldschmidt, 2017).

Observation and Visual Perception Skills

Observation constitutes one of the more fundamental competencies required of architects. Freehand sketching appears to develop this competence by compelling students to study objects carefully before representing them graphically; unlike photography, which captures visual information instantaneously, sketching requires prolonged observation and conscious interpretation. Ching (2023) argues that repeated observational drawing improves visual literacy by strengthening the ability to identify patterns, proportions, and spatial organization, and observation skills developed through sketching may remain valuable in professional practice, during site analysis, building surveys, and construction supervision (Lawson, 2018).

Spatial Visualization and Three-Dimensional Thinking

One of the distinguishing characteristics of architectural education is the ability to visualize three-dimensional space from two-dimensional representations. Goldschmidt (2017) suggests that sketching stimulates mental simulation by allowing designers to manipulate spatial arrangements before physical or digital models are produced, and studies conducted within architectural design studios report that students with strong sketching abilities tend to perform better in spatial reasoning exercises than students who depend exclusively on computer-generated models (Yıldızoğlu, 2024).

Creativity and Conceptual Design Skills

Creativity represents one of the defining characteristics of architectural practice, and freehand sketching appears to remain among the more effective tools for nurturing it. Goldschmidt (2017) describes sketching as a reflective conversation between designers and their drawings, in which every new line introduces visual information that may stimulate further interpretation, while Lawson (2018) similarly argues that sketching supports divergent thinking by encouraging architects to produce numerous conceptual alternatives before selecting an appropriate solution. Artificial intelligence has, if anything, reinforced rather than diminished the importance of this conceptual sketching ability, since, as Albukhari (2025) notes, AI systems remain dependent on human conceptual input and contextual judgement to guide their output.

Visual Communication Skills

Architecture depends on effective communication between architects, engineers, contractors, clients, government agencies, and local communities, and freehand sketching provides one of the faster methods for communicating ideas during the conceptual stages of design. Unlike highly detailed computer renderings, sketches communicate ideas without implying finality, and their informal character tends to encourage discussion, criticism, and collaborative refinement. Menezes and Lawson (2006) argue that sketching facilitates collaborative communication because participants can immediately modify drawings during discussion, a role more recently confirmed by Joseph et al. (2025), who identify sketching, alongside model-making and technical drawing, as one of the core hands-on methods through which architecture studios sustain collaboration. López-Chao and Rodríguez-Grela (2023) add a more specific finding: in their study of architectural graphics, freehand drawing combined with photographic reference appeared to deepen the communicative qualities of linear perspective more effectively than either medium alone, suggesting that the communicative value of sketching may be strongest not in isolation but in combination with other representational media.

Problem-Solving and Critical Thinking Skills

Architecture involves the continuous resolution of spatial, functional, structural, environmental, economic, and social challenges, and design problems rarely possess single correct answers; architects instead investigate multiple alternatives, evaluate their consequences, and refine preferred options through iterative exploration. Suwa and Tversky (2002) argue that sketching enhances problem-solving by externalizing thought processes, allowing designers to identify inconsistencies and discover new relationships. Park et al. (2026) provide more recent eye-tracking evidence for this externalization process, showing that architects rely on exploratory gaze and gesture to offload part of the mental work of spatial reasoning onto the drawing itself, while Lawson (2018) observes that sketching encourages reflective practice by allowing architects to continually evaluate the implications of each design decision.

Professional Competencies Developed through Freehand Sketching

Beyond academic training, freehand sketching appears to contribute to professional competence in several ways. Architects routinely employ sketches throughout project development, including:

- i. conceptual design development
- ii. site analysis and documentation
- iii. client consultations
- iv. interdisciplinary collaboration
- v. heritage documentation
- vi. construction detailing
- vii. post-occupancy evaluation
- viii. urban design studies

Within developing countries, including Nigeria, freehand sketching may also remain economically advantageous, since it requires minimal technological infrastructure while offering fairly immediate opportunities for creative exploration and professional communication.

Comparing Analogue, Digital, and Hybrid Workflows

Table 2 compares the three workflow modes discussed in the literature against the competencies they primarily support. No single mode appears to dominate across all competencies, which underscores the case for treating sketching and digital tools as sequential and complementary, rather than as alternatives to choose between.

