



Designing, Making, and the Body Intuitive

Catalina Castaño Urrea and Charlie Hailey

College of Design, Construction, and Planning, University of Florida

Charlie Hailey, School of Architecture

Abstract

Embodied thinking, also termed “corporeal intuition,” is the ability of the body to hold knowledge, be creative, and be an active participant in the making process. This challenges the idea that to make is to translate something that exists only in the mind into something that exists tangibly outside of the human body. Rather, the experience of making is a relationship between mind and body, the body and object of work, and the hand and material. Through a series of ceramic and woodworking exercises, each with increasing scales and complexities, this research explores experiences of making to understand how the body is an active part of the thinking and making process and then speculates how this process relates to architectural education. Research methodology tracks each exercise’s steps from beginning to end, and examines the roles that each step, the body, and the material’s properties play in the process. Thinking through making raises architecture students’ awareness of all the forces that are part of a design project from concept through to final built work, and the final phase of this research looks at how specific exercises (derived from the methodology) foster embodied thinking for a more holistic design process.

Keywords: thinking through making, embodied knowledge, architectural education

Introduction

Architectural education has a relatively short history with the first formal, dedicated school being a monarchist institution founded in the 1600s (Griffin, 2019). Originally, its pedagogy was structured around apprenticeships and guilds “in which education, mentoring, and... experience were linked” (Winterbottom, 2002, p. 207). Architectural learning and practice changed in response to new technologies and design problems of the industrializing world. In those changes, making and embodied thinking gradually separated from the design process—disconnecting body and mind. Contemporary architectural education grapples with design process in a rapidly advancing digital age, and pedagogical methods like design/build studios have “been posed as an introduction to alternative forms... of [architectural design] practice” (Chi, 2002, p. 161).

The body’s detachment from the design process has made the mind the sole reservoir and practitioner of knowledge in design—neglecting the body’s potential “to produce and store...

knowledge” and its capacity for creativity and imagination (Pallasmaa, 2009, p. 13). Pallasmaa (2009) defines embodied thinking as a manifestation of the body intuitive: hands hold knowledge and play an integral role in the practice of thinking through making. This research does not focus on how the Bauhaus or Cranbrook Academy “integrated craft and design” into their architectural education to engage students in thinking and making as a process of design (Winterbottom, 2002, p. 207). Rather, this research focuses on thinking through making as a method to engage in an embodied design process that architecture designers and students can learn and apply.

Theoretical Framework

The Body Intuitive

In this research, the body intuitive refers to the encompassing of habit, know-how, tacit knowledge, intuition, and embodied thinking. The human experience is a varied embodied existence and knowledge of the body can be used to expand methods of design practice (Pallasmaa, 2009). Sorri (1994), Linzey (2001), and Bardt (2022) refer to this as tacit knowledge: the integration of the body’s understandings and interactions with the world. Sorri (1994) defines “tacit knowledge [as] the kind of knowledge that we cannot fully articulate” (p. 17). This definition helps frame the role of experience for the body intuitive as tacit knowledge that resides and arises from action. Ingold (2019) identifies this knowledge of the body variably as ‘know-how’ and ‘habit’ but suggests that “habits... are not embodied” (p. 8). Others, like Schön (2003), Simpson et al. (2004), and Sennett (2009) argue that know-how is embedded in the body’s engagement and rhythm of action. In this research, habit provides the foundations for know-how. Know-how builds a framework for embodied thinking that can translate experience into tacit knowledge and inform intuition in the making process. The body intuitive engages with the hapticity of material as part of this process.

Hapticity of Material

The hapticity of material is the dialogue materials have with the body intuitive to inform design (Albers & Danilowitz, 2000; Sorri, 1994). Haptics is the feedback of sensations from another source to the body. In material engagement, hapticity is the material’s resistance and tolerance engaging the body’s sense of touch. Bardt (2022) and Gore (2004) describe resistance

as the force needed to affect the material and a guiding force that influences the design process. Tolerance, the material capacity to accept force, is regarded by Chi (2002), Dewey (1980), and Winterbottom (2002) as a powerful constraint that instills creativity and innovation. Together, material resistance and tolerance produce an environment where the body reacts and engages in a compromise between hand and object (Albers & Danilowitz, 2000; Simpson et al., 2004). Each time the body engages with material and its context, it becomes attuned and learns to listen to its hapticity (Pye, 2008). With each iteration, fluidity between the material, the tools, and the body can be achieved. These interactions can transform embodied knowledge and become intuitive forms of reflection and design thinking (Cronin & Hailey, 2021). Learning material hapticity lies at the threshold of experimentation and failure, key factors in the process of reflection-in-action.

Reflection-in-Action

Reflection-in-action refers to the body's capacity to adjust to external feedback during an action (Schön, 2003). In this research, the feedback can be from constraints, material engagement, failure, and experimentation—sources of design imagination and creativity that expand the body intuitive. Chi (2001), Schön (1984), and Winterbottom (2002) see reflection-in-action as an essential means of inquiry to approach design problems. Cronin & Hailey (2021) emphasize reflection-in-action as a cycle where “building provides the opportunity for action to become thought, and reflections on the built spur thought to become action” (p. 61). For Linzey (2001), Mannell (2006), and Pallasmaa (2009), sketching and drawing are tools to engage reflection-in-action, where spatial ideas and intuitions are explored extensively. Drawings record questions and evolutions of design solutions and the circularity of problem-finding and problem-solving present in reflection-in-action. Within this research, problem-finding is the body intuitive's ability to recognize tensions in the design process and respond through problem-solving. Once reflection-in-action and its derivatives (problem-finding and problem-solving) become embodied in a designer's practice, the design process evolves into thinking through making.

