Thinking Through Lines: The Role of Freehand Drawing in Architectural Ideation

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Abstract

In an era where technology increasingly dominates architectural design, computer-generated presentations have largely replaced hand-drawn drawings. This transition, characterized by Capro (2013) as the "digital turn," has significantly transformed how architectural ideas are conceptualized and communicated. Despite these advancements, freehand drawings continue to be a crucial element of the design process. This study investigates the enduring relevance of freehand drawing, highlighting its role as a cognitive tool that facilitates the direct translation of thoughts and imagination onto paper. The research highlights how freehand drawing enables creativity, spatial awareness, and conceptual exploration. By allowing designers to engage deeply with their sensory perceptions of space, freehand drawing captures materials' tactile and visual qualities, offering an embodied experience informed by sensory cosmology and connecting to broader cosmic themes. The study advocates for incorporating freehand drawing exercises in early architectural education to stimulate imaginative and creative thinking, emphasizing the role of line as a fundamental architectural element. However, the undeniable advancement of technology in architectural presentation necessitates a balanced approach. This research, was conducted through online survey of architecture and related spatial design students and professionals aims to gather diverse perspectives on the comparative impact of freehand versus digital methods in the architectural design process, aiming to guide educators in effectively integrating both traditional and digital techniques.

Keywords: freehand drawing, creativity, visualization, Architecture, digital drawing

I. Introduction

A. Background of the study

The design process is a dynamic interplay between cognitive visualization and external representation. As Hewitt (2020) notes, "designing involves using external aids to support the mental images created in the mind." In architectural education, freehand drawing has traditionally served as a fundamental practice, offering designers a dynamic tool through which to explore and refine ideas. However, the advent of digital technologies has transformed the design landscape by introducing advanced tools that enhance precision and efficiency, at times overshadowing traditional methods. For students entering architectural programs, the development of observational skills through drawing remains crucial. Drawing functions as a designer's visual language, with sketchbooks often serving as visual diaries that support reflection and ideation (Edwards, 2008). Freehand drawing, therefore, plays a fundamental role in the early stages of architectural education, supporting the development of visualization skills and conceptual thinking.

As a mode of communication, drawing also acts as a flexible visual language for spatial reasoning, enabling designers not only to represent ideas but also organize and develop them (Kasprisin & Pettinari, 1995). This practice has long been central to architectural pedagogy, fostering spatial awareness and creativity while allowing students to explore and express their ideas efficiently. At the same time, the increasing prevalence of digital tools offering faster and more precise modes of representation necessitates recognition of the significant role of digitalization in architectural training. Digital tools provide precision, efficiency and adaptability, enabling students to refine and articulate designs through advanced computational methodologies.

This research argues that while freehand drawing remains fundamental during the early stages of conceptual development, the integration of digital technologies enhances students' ability to further develop and communicate design ideas with greater clarity. Consequently, a balanced pedagogical approach that

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integrates both traditional and digital methodologies is essential for preparing students to address the evolving challenges of the architectural profession.

B. Research Problem and Significance

Before the rise of Computer-Aided Design (CAD) software and other digital tools, freehand drawing was the primary starting point for architectural design. Through drawing, designers can explore and communicate their ideas using a graphic language much like Leonardo da Vinci's detailed sketches. These initial sketches are not mere representations, they are integral to the thinking and problem-solving processes in architecture. Freehand sketching engages architects deeply with their ideas, often leading to unexpected insights that digital methods may struggle to replicate (Belardi, 2014) In today's fast-paced digital technology, where students mostly favor digital media, it is still crucial to teach the students the value of using hand and paper for developing ideas.

Moreover, the practice of observation is as vital as the practice of designing. Coordination between the hand and eye is essential for mastering freehand drawing. Only through consistent practice and adherence to effective principles can one draw confidently and without hesitation (Edwards,2008). In architecture, everything begins with a line, whether it's a physical line on paper, a conceptual thought, or a written line of text (Abdi, 2021).

