



Designing with Formica®: a FORM Student Innovation Competition Entry

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Furniture I
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Using at least three different Formica® Laminate products (one of which being wood grain), design a furniture piece that could fit in a commercial or residential space. Create a 3D model and up to three renderings of the finished design.

Project Brief

To begin this project, I needed to determine a direction around which I could center my design. To do this, I focused my research on the setting, aesthetic direction, and intended user interaction of my design.

Research

Setting: Where would my design exist?



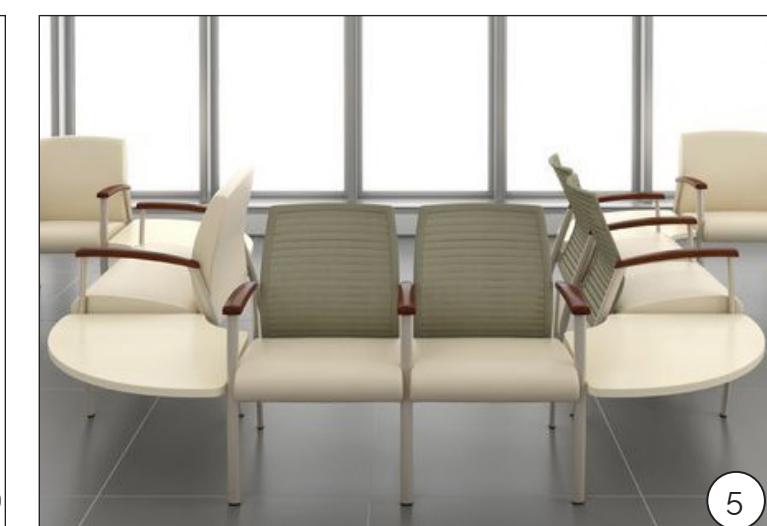
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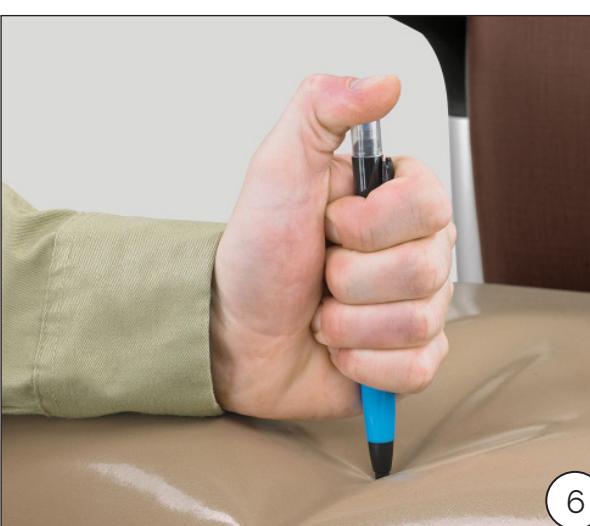
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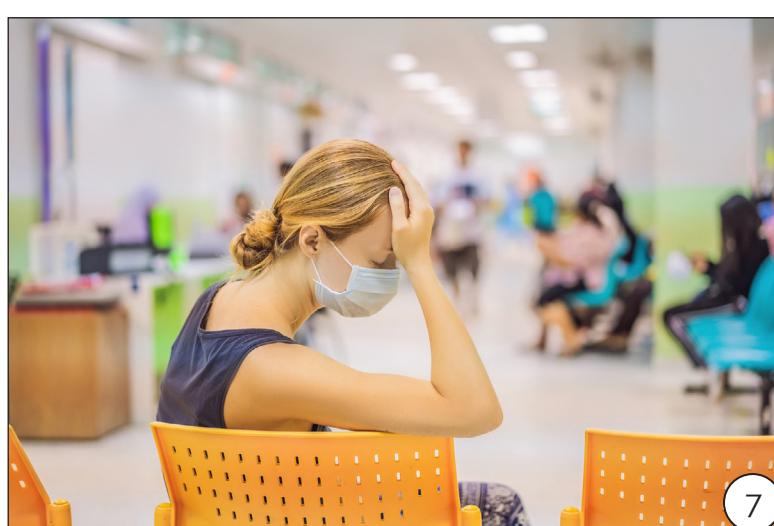
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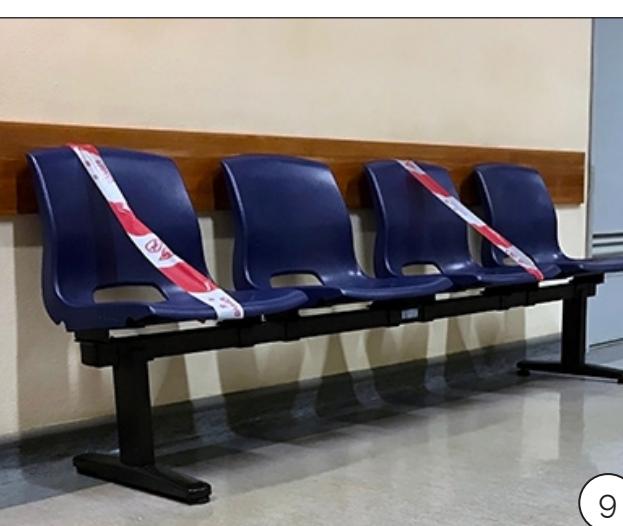
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In order to design a furniture piece with a solid direction, I needed to gain a better understanding of the existing products, materials, and human interactions within the setting of my intended design: waiting rooms of healthcare facilities such as hospitals or primary care facilities.

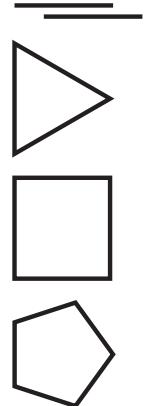
When looking at existing healthcare waiting room furniture, several common characteristics are evident. This includes prioritization of a clean, "timeless" aesthetic that doesn't need to be replaced often, simple and repeated forms, and pieces of furniture that fit together well or are scalable. Use of laminates, metal, and water-resistant fabrics with neutral/mild color schemes are also prevalent (pictures 1-3).