Thinking Through Making

Thinking through making refines reflection-in-action, the hapticity of material, and the body intuitive as a collective method to approach design. Bardt (2022) discusses a “process in which

ideas, designs, and meaning emerge not from *a priori* intent but from the reflection, engagement, and recursive iterations, which imbue work with the contradictions and tensions necessary” for meaningful designs (p. 615). In thinking through making, problem-solving, problem-finding, experimentation, failures, material resistance and tolerance, drawing, and sketching become participants in a fluid and intuitive dialogue. It is an active method of inquiry that is present at all levels of a design project, and in the processes within them (Cronin & Hailey, 2021). Thinking through making is the integration of all these series of acts through a dynamic feedback loop process that gives form to meaningful design concepts through an embodied method of design process.

Methodology

Introduction

The methodology involves five exercises exploring embodied knowledge, material interaction, and the reflective process of design. These exercises, in clay or wood, investigate how thinking through making presents a method to ask, reflect, and solve design questions along the making process. The series of exercises begin at the scale of the hand (vessel and joinery), to the body (step-stool and table), to the mind and space (luminaire). Each iteration becomes an opportunity to understand the role of the body as a participant in design decision-making as it engages with each object at gradual changes of scale. Lastly, a conscious choice of working only with hand tools provides an experience where the body intuitive is familiarized with reflection-in-action and hapticity of material. Thus, as each exercise progresses so does the body’s ability to engage in thinking through making.

Vessel

step-by-step process.

The initial clay mound is wedged and set for throwing. It is placed on a bat that is secured to the potter’s wheel. The clay is coned and centered to ensure the piece is symmetrical through the form-finding process. The hands hold and press down firmly to arrange the clay in place, working together with the forces from the wheel.



Figure 1. Vessel

Once centered, the clay is opened by the thumbs, which press down into the center of the clay and push out to make the walls. A balance between hand pressure, body posture, and wheel speed ensures the clay stays centered.

The walls are pulled in a process where the hands hold the interior and exterior surfaces of the clay wall at a point while applying equal pressure and moving up. The clay transforms into a cylinder, a shape that allows for form-finding.

The form-finding process (Figure 2) involves the dialogue between hand and clay responding to feedback. If the applied pressure is uneven in the process, the hand alters the clay and responds to its material tolerance needs. The form is directed not only by the mind but by the hands and the material. The feedback they present to each other yields a consistent cycle of reactions that inform intention (Bardt, 2022).

The form of the vessel is found in this making process that unifies body, material, and tools and embraces reflection-in-action throughout (Dewey, 1980). The base and foot are trimmed. The clay is left to dry and is finished (Table 1).



Figure 2. Form-Finding Process

Table 1. Vessel Specifications

Factors	Specifications
Materials	Speckled clay, water, glaze.
Tools	Throwing wheel, bat, bucket, sponge, wire cutter, needle tool, wood rib, and kiln.
Size	4" height × 4" base diameter. *
Finish	Bisque and glaze kiln fired. **

Note. Materials and Tools determined by accessibility.

* Starting from 1.25 pounds of clay.

** Glaze is applied between firings.

reflections.

Clay is a malleable material allowing for fewer failures while also teaching lessons of thinking through making. Consequently, clay helps the maker understand material tolerances and their agency during the process—qualities that help frame embodied thinking through the dialogue between the body and other contexts. The process of making is composed of a dialogue of reflections and actions that guide the form-finding process. The practice of thinking through making is embodied in the form of the vessel.

Joinery

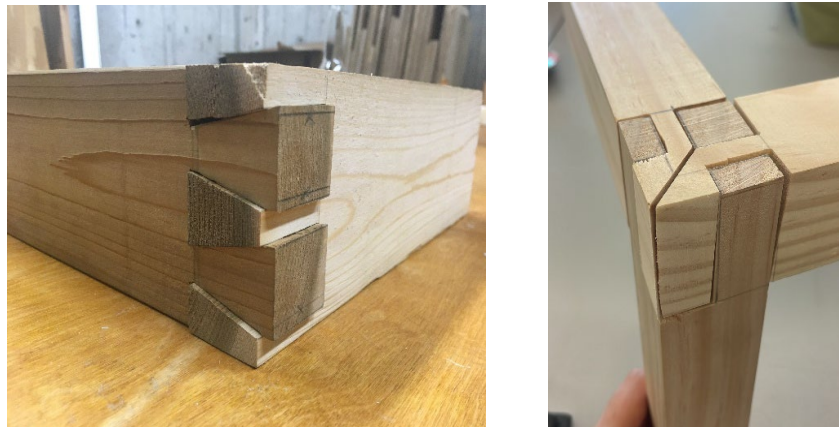


Figure 3. Joinery: Dovetail and Corner Miter

step-by-step process.

The wood is cut to scale each piece of the assembly to the hand. Each joint type is studied, measured, and drawn in the individual pieces of wood.

Removal of material is done with a saw and chisel. The wood is reactive to the sawing—sound and vibration let the body know through resistance haptics when the hand and tool are in

unison. The hand adjusts accordingly to make the sawing process move smoothly. Responding to the wood’s feedback ensures that the lines are being cut accurately (Albers & Danilowitz, 2000).