As technology advances, it is reshaping how architects approach graphic representation. While some argue that technology diminishes creativity, others contend that it enhances freedom in the creative process. This research argues that freehand drawing remains a crucial element in the cognitive process of architectural ideation, while technology best utilized in later stages to refine and develop ideas initially conceived through manual drawing.

The architectural design process relies heavily on the ability to translate abstract ideas into tangible representations. For centuries, freehand drawing has been the primary method through which architects express, explore, and refine their concepts. It fosters a deep connection between thought and visualization, allowing us to engage in an iterative process of ideation where ideas evolve through the act of sketching. Despite the undeniable value of this skill, the increasing prevalence of digital tools has begun to overshadow traditional methods. While digital tools offer precision and efficiency, yet the digital design process can undoubtedly open up new possibilities and expand the limits of construction; however, it often diminishes the richness of our multi-sensory imaginations. The use of computers introduces a sense of detachment between the creator and the object, while hand drawing and working with physical models allow the designer to engage in a tactile interaction with the object or space. (Pallasmaa, 2012)

This raises a critical question for contemporary architectural education:

Main Problem:

How does freehand drawing influence the process of architectural ideation?

C. Objectives of the Study

- To evaluate the role of freehand drawing in the design process.
- To explore the effectiveness of freehand drawing as a tool for architectural thinking.
- To study the integration of freehand drawing with digital tools in modern architectural practices.

II. Review of Related Literature

The practice of architectural drawing is a skill, wherein some individuals may exhibit a natural tendency, yet it is also one that can be systematically developed through sustained effort. The essential aspect involves leveraging the coordination of the hand to accurately convey the envisioned design onto the medium. (Frascari, 2011) The untrained eye can acquire substantial knowledge through the practice of drawing, as it instills essential visual discipline and cultivates a heightened awareness of form, line, and perspective. (Edwards,2008) Visual perception forms images of the external world as seen with our eyes open, contributing to our exploration and understanding of our surroundings. Conversely, with our eyes closed, the mind's eye creates images of an internal reality—either memories of past events or visions of an imagined future. (Ching, 2018)

To nourish the brain effectively, humans must engage their eyes, hands, and spatial awareness. In the process of learning to design, architects must first develop their drawing skills. Research on design thinking indicates that architecture students should utilize soft pencils and sketch paper to cultivate visual thinking skill. (Hewitt, 2020) in drawing by hand, each individual naturally creates unique marks and lines. These fundamental aspects of drawing are the most immediate expressions of our visual thinking and creative imagination. They embody how we synthesize and develop a design through a complex process, allowing us to explore alternative directions, opportunities, and ideas that might be challenging to express otherwise. (Dernie, 2010) However in the current digital building era, it is important to examine and understand the interplay between analogue and digital methods in architectural representation. Digital media now provides exceptional opportunities for architectural drawing and has evolved to meet the needs of a contemporary construction industry that has largely transitioned away from traditional craftsmanship. (Dernie, 2010). Architects start with free-hand sketching, it has been proposed that sketching introduces a unique dialectical approach to design reasoning, this method is based on interactive imagery, where sketches continually produce visual cues that guide the process of visual reasoning. Importantly, this reasoning is not about something already perceived, but about the yet to be realized (Goldschmidt, 1991).

III. Research Methodology

A. Research Design

This study adopted a mixed-methods research design, combining qualitative inquiry with descriptive quantitative analysis to examine perceptions of freehand drawing, digital drawing, and hybrid drawing practices in design ideation. Data were collected using a survey method to capture both measurable trends and reflective insights related to drawing practices in design thinking.

A convenience sampling strategy was employed, with participants recruited through online platforms and academic and professional networks. The respondents consisted of students and practicing professionals from architecture, interior design, and landscape architecture, representing varying levels of educational background and professional experience. the study did not aim for statistical representativeness; rather, it sought to capture a broad range of perspectives across design disciplines and experience levels.