The materials used in healthcare furniture are specific to the needs of the space and must be strong, cleanable, and relatively inexpensive. Non-porous materials are crucial, and laminates and metals are common (Groshek). Durable, water-resistant fabric that allows for cleaning, such as vinyls and polyurethanes, are necessary (Sanchez) (pictures 4-6).

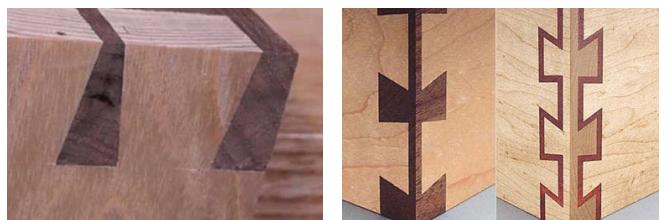
Furniture in healthcare settings must withstand interactions from both healthcare workers and patients. To prevent healthcare associated infections (which account for around 722,000 infections in the U.S. yearly), furniture must be designed to be cleaned often, with all components easily reachable (Sanchez). As a part of this, textured details should be avoided (Groshek). The furniture must accommodate a variety of body sizes for a long period of time, an average of 41 minutes (Ahmad) (pictures 7-8).

During the pandemic, the relationship between patients and waiting rooms has changed (picture 9). COVID-safe practices have caused furniture to be used inefficiently, with a portion of healthcare seating becoming unusable due to spacing constraints ("Social Distancing"). All of these factors impacted my concept development, helping me focus on both setting constraints and opportunities for design solutions.

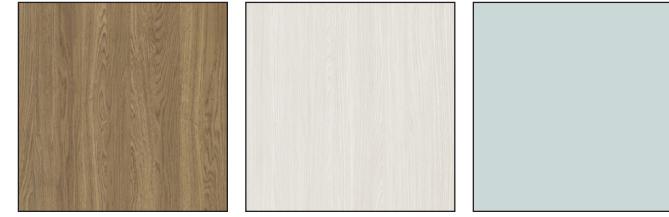
Design Direction: Aesthetic, User Interaction



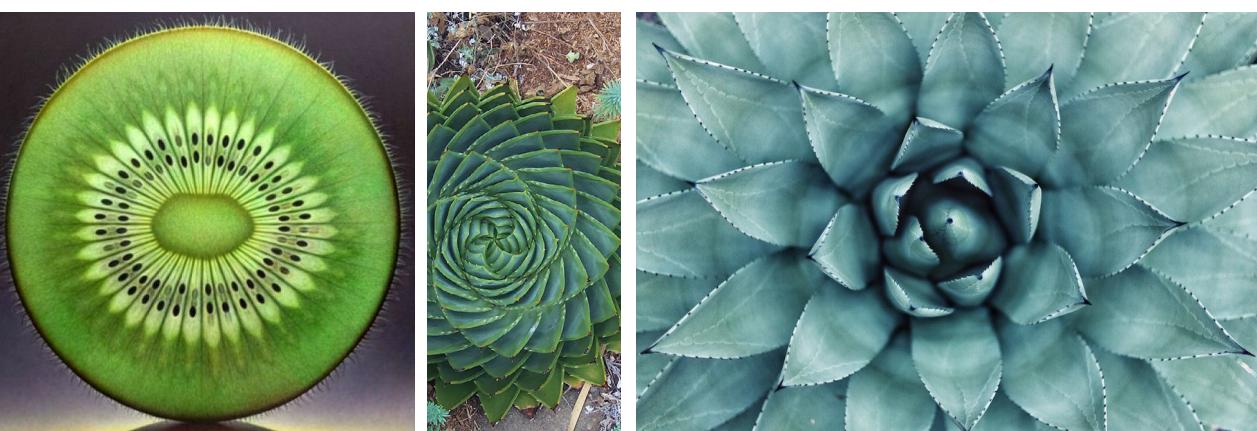
Interacting, Repeated Forms



Possible Details



Color Direction



Inspiration from Nature

After gaining a sense of constraints and opportunities within healthcare settings, I moved towards a design direction that I felt addressed the needs of patients in this space.

The ultimate goal of my furniture piece became focused on creating a soothing, private space for patients or visitors in healthcare settings. To do this, I wanted to create physical barriers between individuals (a pandemic-friendly feature), fit individual seating spaces in a space-saving orientation, and prioritize versatility, whether that be related to individual user interaction with the piece or being able to change the seating capacity based on the specific healthcare setting.

To do this, I began to look to nature as inspiration for nesting and interacting forms. I focused on curvature and flowing lines, as well as components that are directly dependent on one another, or "seamless." Using Formica products to mimic these natural undulations was exciting to me.

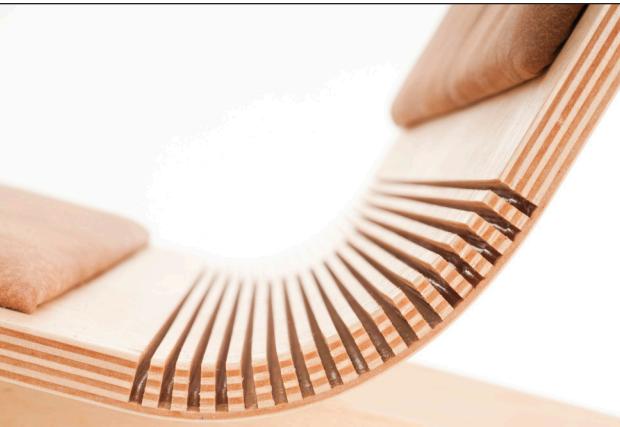
In terms of color scheme, I researched color perception and associations to find what would pair strongest with my intended design. While color perception is largely culturally-dependent (and not a strong science), associations do exist between the color blue and soothing, calming, and treating pain (Cherry) and trust ("Color Psychology"). The use of wood grain would also add warmth in an otherwise clinical space.