All cuts are made, and chiseling can begin. The reactions of the wood to the chisel and mallet acquaint the body to the material’s tolerance (Gore, 2004). Without adjusting the body’s force to the material, the tools cause damage. Gaps and dents show where the wood was overworked. Mistakes and failures become moments to reflect on how the material provides feedback on its resistance and intolerance (Pye, 2008).

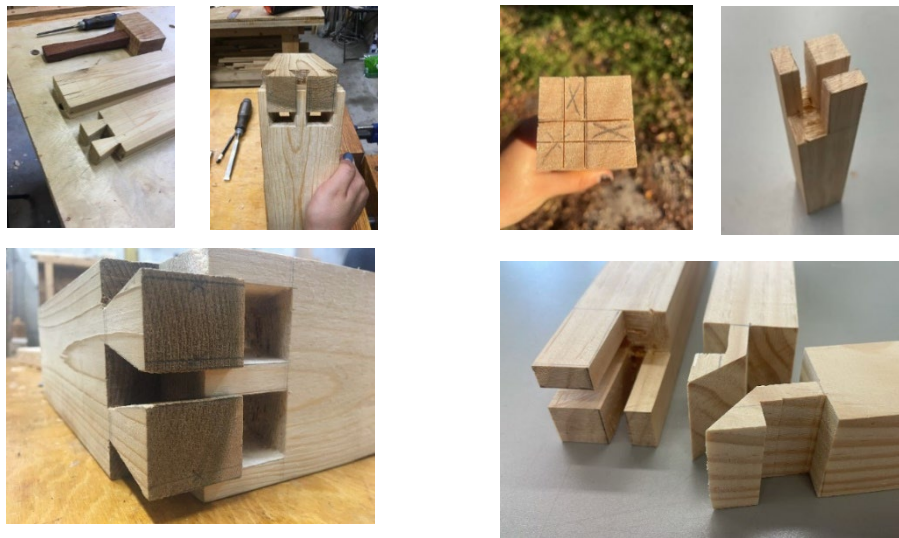


Figure 4. Joinery Making Process

Pieces now have all the erasures needed to begin test-fitting (Figure 4), an iterative process of testing the assembly and removing small portions of material where needed. Once a tight-fitting joint is achieved, the assembly is finished (Table 2).

Table 2. Joinery Specifications

Factors	Specifications
Materials	Cedar and pine wood.
Tools	Pull saw, clamps, chisels, pencil, marking knife, ruler, and mallet.
Size	Within one cubic foot of volume. *
Finish	Surfaces are cleaned for gluing. Glue is applied and cured.

Note. Materials and Tools determined by accessibility.

* Each joint was made with individual pieces of 6-8” length and 1.5-2” width and depth.

reflections.

Wood is a resistant material. It asks for a high level of dexterity and sensitivity to the material's haptic feedback. By working with small-scale construction logics, wooden joinery offers lessons on both material tolerance and the extension of the mind and body to tools. Embodied thinking and know-how result from practice and growing familiarity with the tools, their weight, and the amount of force needed to affect the wood—without negatively impacting the material. By working with unfamiliar materials, experimentation and failures are understood as essential parts of the thinking through making process.

Step-Stool

Figure 5. Step-Stool

step-by-step process.

Initial sketches explore the design, demonstrating how drawing multiple iterations reveals thinking through making (Pallasmaa, 2009). In this process, reflection-in-action tests the sketches as they record questions and experiments of proportion, dimensions, and design ideas (Figure 6).

The wood slab is cut to workable sizes. Those pieces are smoothed and squared by hand-planing. The pieces are glued, cured, and cleaned to make the three separate elements that form the stool. These are mocked up to test the design developed from the sketches.

The mock-up is examined by engaging with the scale of the body (Figure 7). In this process, the physical body and the body intuitive are working directly with the construction—assessing

whether overall size, dimensions, and comfort are appropriate (Gore, 2004). This process demonstrates the reflective nature of thinking through making in design, where initial ideas are tested and modified to improve the design.

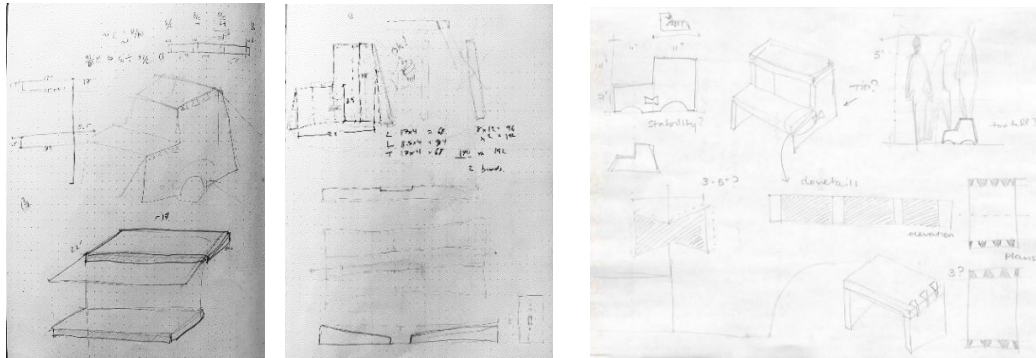


Figure 6. Reflective Sketching



Figure 7. Mock-Up and The Body



Figure 6. Step-Stool Making Process

The pieces are measured, drawn, marked, and cut to the revised dimensions (Figure 8). Using embodied knowledge from the joinery exercise, the dovetails for the step-stool are cut, chiseled,

and fitted in a process that becomes increasingly smooth and fluid with each action (Albers & Danilowitz, 2000). Once assembled, the stool is glued and finished (Table 3).