A total of 260 individuals completed the survey. Among them, 65 were practicing architects, 6 were practicing landscape architects, 6 were architecture apprentices, and 177 were students. Student participants were distributed across year levels as follows: 89 first-year, 40 second-year, 23 third-year, 13 fourth-year, and 24 fifth-year students (Figure 1). This distribution indicates a larger representation of early-year students compared to professionals, which should be considered when interpreting the results.

Data collection was conducted through an online survey comprising both structured and open-ended questions. The survey explored participants' drawing preferences, perceived cognitive and creative benefits, and design communication practices associated with freehand, digital, and hybrid drawing approaches.

IV. Research Proper

To analyze the different approaches to visualizing ideas through freehand drawing and digital drawing, a survey was conducted to gather insights on preferences, experiences, and perceived advantages of both methods. Participants were asked a series of questions designed to explore various aspects of each technique, including creativity, ease of use, precision, flexibility, and overall satisfaction.

The survey was conducted through a series of questions, and 260 respondents participated.

Drawing is an extension of the architect's mind, the mind is an extension of his hand (Pedersen, 2015 p.166 as cited in Welton, 2015) Drawing is a communication tool, to understand the relationship between mind and thought therefore, before a design is sketched, it takes shape in the architect's mind as an evolving concept. Goldschmidt (2014) emphasizes that "sketching is thinking", highlighting that the act of drawing is not merely a way to record ideas but an integral part of the designer's cognitive process.

The "search cycle" in design—comprising exploration, experimentation, and reflection—continues until the designer is ready to commit to a 'hard line' drawing, which represents a more formalized and resolved solution (Goldschmidt, 2014, p. 130). In this sense, sketching functions as both a thinking tool and a problem-solving mechanism, allowing designers to externalize ideas, test multiple alternatives, and refine concepts iteratively.

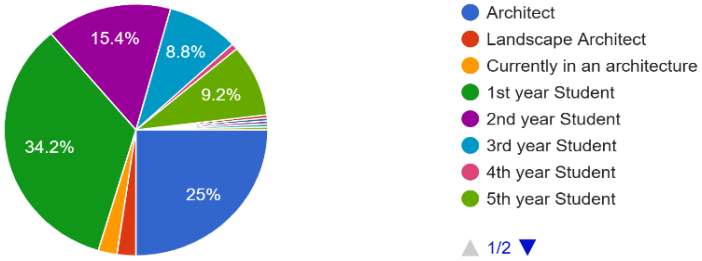

Figure 1 presents the demographic profile of the respondents. (n = 260).

In the context of architectural education, this perspective underscores the importance of freehand drawing exercises in studio courses, where students engage in iterative sketching to develop spatial ideas, compositions, and design strategies. By integrating both freehand and digital methods, students can explore a broader range of solutions while maintaining the cognitive benefits of sketching as a mode of thinking (Goldschmidt, 2014).

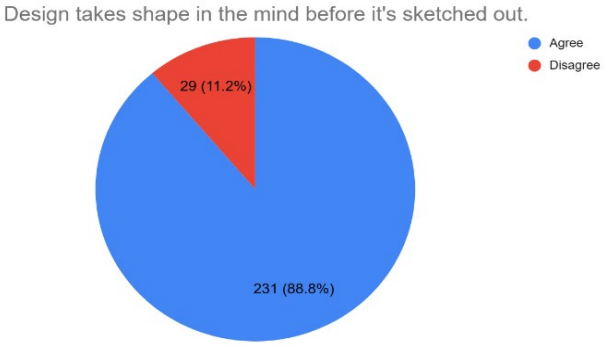

Figure 2 Pie chart illustrating the distribution of participant agreement levels on the statement "Design takes shape in the mind before it is sketched out." (n=260).

One key question asked was: "How confident are you in visualizing your ideas through freehand drawing and digital drawing?" This question aimed to assess the participants' level of comfort and confidence with each method and how it impacts their ability to communicate their ideas effectively examining the responses to these questions, the survey aims to provide a deeper understanding of how freehand and digital drawing contribute to visualizing ideas, how confident individuals feel with each method, and what factors influence their choices between the two.