Finally, I explored possible details that I could include in my design with the use of Formica. These include decorative and functional joinery utilizing different Formica colors, exposing layers with varying colors, and nesting pieces of my design to create patterns.

With this general aesthetic direction in mind, I felt more grounded in my concept development.

Materials and Processes: A Deeper Understanding

Anti-microbial collection



Kerf Bending

Creating warmth with wood grain



Soaking

Adding vibrance through color



Bent Substrate



Steam Bending



Molded Plywood



Molding Process

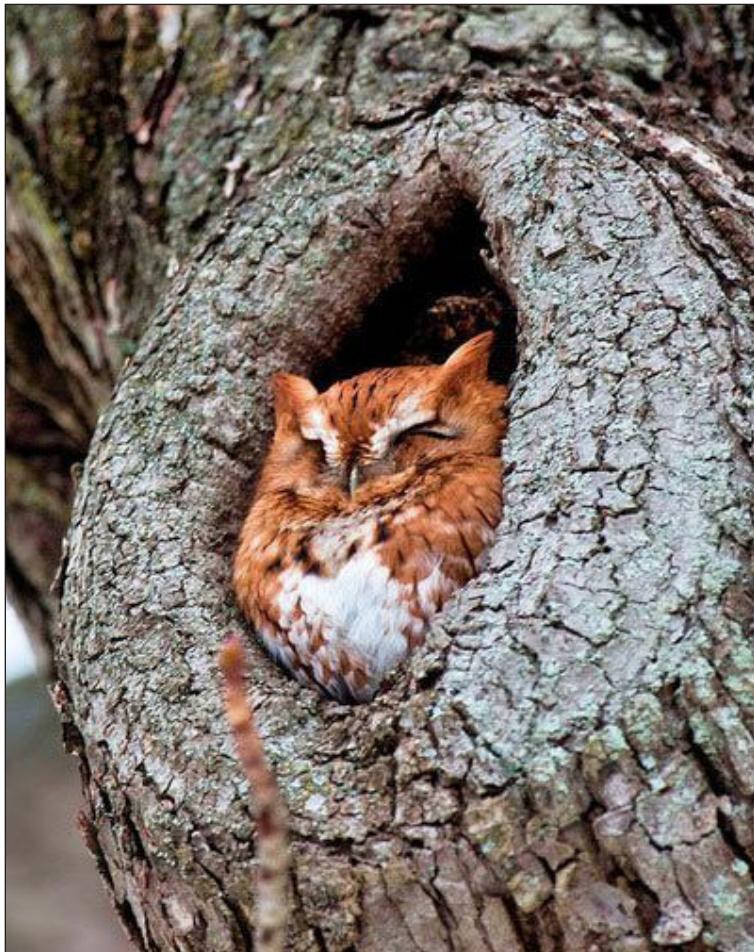
Even though I had a clear design direction to explore, I needed to **better understand the manufacturing processes and materials that would be used in my design**. I wanted to make sure that none of my design goals conflicted with material capabilities.

I knew that I wanted to create a substrate with relatively complex curves. Through my research, I found that there are multiple ways to achieve bends in wood. Kerf bends utilize grooves cut along a bend to be radiused. The process of steaming or soaking wood softens wood to be bent over a form. Laminated plywood or molded plywood creates curves through adhering multiple layers of veneer together with pressure over a form (Clax). To do this, a positive and negative mold are often made that are stronger than the plywood itself ("Bending Plywood").

Based on this, I concluded that I would focus on designing forms that could be created through a molded plywood/lamination process. While minimum radius constraints differ based on the type of wood used as veneer, the use of Formica® over the substrate allows for a wide variety of wood possibilities to exist without compromising on aesthetics ("Wood Bending"). I was happy to learn that one of plywood's strengths over solid wood is its dimensional stability and strength, which would be advantageous in high-traffic settings ("Plywood").

The specific Formica® options that I chose highlighted the qualities of the material itself. I planned to use a laminate from Formica's Antimicrobial collection as an integral surface in a healthcare setting. The use of a wood grain laminate adds warmth without the potential dangers of porosity in wood. Finally, I wanted to add interest and detail through using colorful laminates alongside woodgrain.

Synthesis: How Research Influenced my Design



Design question:
how can I create
a piece that
evokes a feeling
of comfort and
safety (similar to
these images)
while using
Formica® and
fitting well within
a healthcare
setting?



The process of contextualizing my design through research allowed me to **situate my piece in an existing setting**, causing me to think critically about the real purpose of my design within that space.

Rather than solely creating a design that I thought was aesthetically pleasing, the research pushed me to look at **aspects of healthcare seating today that could be improved upon, and how Formica® could be used to create a solution.**

Through exploring existing healthcare furniture, the needs of humans interacting with that furniture, and aesthetic possibilities (based on the capabilities and qualities of my materials), I was able to look beyond existing products to prioritize what I think should be present in healthcare furniture: a **space that can create a feeling of comfort and safety amid stressful situations, while still valuing cleanliness and space-saving qualities.**