Table 3. Step-Stool Specifications

Factors	Specifications
Materials	Cedar wood.
Tools	Pull saw, hand planer, clamps, chisels, pencil, marking knife, ruler, measuring tape, mallet, sandpaper, orbital sander, tape, glue, and tung oil finish.
Size	11" width × 13" height × 17" length.
Finish	All surfaces are sanded and cleaned. Finish is applied and cured.

Note. Materials and Tools determined by accessibility.

reflections.

The step-stool's changes in design along the making process demonstrated how reflection-in-action challenges and improves design ideas. Drawings were utilized to start the design process, but not to design in a linear, pre-descriptive way. Rather, drawing is an active tool that experiments with scale, details, and the designs relationship to the body. The body intuitive works with problem-finding and problem-solving by engaging directly with the object and assessing the success of the design throughout the making process.

Table



Figure 7. Table

step-by-step process.

Research on material and material processes prompts one-to-one scale material mock-ups. Three mock-ups of wooden joinery are made, each testing different construction logics and expanding an embodied knowledge of working with wood. The mock-ups begin to suggest design concepts for the table (Dewey, 1980).

Special interest in one of the joints (Figure 10) induces a set of steam bending design experimentations (Figure 11). The tolerance of the wood allows the body to test how much force can be applied before failure. The resistance of the wood informs the thickness at which the wood surpasses the strength of the body. The body's know-how and the hapticity of material determine the design concept and scale as it relates to the hand (Winterbottom, 2002).

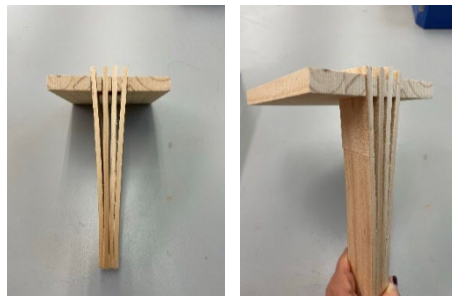


Figure 8. One of Three Initial Joints



Figure 11. Steam Bending Corner Mock-Ups

With a concept established, drawing and sketching exercises guide the development of design intent (Mannell, 2006). In this iterative process, analog or digital (Figures 12 and 13), proportions and dimensions are examined in relationship to the scale of the body—evoking reflection-in-action and fluidly recording questions and evolutions of the design (Gore, 2004). Two scale models are made to settle design aesthetics (Figure 14).

Final materials are chosen and used in a full-scale mock-up (Figure 15). In this process, the body is familiarized with wood-bending haptics and techniques alongside material tolerance (Albers & Danilowitz, 2000). The model allows the body to engage, reflect, and determine adequate dimensions and proportions for greater comfort (Figure 16). Final dimensions and construction details are adjusted accordingly. Assembly of the table begins (Figure 17).