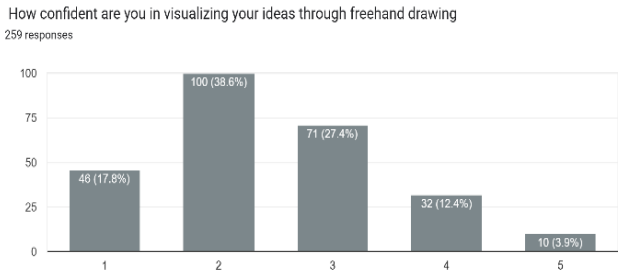

Figure 4 Distribution of participant confidence in freehand drawing, measured on a linear scale from 1 (Very Confident) to 5 (Not Confident) (n = 260).

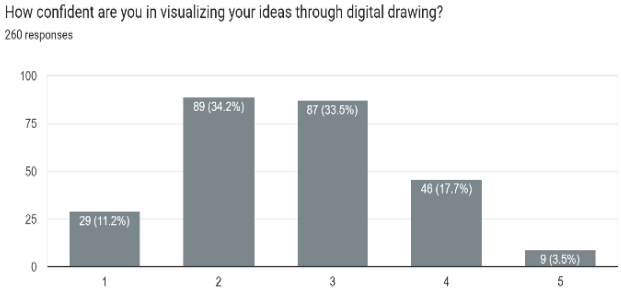

Figure 6 Distribution of participant confidence in digital drawing, measured on a linear scale from 1 (Very Confident) to 5 (Not Confident) (n = 260).

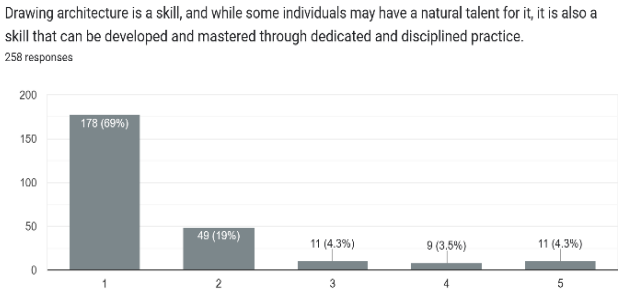

Figure 3 Distribution of participant responses to the statement "Drawing architecture is a skill, and while some individuals may have a natural talent for it, it is also a skill that can be developed and mastered through dedicated and disciplined practice" measured on a 5-point Likert scale from 1 (Agree) to 5 (Disagree) (n = 260).

While not all individuals exhibit a natural talent for freehand drawing, evidence suggests that skills in this area can be significantly developed through sustained practice. Students who regularly engage in freehand sketching often experience marked improvements in their visual communication abilities over time. This enhancement is largely due to the iterative nature of the drawing process, which encourages experimentation and refinement.
Furthermore, drawing facilitates cognitive processes that promote creative thinking and problem-solving, enriching the overall design experience. Therefore, it is crucial for architectural education to incorporate structured opportunities for freehand drawing practice, as these experiences not only improve students' confidence but also empower them to articulate complex ideas more effectively. Similar question with focus on digital drawing was asked to see how much difference would accrue between freehand drawing and digital drawing, 11.2 % were confident compared to the 17.8 % of free hand drawing.
The next question, "How often do you use freehand drawing in work or school?" aims to explore the frequency with which individuals engage in freehand drawing as part of their daily tasks or educational activities.

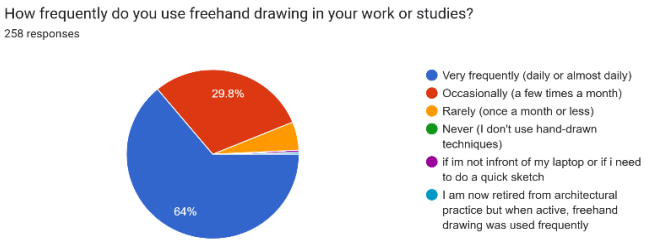

Figure 5 Pie chart illustrating the frequency of freehand drawing use among participants, measured on a scale from Never to Always (n = 260.