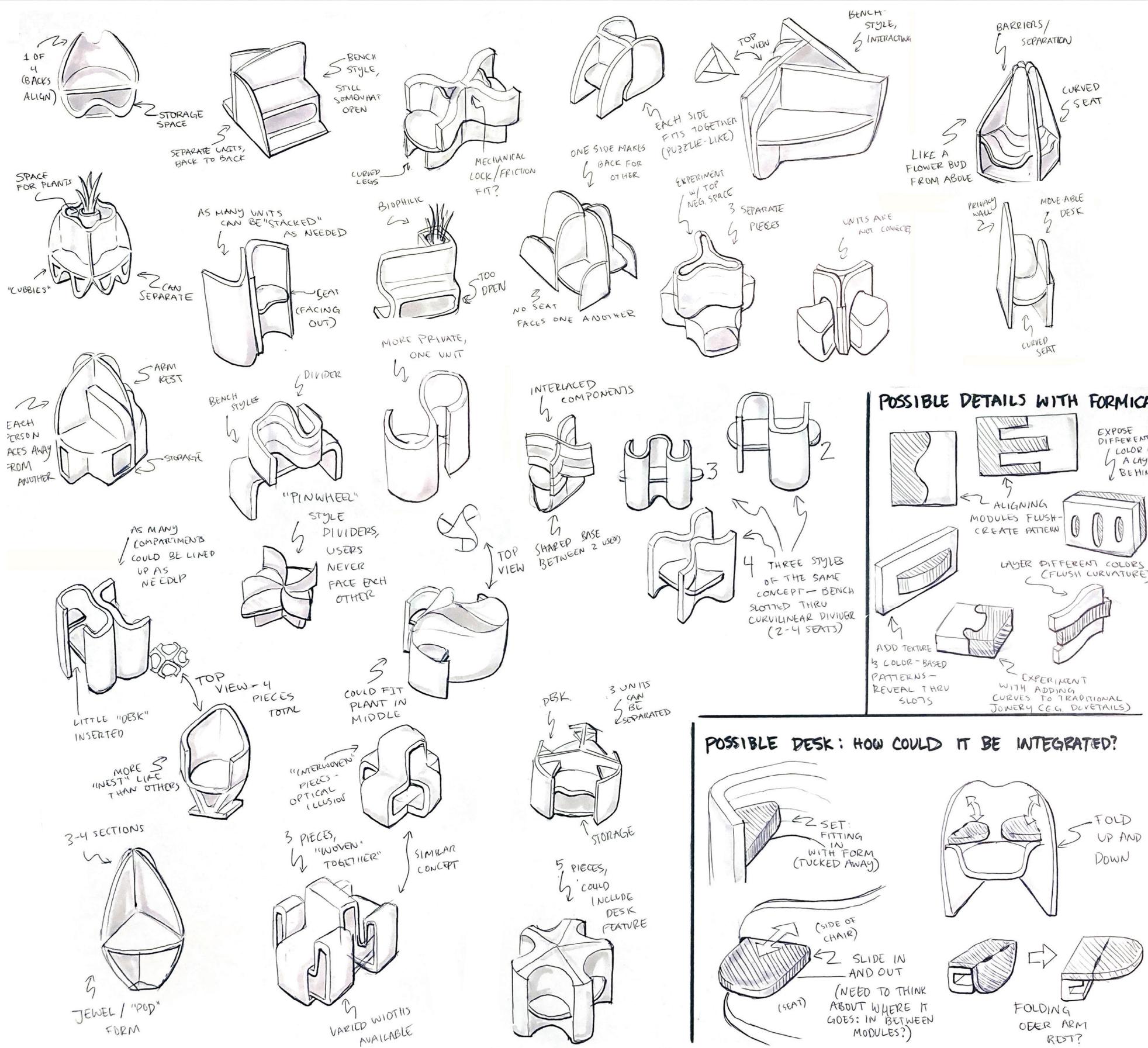
Through my research, I found a design opportunity that I wanted to explore further: improving healthcare furniture through creating a comforting and private environment. I wanted to address the lack of physical barriers in most current healthcare seating, while still prioritizing clean, safe, and space-saving solutions.

Design Opportunity

My concept development moved from general brainstorming to a refined direction, utilizing peer feedback and research to guide my design.