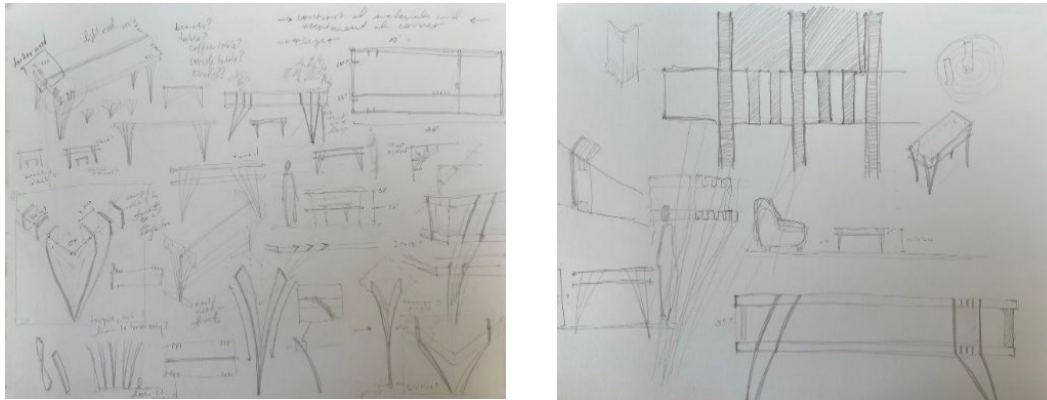


Figure 9. Reflective Sketching

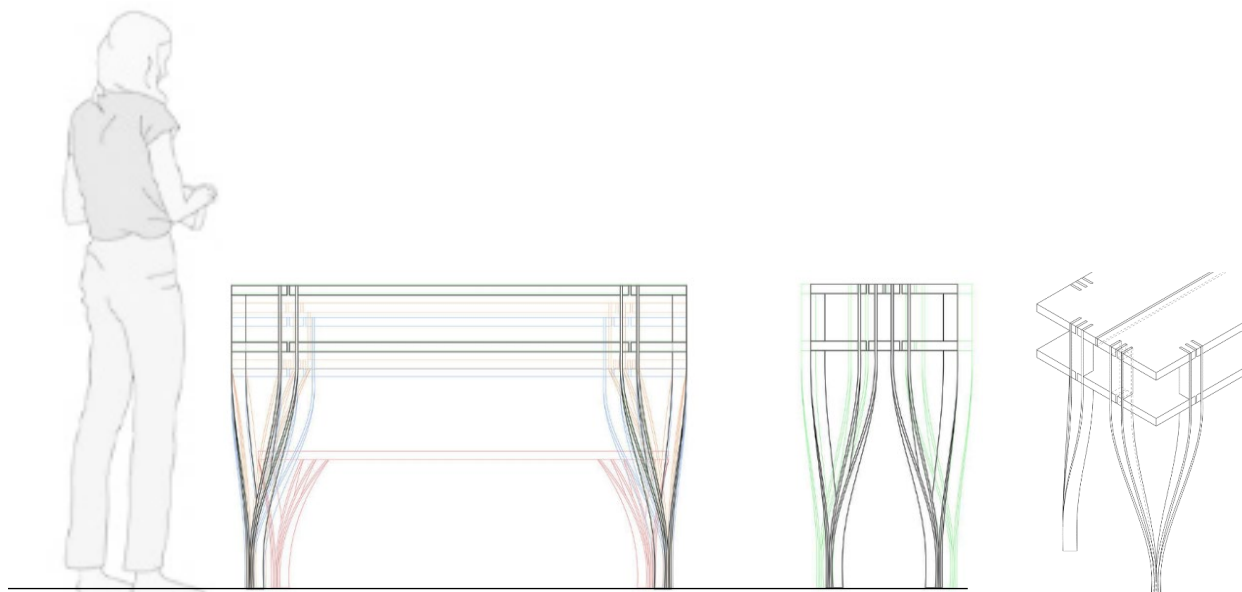


Figure 13. Digital Iterative Drawings and Corner Detail



Figure 14. Scale Models: 3":1' and 1":1' (from left to right)



Figure 15. Full-Scale Corner Mock-Up

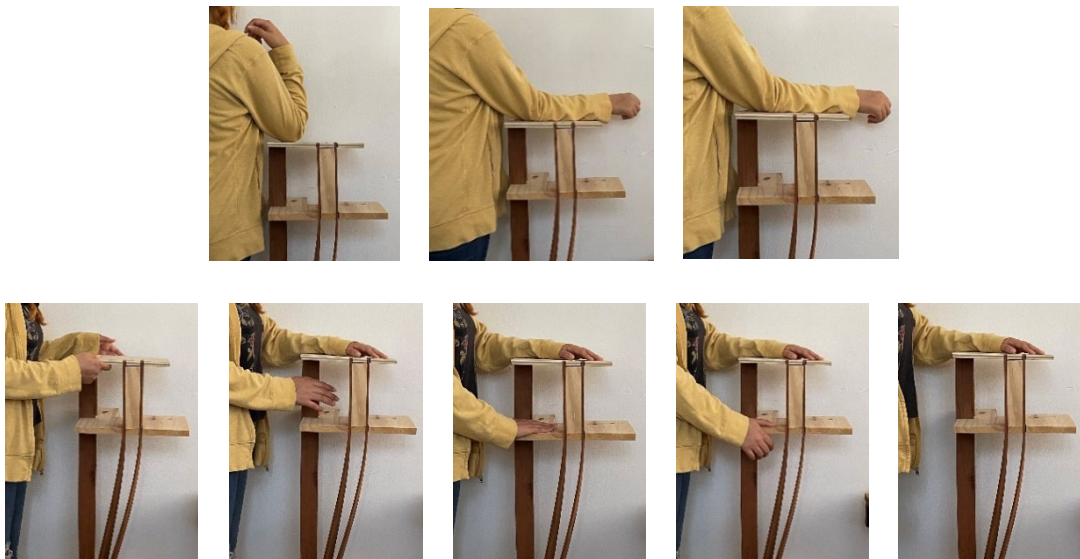


Figure 16. Dimension and Comfort Test

The wood is cut, surfaced, dimensioned, and squared. The oak slabs are glued, cured, and cleaned to make the tabletops. The cherry strips and blocks are dimensioned and cut. The strips are surfaced for accuracy and consistency in thickness. The joinery is drawn in a template and transferred to the tabletops. The pieces are cut, chiseled, and sanded to fit the cherry pieces. The tabletops and blocks are glued, cured, and cleaned. They can now accept and support the strips that will make the leg.

The strips are steamed for 30 minutes in sets of four. They are glued to the tabletops and blocks for support, while simultaneously being torqued to form one leg. This process is repeated three more times. The legs are dimensioned and cut parallel to the ground to stand flat. Once standing, the table is finished (Table 4).



Figure 10. Making and Assembling a Table

Table 4. Table Specifications

Factors	Specifications
Materials	Red oak and cherry wood. * Pine, white oak, poplar, and balsa wood. **
Tools	Rhino7, pull saw, hand planer, clamps, chisels, pencil, marking knife, ruler, measuring tape, mallet, chop saw, table saw, bandsaw, shop planer, jointer, steam box, sandpaper, orbital sander, tape, glue.
Size	35" height × 38" length × 16" width.
Finish	All surfaces are sanded and cleaned. Finish is applied and cured.

Note. Materials and Tools determined by accessibility.

* Final materials: chosen for their color contrast and their bending properties.

** Mock-up materials: chosen for their affordability.

reflections.