The motivation for this question lies in understanding the personal preferences and choices of respondents when it comes to choosing which drawing technique as a tool for thinking, communication, or creativity. By examining how frequently people rely on freehand drawing, the survey seeks to determine whether it plays a crucial role in their problem-solving, design processes, or ideation in various contexts. Additionally, it aims to assess whether freehand drawing is an essential skill that enhances the effectiveness of their work or academic projects, or if digital tools have largely supplanted traditional drawing methods. This insight can help illuminate the relevance of freehand drawing in modern professional and educational settings, highlighting its value or decline in daily practice.

When we use a pen to translate our thoughts onto paper, it creates a direct and intuitive connection between the mind and hand, allowing for a faster and more effective flow of creativity. The simple act of drawing lines transforms abstract ideas into concrete visual representations, helping individuals conceptualize and problem-solve in real time. Freehand drawing serves not only as a tool for communication but also as a method of thinking, enabling the mind to explore, refine, and develop ideas dynamically.

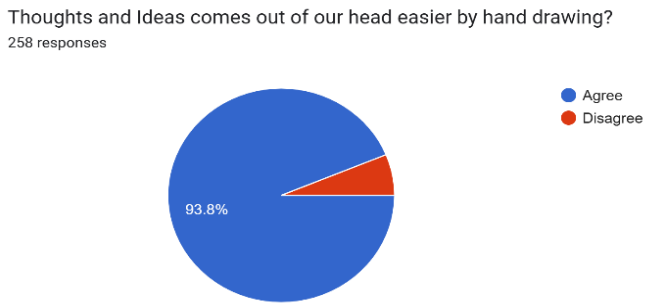

Figure 7 Pie chart showing participant responses to the statement "Thoughts and ideas come out of our head easier by hand drawing" measured on an agree–disagree scale (n = 260).

This process can be crucial in the creative workflow, as it allows for the rapid expression and evolution of complex thoughts, often more effectively than methods like typing or digital tools. The purpose of this question is to determine whether individuals find drawing to be an essential part of their creative process and whether it enhances their ability to translate thoughts into workable designs solutions. The ability to translate thoughts into workable designs or solutions.

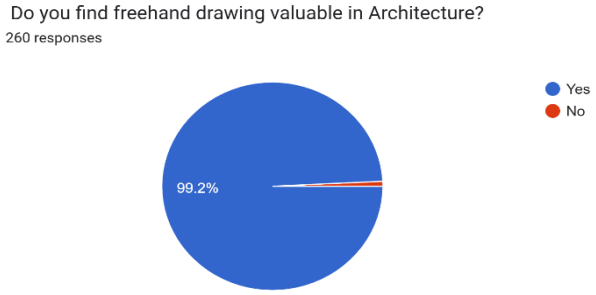

Figure 8 Pie chart showing participant responses to the question "Do you find freehand drawing valuable in architecture?" (n = 260)

Do you find freehand drawing valuable in architecture?" was the next question 99.2 % agreed with freehand drawing as an essential part of Architecture. This question was included to gather insights from respondents on the perceived importance and relevance of freehand drawing in the field of architecture. The primary objective was to explore how individuals, particularly architects and designers, view the role of traditional sketching methods in the context of modern architectural practice, where digital tools are increasingly prevalent.

The reason for posing this question was to understand different perspectives on freehand drawing's contribution to the creative process, communication of ideas, and design development. By asking this, the survey aimed to uncover whether professionals and students alike still consider freehand drawing as a critical skill for rapid ideation, conceptual development, and artistic expression in architectural projects, or if they view it as less relevant due to the advancements in digital design software.