Development

Brainstorming: Exploring Possibilities

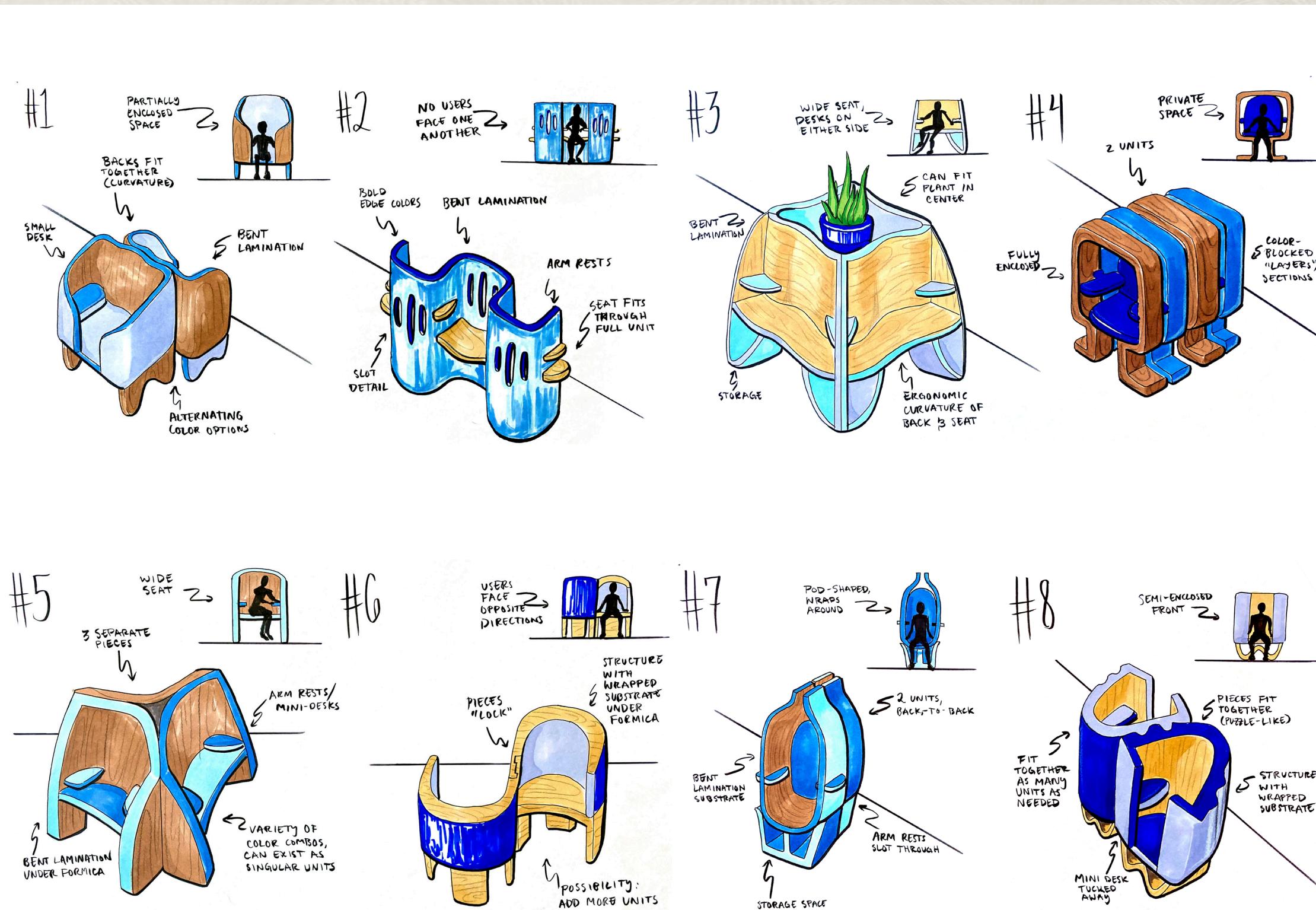


My initial brainstorming was based on my research focus. I attempted to explore seating options that allowed for privacy while also coordinating with repeated seats in some sort of pattern. I wanted the seats to be able to hypothetically exist on their own or be paired with their complementary "partners" to create some sort of visually interesting formation. I worked to think of interactions that could exist between two to five repeated seats.

I also began to think about interesting ways to create detail in my piece, whether that be between individual chairs, as a part of joinery, or simply as a decorative element. I brainstormed ways to connect a desk or working surface to the seat as well, as I wanted to prioritize the seat being multi-functional.

When I showed these thumbnails to my peers, the main feedback that I received was to put greater thought into space-saving options, and less focus on forms that, when interacting, boxed off a certain area of a healthcare waiting room.