This exercise demonstrated the relationship between the body intuitive, reflection-in-action, and hapticity of material. Leaning heavily into the haptics of material, the wood's resistance and tolerance determined initial design decisions. Drawing was then utilized as a method of reflection-in-action to quickly experiment ideas and engage in problem-finding and problem-solving, pushing forward the design concept. Through the mock-ups the body intuitive informed suitable dimensions for comfort—engaging and adjusting the design along the making process. Within the repeating dialogue across the body intuitive, reflection-in-action, and hapticity of material, thinking through making occurred and the table found its form.

Luminaire

Figure 11. Luminaire

step-by-step process.

The design proposal is drawn and sketched multiple times in a cycle between analog and digital methods (Figure 19). Drawing iterations test the dimensions and proportions of each lampshade and the composition of the luminaire, using reflection-in-action to study its scale in relationship to the body (Linzey, 2001). In this process, the figure of the body helps understand the appropriate height of the luminaire (Figure 19), based on sightlines and head-height, and how it can suggest an overhead condition and spatial zone when lit. The final revised forms are made into templates for hand-building.

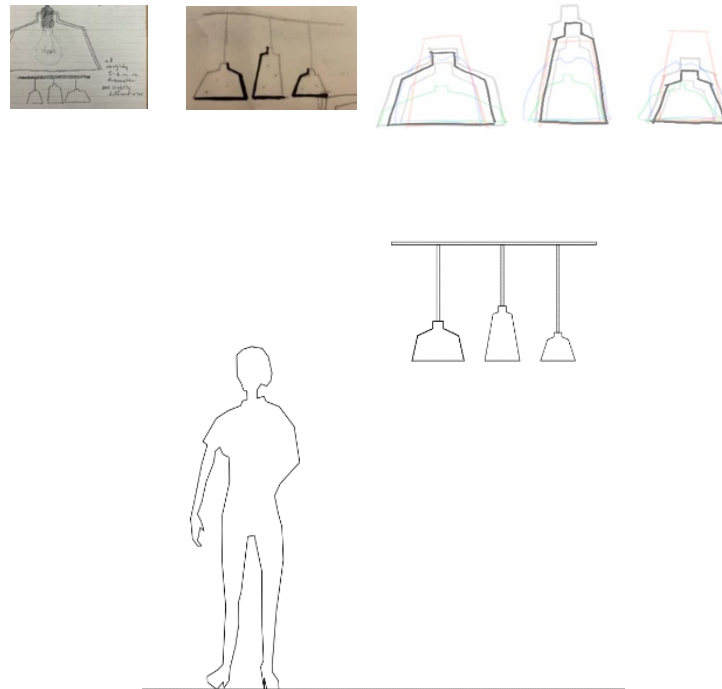


Figure 12. Reflective Sketching

The templates are made by breaking down the design into its simplest geometries and unrolling the surfaces that three-dimensionally form the lampshades. The templates are printed, cut, and set on a clay slab where the shapes are cut (Figure 20).

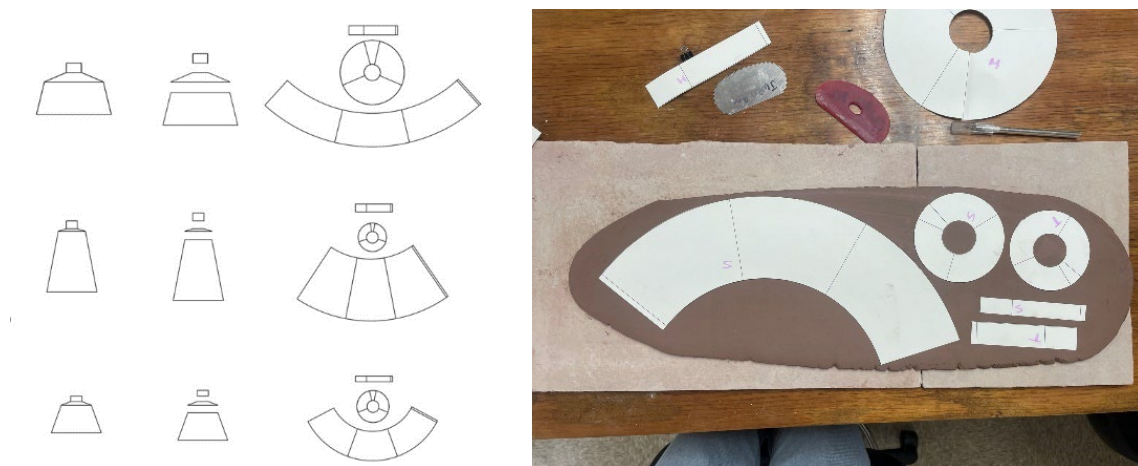


Figure 13. Templates in Action

The shapes are sculpted into their volumetric forms; its seams are scored and slipped to make a strong joint. The three separate forms are assembled and joined together to make each lampshade (Figure 21).

The material nature of the clay is not responsive to the hard edges of the digital design. The lampshades' forms are smoothed and sculpted as needed according to the material's tolerance (Albers & Danilowitz, 2000). The forms become a testament of reflection-in-action rooted in the hapticity of material. Once the final form is found, a final layer of detail is added by carving and perforating the clay. The forms are left to dry and are finished. The electrical and structural elements are added, and the luminaire is assembled (Table 5).