Most participants agreed that hand sketching allows ideas to flow more naturally and evolve in ways that digital tools

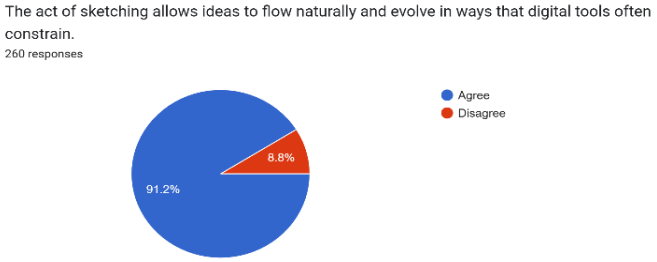

Figure 9 Pie chart showing participant responses to the statement "The act of sketching allows ideas to flow naturally and evolve in ways that digital tools often constrain." (n = 260)

often constrain. Unlike the rigid structures and predefined parameters of software, sketching fosters a more intuitive design process, encouraging creativity and spontaneity, which are essential in early-stage conceptual development. This freedom enables architects to explore ideas without the technical limitations imposed by digital tools, thereby promoting flexibility and deeper engagement with the design process. While digital tools offer precision, participants' responses highlight the enduring relevance of hand-drawing in architectural practice, particularly for its capacity to enhance creative exploration.

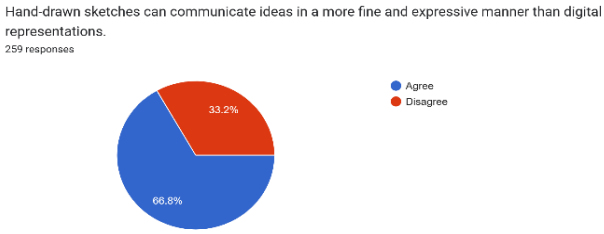

Figure 10 Pie chart showing participant responses to the statement "Hand-drawn sketches can communicate ideas in a more fine and expressive manner than digital representations." (n = 260)

In the world of design and communication, hand-drawn sketches hold a unique value that often surpasses digital representations. These sketches provide a direct and organic link between the creator's thoughts and the visual expression, capturing nuances and emotions that might be lost in digital formats. The tactile nature of hand-drawn lines and their imperfections bring a sense of authenticity and spontaneity, allowing for a more expressive form of communication. Unlike digital tools' often rigid and polished outcomes, hand-drawn sketches foster a deeper connection to the idea.

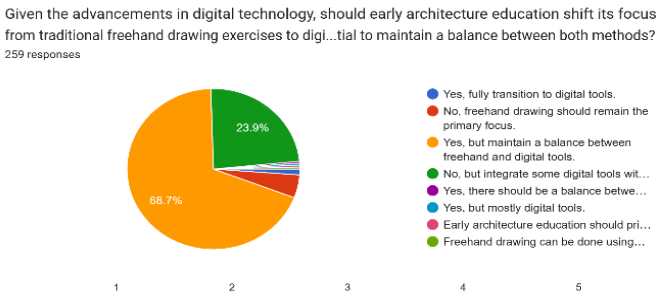

Figure 11 Participant responses to the question "Should early architecture education shift from traditional freehand drawing to digital tools, or maintain a balance between both methods?" (n = 260)

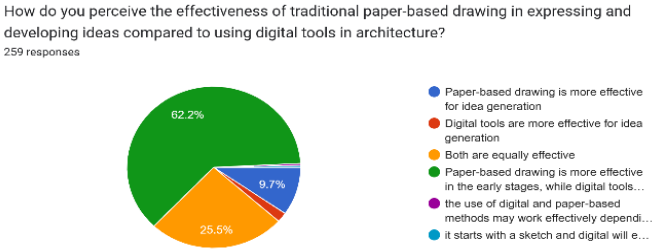

Figure 12 Participant responses to the question "How do you perceive the effectiveness of traditional paper-based drawing in expressing and developing ideas compared to using digital tools in architecture?" (n = 260)

As digital technology continues to revolutionize the field of architecture, there is an ongoing debate about whether early architecture education should shift its focus away from traditional freehand drawing toward digital tools. Freehand drawing has long been considered a fundamental skill that enhances an architect's ability to conceptualize and think critically in the design process. However, with the increasing availability and sophistication of digital design software, some argue that digital tools are now more practical and efficient for modern architectural practice. This survey aims to explore the opinions of students and professionals on whether architecture education should prioritize digital tools, retain traditional drawing exercises, or maintain a balance between both methods to foster creativity and technical proficiency.