Table 2. Comparison of manual, digital, and hybrid design workflows

Attribute	Manual Sketching	Digital / BIM Modelling	Hybrid Workflow
Speed of idea generation	High	Low to moderate	High (sketch stage), with precision later
Tolerance of ambiguity	High	Low, requires early commitment	High at concept stage, narrows progressively
Precision and documentation	Low	High	High, achieved after concept stage
Cognitive/creative engagement	High (Goldschmidt, 2017; Xia et al., 2021)	Moderate	High, sustained across stages
Infrastructure dependency	Minimal	High	Moderate; sketching stage remains low-cost
Collaboration / client communication	Fast, informal	Detailed, but slower to produce	Fast initial communication, detailed follow-through

RE-INVENTING FREEHAND SKETCHING IN CONTEMPORARY ARCHITECTURAL EDUCATION AND PRACTICE

Why Freehand Sketching Must Be Re-invented

Employers increasingly require proficiency in BIM, parametric modelling, digital visualization, and collaborative cloud-based workflows, and architectural schools have correspondingly devoted increasing curricular time to software instruction, often at the expense of manual drawing courses. This has arguably produced a generation of students who demonstrate high digital proficiency but comparatively weaker conceptual sketching ability: several studies report that many architecture students experience difficulty generating ideas without immediately relying on computer software, which may limit creative exploration

during the early stages of design (Yıldızoğlu, 2024). Goldschmidt (2017) suggests that this trend may weaken design cognition, since premature dependence on digital precision can discourage experimentation and reflective thinking. Reinventing freehand sketching, in this light, means repositioning it as the first stage of an integrated digital workflow, rather than treating it either as an isolated artistic exercise or as an optional precursor that can simply be skipped.

Artificial Intelligence and the Future of Sketch-Based Design

AI-powered software can rapidly generate conceptual images, optimize building forms, and support generative design processes, yet it remains dependent on human creativity, contextual understanding, and ethical judgement. Albukhari (2025) argues that AI functions most effectively as an intelligent design assistant rather than an autonomous architect, with human designers remaining responsible for establishing project objectives and making informed design decisions. Freehand sketching therefore assumes, arguably, a renewed importance within AI-assisted workflows, since initial manual drawings often serve as prompts or conceptual anchors for AI visualization software, allowing architects to explore alternatives while retaining creative control (Castro Pena et al., 2021; Li et al., 2024). Future curricula might accordingly include instruction on AI-supported sketch interpretation and generative design, without abandoning manual sketch-based thinking.

Challenges Affecting the Teaching of Freehand Sketching

Several factors continue to undermine the effective teaching of freehand sketching in architectural education: excessive student dependence on digital software, which many perceive as more directly tied to employability; curriculum overcrowding, as newer subjects such as BIM, sustainability, and computational design compete for limited studio time; inadequate instructional resources, particularly in developing countries with constrained studio facilities and infrastructure (Onyegiri et al., 2014), a constraint Okofu and Fakere (2022) link more recently to the continued reliance of Nigerian architectural curricula on inherited British and American pedagogic models; and changing student learning preferences shaped by mobile devices and online visualization tools. Any curricular response to these constraints presumably depends on protecting studio time for sketching instruction, rather than treating it as residual capacity once digital coursework has been scheduled.

A Hybrid Pedagogical Framework for Re-inventing Freehand Sketching

A hybrid pedagogical framework is proposed here, sequencing freehand sketching, digital refinement, and AI-assisted visualization across a student's training and into professional practice. The framework operates in two dimensions: a curricular dimension, which specifies the stage of training at which each competency might be introduced (Table 3), and a workflow dimension, which specifies the sequence in which an individual design project could move between analogue and digital media (Figure 1).

4.4.1 Curricular Dimension

Table 3. Curricular dimension of the hybrid pedagogical framework

Stage	Primary Focus	Sketching's Role	Digital Tools Introduced
Foundation (Years 1–2)	Observation, proportion, perspective, spatial visualization	Compulsory; sketchbooks maintained as assessed coursework	None, or basic digital tablets for familiarisation only
Intermediate (Years 3–4)	Studio design development, BIM fundamentals	Every project initiated through manual sketch exploration before digital modelling begins	BIM, parametric modelling, digital tablets for refinement
Advanced (Final year)	Interdisciplinary collaboration, project delivery	Sketching retained for client communication, site documentation, and concept review	Full BIM/CAD documentation, AI-assisted visualization
Professional practice	Client consultation, site supervision, design review	Rapid sketching for communication and on-site problem-solving	BIM/CAD for documentation; AI tools for visualization and option generation

Workflow Dimension

Within an individual project, the framework sequences seven stages, moving from analogue to digital and back to analogue at the point of professional communication:

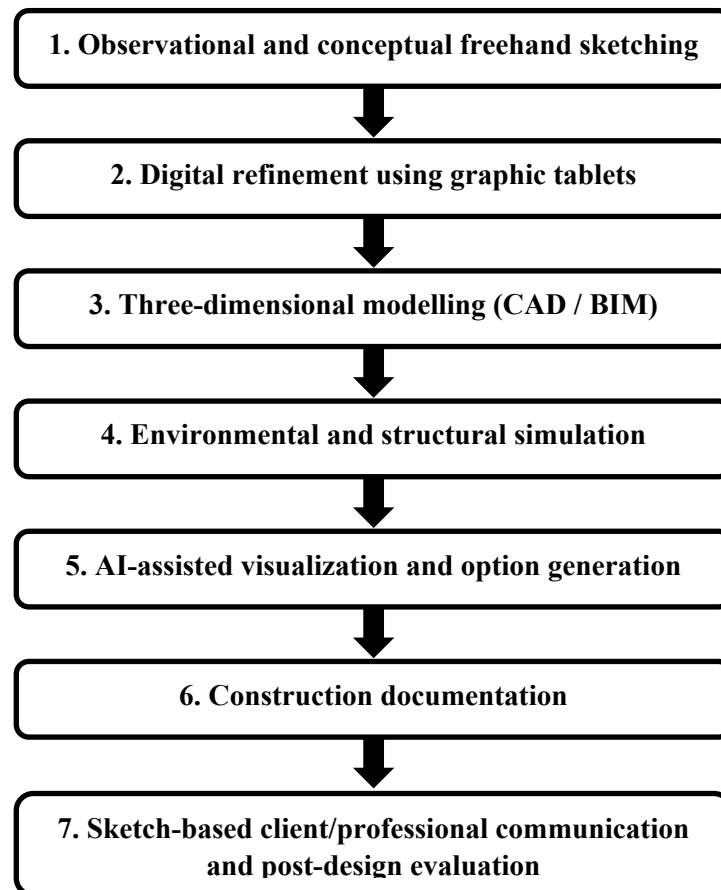


Figure 1. Workflow dimension of the hybrid pedagogical framework: sequencing freehand sketching with digital and AI-assisted design

Sketching's return at Stage 7 follows from the literature reviewed in Section 2.6, which suggests that professional communication (client meetings, site visits, interdisciplinary discussion) tends to favour fast, informal sketching even after a project has been fully developed in BIM, since sketches communicate without implying finality (Lawson, 2018; Menezes & Lawson, 2006; Joseph et al., 2025). The framework accordingly treats sketching as both the entry point and a recurring communicative tool throughout the design and delivery process, rather than only as a preliminary phase discarded once digital modelling begins. Consistent with UNESCO's (2021) call for higher education to cultivate creativity, adaptability, and technological competence together, studio assessment under this framework might evaluate the process shown in Stages 1–2 (sketchbooks, iterative concept studies) alongside the documentation produced in Stages 3–6, rather than evaluating only the finished digital presentation.

CONCLUSION, RECOMMENDATIONS AND REFERENCES

Conclusion

Freehand sketching has remained an important component of architectural education and professional practice despite the rapid advancement of digital technologies. The review undertaken here suggests that sketching is a cognitive process supporting creativity, design reasoning, visual communication, and problem-solving, and that these functions remain relevant within twenty-first-century architectural practice (Goldschmidt, 2017; Lawson, 2018). Where the existing literature appears to fall short is in specifying how sketching and digital technology should be sequenced within a curriculum and a project workflow; the hybrid pedagogical framework proposed in this paper attempts to address that gap by sequencing sketching, digital refinement, BIM development, and AI-assisted visualization across both a student's training and an individual project's lifecycle. It is concluded, tentatively, that the future of freehand sketching may lie not in preserving traditional practice unchanged, nor in replacing it with digital technology, but in something closer to the explicit, sequenced integration set out in the proposed framework, which could help architecture graduates combine creative thinking with technological competence.

Recommendations

Based on the framework developed in this paper, the following recommendations are proposed:

- i. Schools of architecture should consider retaining freehand sketching as a compulsory, assessed component of the foundation years, consistent with Table 3.
- ii. Studio curricula might require every project to begin with documented freehand sketch exploration before digital modelling is permitted, consistent with the workflow in Figure 1.
- iii. Studio assessment should ideally evaluate sketchbooks and iterative design process alongside finished digital presentations.
- iv. Architectural educators might introduce AI-assisted visualization only after students have developed independent conceptual sketches, positioning AI as Stage 5 rather than Stage 1 of the design process.
- v. Nigerian schools of architecture could invest in studio facilities and digital tablets while protecting foundation-year sketching instruction from displacement by software courses.
- vi. Architectural accreditation bodies might recognise both analogue and digital design capabilities in graduate competency standards, reflecting the curricular dimension of the proposed framework.

Implications for Architectural Education and Practice

For architectural schools, the framework implies a fairly specific curricular sequence (Table 3), rather than a general endorsement of “blended learning”: sketching is compulsory and unassisted in the foundation years, digital tools are introduced once sketching competence is

reasonably established, and AI is introduced last, as a refinement and visualization aid. For professional practice, the framework suggests that sketch-based communication might be maintained deliberately at the point of client and interdisciplinary engagement (Stage 7), even on projects developed primarily in BIM.

Limitations of the Study

This paper is a narrative review and does not include original empirical investigation involving architecture students or practising architects; the proposed framework is therefore conceptual and would likely benefit from empirical testing. The review also concentrates on architectural education without undertaking comparative analysis across related design disciplines such as industrial or landscape design, which may limit how far its conclusions can be generalised.

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