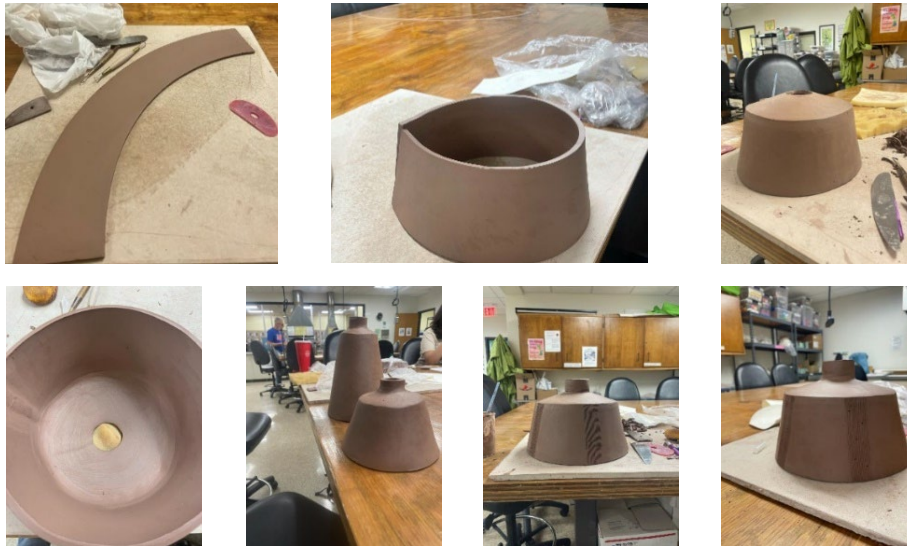


Figure 14. Lampshade Making Process

Table 5. Luminaire Specifications

Factors	Specifications
Materials	Speckled clay, water, glaze.
Tools	AutoCAD, templates, slab roller, craft knife, sponge, needle tool, ribs, carving tools, sculpting tools, kiln.
Size	40" length × 20" height × 10" width volume. *
Finish	Bisque and glaze kiln fired. **

Note. Materials and Tools determined by accessibility.

* Total Luminaire volumetric size. For each lampshade: small has a 6" height x 7" base diameter, medium has a 7" height x 10" diameter, and tall has a 10" height x 7" base diameter.

** Glaze is applied between firings.

reflections.

The luminaire reflected how drawing and sketching are tools for design process rather than a linear path towards an initial representation. Drawing also presents a method to understand the

relationship between the scale of the body and the object before the making process begins. The hapticity of material became a primary design driver and led the form-finding process when the clay met the digital design with resistance. Through reflection-in-action, the necessary changes in form could be made and a final construction achieved.

Results of Methodology

The five exercises were successful in demonstrating the potential roles and applications of the body intuitive, hapticity of material, and reflection-in-action in the design decision-making process. Through each exercise the body became acquainted with the material haptics of clay and wood, building upon a tacit knowledge out of working with the materials. Simultaneously, by embodying a material intuition, the body achieves a fluid reflection-in-action in the making process—all while improving how to reflect, react, and respond to design challenges. The experiences of each exercise, and their totality, exhibit the significance of thinking through making to engage in meaningful design production and to develop design concepts.

Conclusion

The Body Intuitive

Pye (2008) explains that in craft “care counts for more than the judgement and dexterity [of the body], though care may well become habitual and unconscious” (p. 7-9). In this research, it was found that judgement, dexterity, and care are related. The ability of the hands and body to connect with the material through practice is the embodiment of judgement, as an experience and action, as tacit knowledge. Dexterity is the result of the hand becoming fluent in dialogue with material, but not without allowing the mind to engage in reflection-in-action. Care results in the body’s sensibilities (through embodiment and know-how) to dwell in the action or process of making. All these aspects together allow the body to build on its intuitions and habits—becoming a foundation for thinking through making.

Hapticity of Material

The material is reactive and an active participant in the design process. Its resistances and tolerances offer constraints which, when engaged with the body intuitive, make form-finding possible. The resistance and tolerance of the materials inform a dialogue between object, tools,

and body that is meant to be worked with, reflected upon, and embodied. In material failures and experimentations both the body and mind of the designer react to haptic cues, engaging in a process of reflection and creativity to adapt to challenges. These material experiences, along with applications of reflection-in-action, inform thinking through making.

Reflection-in-Action

Utilizing reflection-in-action boosts confidence in design. Embracing mistakes, failures, and experimentation develops a habit of challenging design concepts and ideas at each step of the making process—simultaneously strengthening the design. Reflection becomes an active participant at all levels of design, rather than a post-rationalizing exercise. It creates opportunities for the body intuitive to engage and provide insight into the design's comfort or scale, determining its success in relation to the body. Reflection-in-action is a positive method where mistakes and failures are seen as learning opportunities to improve craft and design sensibilities.

Thinking Through Making

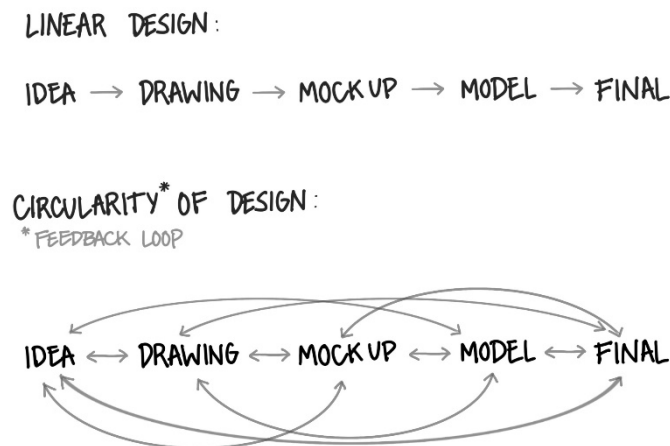


Figure 15. The Design Process: An Active Exchange of Reflections

Thinking through making engages designers with all the external forces involved in the design process, whether material or contextual. It is the unison of the body intuitive, hapticity of material, and reflection-in-action within one process that accomplishes meaningful and

embodied design. Thinking through making is a means by which to become familiar with the circularity of the design process, where design concepts grow organically rather than following a linear path (Figure 22). Thinking through making demonstrates the form-finding process as an intuitive dialogue between the body and all the external feedback present at each step of the design and making process.