Initial Concepts

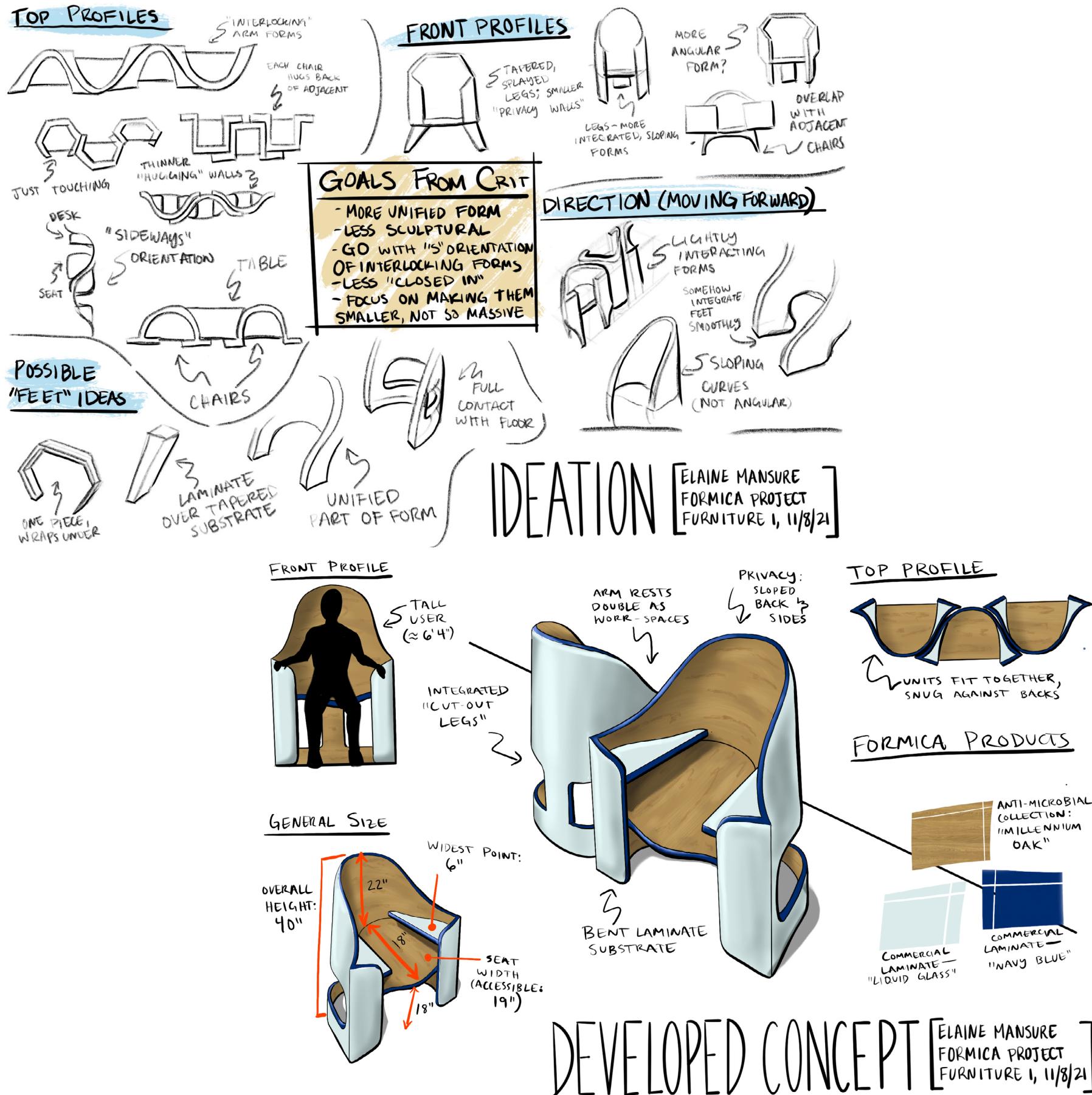


My initial concepts were developed from directions that I wanted explore further in my brainstorming. I focused on coupling wood grain with a light blue Formica® laminate, and adding dark blue accents. The main formation patterns that my initial concepts are grouped into include "back to back" interactions (concepts 1, 4, and 7), "boxed off" interactions (concepts 3 and 5) and "S" interactions (concepts 2, 6, and 8).

After presenting these concepts, peer critique encouraged me to move forward with several goals in mind:

- 1) To focus on unifying the overall forms of the seats through creating a more smooth transition between the legs and seating portions,
- 2) To create less sculptural forms,
- 3) To develop the "S" interaction further, and discard designs based off of "boxed off" and "back to back" interactions,
- 4) Create less massive designs while still prioritizing privacy,
- 5) Narrow down to a singular direction.

Developed Concept: Finding a Direction

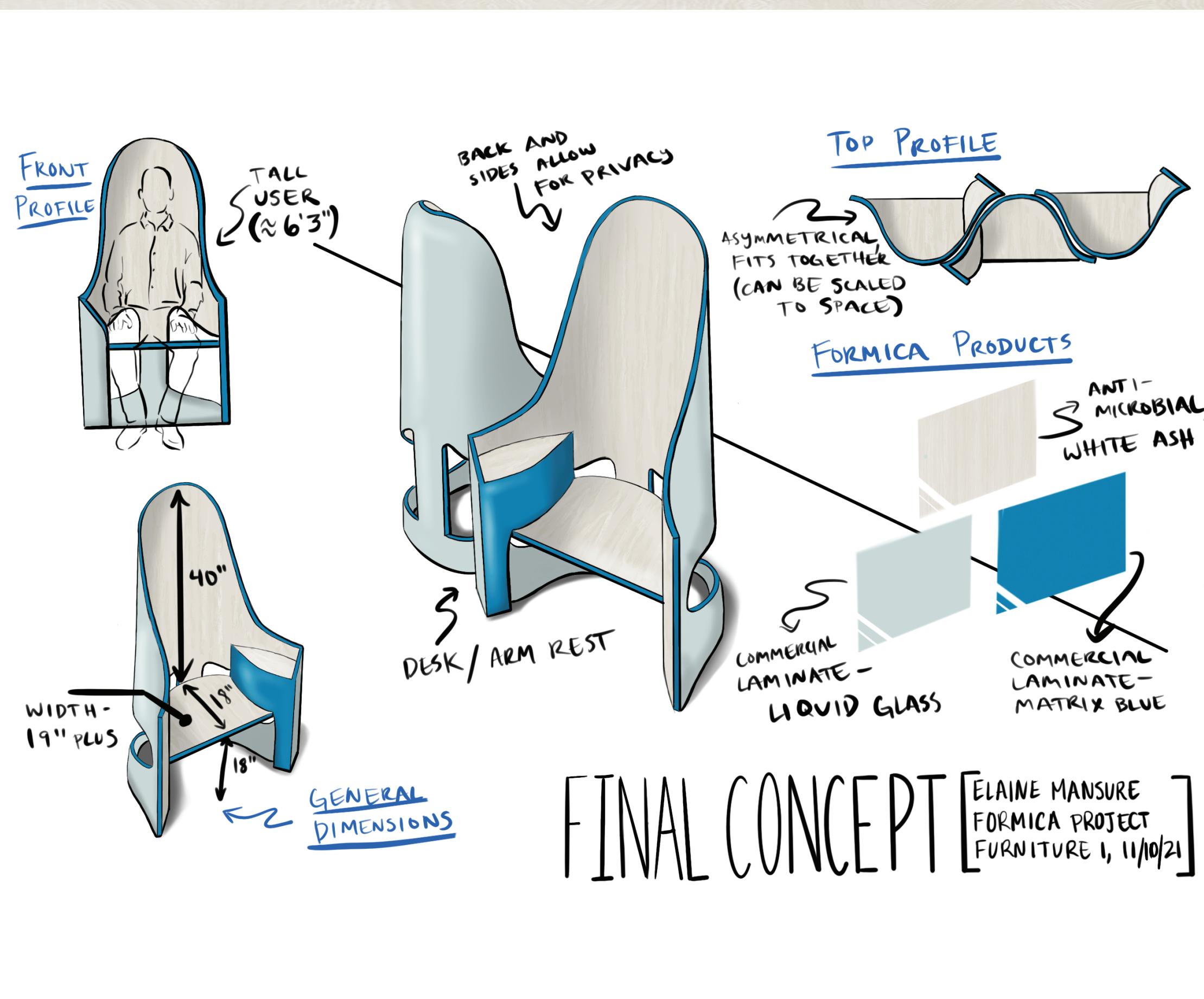


To move in a singular direction from my initial concepts, I needed to brainstorm based on peer critique. I initially based my ideation on top and front profile options, as I felt that developing strong forms from these views was critical in creating a more fully realized design. I also thought about creating less "sculptural" feet to integrate into my design.