The question aimed to understand how students and architects choose between digital tools or freehand drawings when starting the ideation process in their respective works. The purpose of this question is to explore which method is preferred for initial concept development and how each approach influences creativity, problem-solving, and the translation of ideas into early-stage designs. By examining these preferences, the survey seeks to shed light on whether individuals find one method more effective than the other, or if a combination of both is ideal for fostering innovation and clarity in the design process.

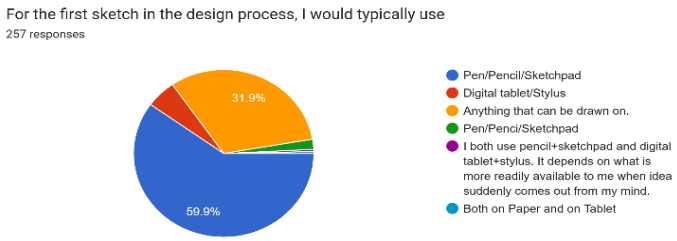

Figure 13 Distribution of participant preferences for sketching mediums in the first stage of the design process (n = 260).

The question, "When should you start using computer tools in the design process?" was posed to understand the perspectives of participants regarding the appropriate point to introduce digital tools. The aim was to gather insights into when participants believe these tools best support the design process, especially in relation to the early conceptual stages traditionally dominated by hand-drawing.

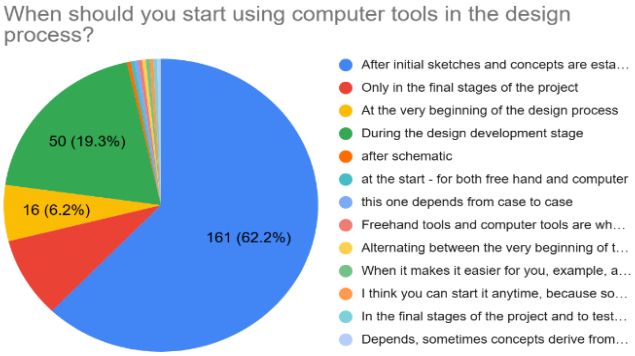

Figure 14 Participant responses to the question "When should you start using computer tools in the design process?" (n = 260)

The direct connection between hand and paper supports a smooth creative process, where hand-eye coordination links physical actions to our thoughts. This interaction helps ideas flow more naturally, leading to better creative outcomes and problem-solving skills. The tactile experience of drawing allows for greater freedom in exploring concepts, compared to the limitations often imposed by digital tools.

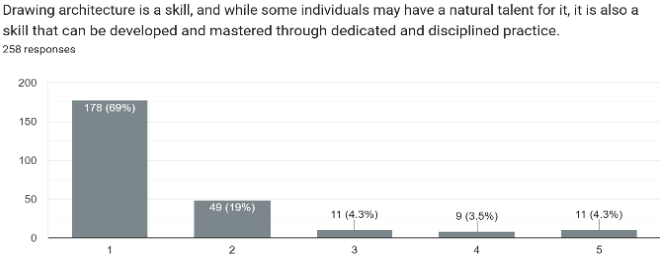

Figure 15 Linear scale bar showing participant agreement levels among students and professionals regarding the statement "Drawing architecture is a skill, and while some individuals may have a natural talent for it, it is also a skill that can be developed and mastered through dedicated and disciplined practice" (1 = Agree, 5 = Disagree; n = 260)

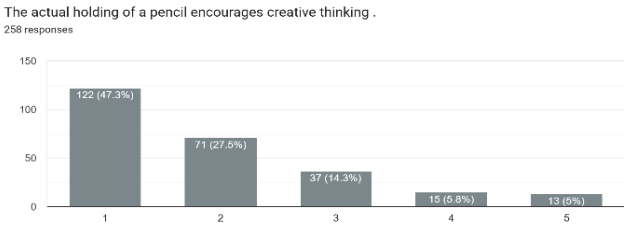

Figure 16 Participant responses to the statement "The actual holding of a pencil encourages creative thinking" measured on an agree–disagree scale (n = 260).