Future Research and Applications in Architectural Practice

This research supplies a framework in which different craft exercises can be incorporated into architectural practice to engage both the mind and body in the design process. This research aims to give anyone who practices architecture a means to learn and apply thinking through making in the design process; informing an architecture that embodies meaning. Future research can begin to question how effective these methods are, how receptive designers are to them, and when they are appropriate to introduce to design students.

At the professional level, this research demonstrates a method in which designers can reengage with their body intuitive in the design process and explore architectural ideas without constructing buildings. All while establishing a closer dialogue with the hapticity of materials and finding their resistances and tolerances as design drivers.

At the educational level, the exercises are a method for students to become acquainted with the “dialogue [of] our medium”, the fluidity of design and its many constraints, whether material or contextual (Albers & Danilowitz, 2000, p.74). The different materials and construction methods of the exercises introduce students to the hapticity of material. The changing scales of the exercises engage students’ perception of the human scale while building a spatial language—at the level of the hand, to the body, and to the mind and space. The use of the scale of body as means to reference, engage, and challenge design ideas, introduces students to the body intuitive and the active role the body can take in design and form-finding. The process of making these ‘objects’ teaches students the benefits of reflection-in-action and how to value mistakes and failures as part of design practice. Ultimately, the exercises familiarize students with thinking through making as a practice and a means to approach projects in design studios—whether in sketching, drawing, modeling (analog or digital), or a combination of these—in an embodied and meaningful way.

Acknowledgments

To Professor Charlie Hailey, thank you for your unwavering support throughout the entire process of this research. Your mentorship is invaluable and a defining factor of my undergraduate trajectory. Through your encouragement, I have accomplished things I didn't think were within my reach.

References

- Albers, A. & Danilowitz, B. (2000). *Anni Albers: Selected Writings on Design* (pp. 74-75). University Press of New England.
- Bardt, C. (2022). Recapturing meaning: Toward a new material-based design theory for Architecture. *Frontiers of Architectural Research*, 11(4), 609–617. <https://doi.org/10.1016/j.foar.2022.03.005>
- Chi, L. H. (2001). Introduction: Design as Research. *Journal of Architectural Education*, 54(4), 250–250. <http://www.jstor.org/stable/1425659>
- Chi, L. H. (2002). Building Speculations: Introduction. *Journal of Architectural Education*, 55(3), 161–162. <http://www.jstor.org/stable/1425534>
- Cronin, E. & Hailey, C. (2021). Reflective Building: The Tidal and the Built. In *Vorkrus* (Vol. 6, pp. 60–67).
- Dewey, J. (1980). *Art as Experience*. United States: Perigee Books.
- Gore, N. (2004) Craft and Innovation: Serious Play and the Direct Experience of the Real. *Journal of Architectural Education* (1984-), 58:1, 39-44, DOI: 10.1162/1046488041578211
- Griffin, A. (2019). *The Rise of Academic Architectural Education: The Origins and Enduring Influence of the Académie D'Architecture* (Introduction). United Kingdom: Taylor & Francis.
- Ingold, T. (2019). Of Work and Words: Craft as a Way of Telling. *European Journal of Creative Practices in Cities and Landscapes*, 2(2), 5–17. <https://doi.org/10.6092/issn.2612-0496/10447>
- Linzey, M. (2001). On the Secondness of Architectural Intuition. *Journal of Architectural Education* (1984-), 55(1), 43–50. <http://www.jstor.org/stable/1425674>
- Mannell, S. (2006). Architectural Reenactments at 1:1 Scale. *Journal of Architectural Education* (1984-), 60(2), 29–42. <http://www.jstor.org/stable/40480689>
- Pallasmaa, J. (2009). *The Thinking Hand: Existential and Embodied Wisdom in Architecture*. United Kingdom: Wiley.
- Pye, D. (2008). *The Nature and Art of Workmanship*. United Kingdom: Bloomsbury USA.
- Schön, D. A. (2003). *The Reflective Practitioner: How Professionals Think in Action*. United Kingdom: Ashgate.

Schön, D. A. (1984). The Architectural Studio as an Exemplar of Education for Reflection-in-Action. *Journal of Architectural Education* (1984-), 38(1), 2–9. <https://doi.org/10.2307/1424770>

Sennett, R. (2009). *The Craftsman*. United Kingdom: Penguin Books Limited.

Simpson, J. C., Simpson, D. J., Jackson, M. J. B. (2004). *John Dewey and the Art of Teaching: Toward Reflective and Imaginative Practice*. United Kingdom: SAGE Publications.

Sorri, M. (1994). The Body Has Reasons: Tacit Knowing in Thinking and Making. *Journal of Aesthetic Education*, 28(2), 15–26. <https://doi.org/10.2307/3333264>

Winterbottom, D. (2002). Building as a Model for Learning. *Landscape Journal*, 21(1), 201–213. <http://www.jstor.org/stable/43323582>