From this ideation, I developed a concept direction with which to move forward. **This developed concept features a more unified form than initial concepts, with the legs integrated into the upper form.** I chose to have the chairs interact in a "sine wave" style orientation to save the most space. The color combination chosen was based on existing Formica® swatches.

During critique, however, I realized that I scaled the height of the chair incorrectly and that the back of the seat should be around 18 inches taller in order to fully cover the user. Along with revising my design to address this mistake, **peer feedback encouraged me to experiment with asymmetry (especially with the arm rest/work surface), altering my color scheme to appear less heavy, and to omit any corners or parts of the chair that would be difficult to clean.** This feedback helped move my design process towards my final concept.

Final Concept



My final concept moved forward with peer feedback in mind, featuring a more asymmetrical form, lighter color scheme, and corrected scale to allow for greater privacy for the user. In order to remove corners that would be difficult to clean, the singular arm rest or work space became closed off, which also created greater variation to the overall form.

Finalizing my conceptualization in this direction allowed more practical and structural decisions to be made for the piece, including adding a T-bracket to be included under the seat for support and floating the seat away from the outer piece to allow for better cleaning and a more predictable fit. This concept, along with technical revisions, moved forward to be 3D modeled and rendered.

In order to improve my understanding of the scale of my piece, I created simple paper models at quarter-scale.

Prototypes

Prototyping Process



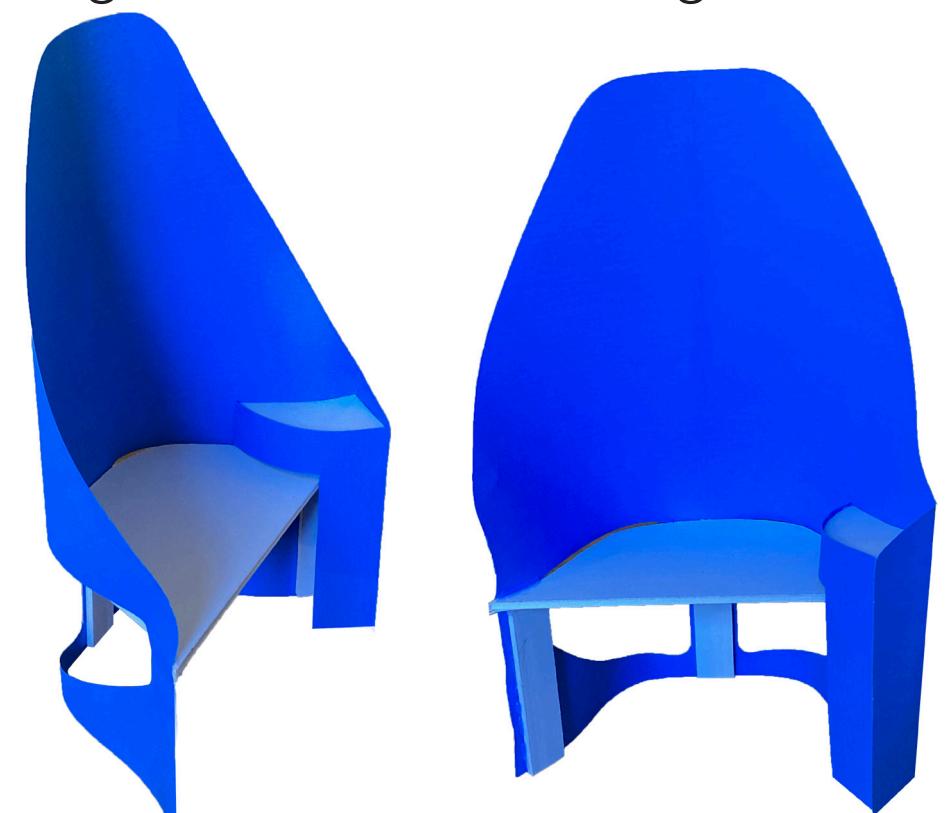
Quarter-scale models used to ideate before moving towards my developed concept



Process photos, using one sheet to create various forms



Quarter scale model of my final concept used to confirm formal changes and guide further modeling



As my concepts featured organic, interacting forms at a scale that I am not familiar with, **it became necessary to make simple paper models to gain a better understanding of my designs.**

Made with foam core and poster board at quarter-scale, I experimented with varying widths, heights, and general forms. I focused on creating my overall outer piece with only one piece of paper, as I knew that it would have to be **constructed with one continuous lamination as a substrate**. Doing this caused me to prioritize more unified, simple forms.