V. Analysis and Results

The question, "*What are your thoughts about freehand drawing and hybrid drawings?*" was aimed at understanding preferences regarding these mediums. The aim was to gather insights on which approach participants favor and how each method impacts their creativity and effectiveness in translating ideas into visual forms.

Table 1 Summary of participant responses to the open-ended question "What are your thoughts about freehand drawing and hybrid drawings?" (n = 260)

Theme	Description	Sample Quotes
Free hand drawing	• Encourages spontaneous expression and creativity • Effective for on-the-spot communication of concepts. • More tactile; allows for a direct feel of the medium • More loose and less constrained; allows for random ideas.	• Free hand drawing has its own convenience such that it enables an on-the-spot communication of ideas and may supplement the architect's conversation with the client • designer has the freedom to express forms
Hybrid Drawing	• Enhances clarity and precision in final presentations • Valuable for combining strengths of both methods. • Expands and enhances ideas initiated in freehand • Convenient for professionals to accelerate the design process	• Hybrid drawings are objectively more 'convenient' such that they enable architects and other professionals to catalyze the drawing process. • The freehand drawings and technical drafting can enhance the analytical skills and drawing skills of the architecture students. It is important that thy have the foundation of these two, to create CAD drawings. Hybrid drawings on the other hand can save time and make the presentations to life.

Participant responses indicate that freehand drawing is primarily used during the initial stages of design to quickly capture ideas and explore creativity, while hybrid drawings are more often employed for refinement, presentation, and achieving accuracy. Many participants emphasized that both freehand and hybrid drawings are complementary, allowing designers to leverage the strengths of each method throughout the design process. Skills and technical considerations also influenced preferences, with freehand relying on creativity and hand skills, while hybrid drawings require digital literacy. Personal workflow and familiarity shaped individual preferences, though most agreed that mastering both techniques enhances the design process.

VI. Conclusion

In conclusion, the transition from hand drawing to digital drawing in architecture exemplifies the broader technological shifts influencing contemporary design practices. While digital tools provide remarkable precision and efficiency, the significance of hand drawing cannot be overlooked, particularly in the initial phases of design where it fosters creativity, spatial awareness, and conceptual exploration. Engaging in hand drawing allows students to experiment freely, sketching their ideas in real time and facilitating an intuitive understanding of design. The concept of embodied cognition further emphasizes the intrinsic connection between hand drawing and the cognitive processes involved in architectural thinking, highlighting its role as a fundamental medium for creativity and visualization.

We must continue to prioritize hand drawing in architectural education, teaching students to use their hands to transfer ideas onto paper. This skill is vital for cultivating a deep connection between designers' thoughts and their representations. However, we cannot ignore the rapid technological advancements shaping the architectural landscape. The integration of digital tools offers unprecedented precision and the ability to handle complex geometries, enhancing the capabilities of architects in executing intricate designs.

Therefore, establishing a balance between hand drawing and digital drawing is essential for preparing future designers. Rather than viewing these methods as mutually exclusive, a hybrid approach that integrates both techniques provides the most comprehensive solution. This balanced method enhances creativity, fosters technical competence, and ensures a fluid transition between conceptual ideation and precise technical execution.

Ultimately, by emphasizing the importance of hand drawing while integrating digital tools into the curriculum, we can cultivate a generation of designers who are not only technically proficient but also deeply connected to the artistic and conceptual aspects of their work. This duality will enrich their understanding of design and ensure they are prepared to navigate the complexities of the design field with confidence and creativity. By fostering an environment that values both drawing methods, we can promote a holistic understanding of design that bridges the gap between tradition and innovation in architectural education and practice.

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