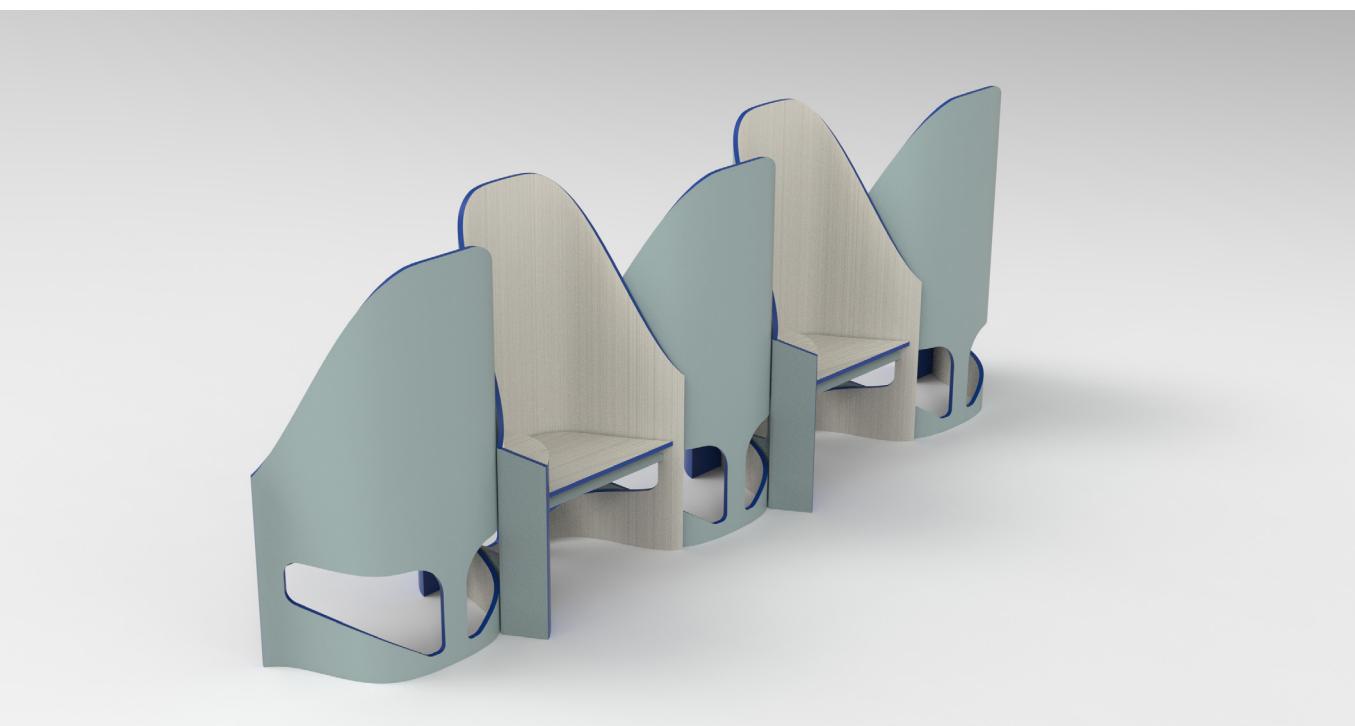
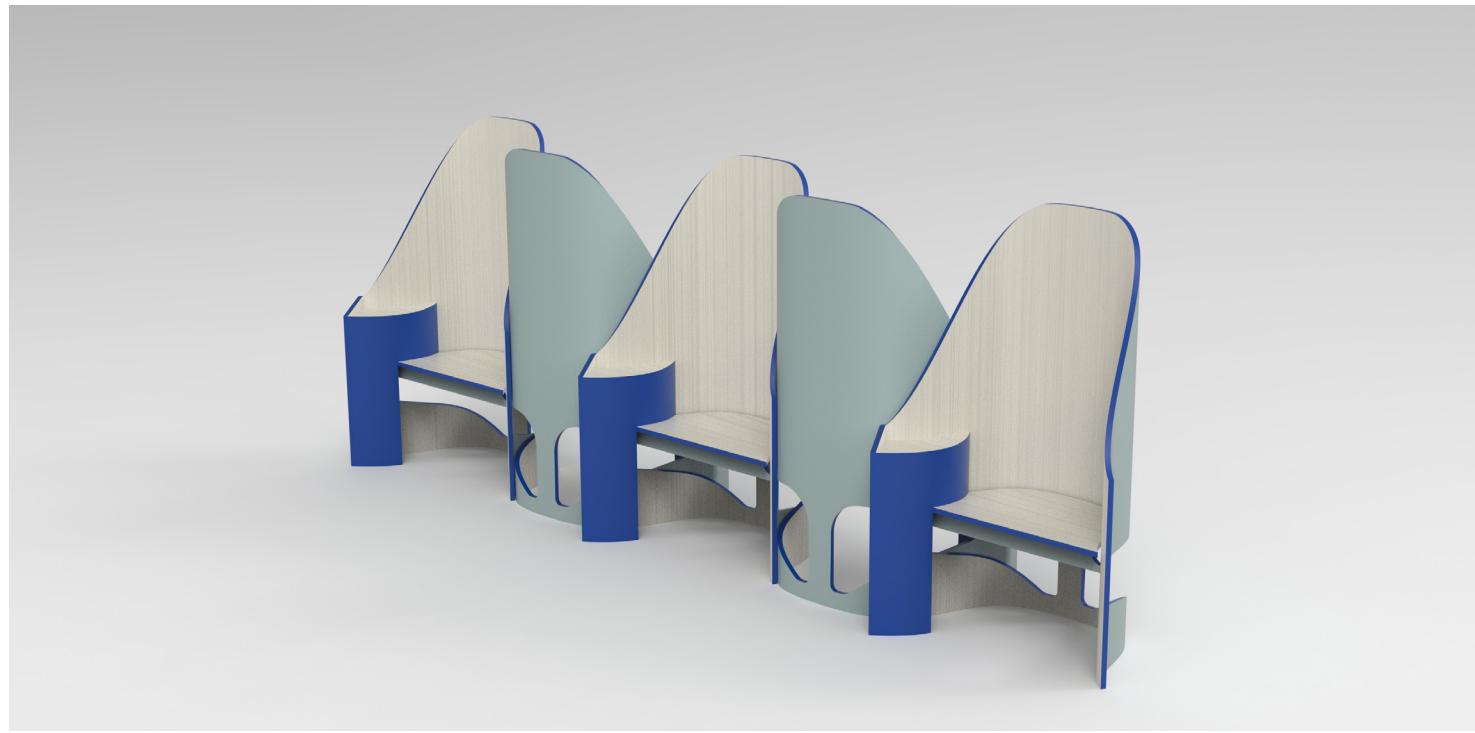
The quarter-scale models for my developed concepts (upper) helped me realize that I needed to add around 18 inches to the back of the seat to fully cover a tall user. **I was also able to better visualize how a user could sit and interact with the chair.** I experimented with varied tapers, profiles, and integrated feet options, encouraging me to incorporate many design cues from the left-most model into my developed concept.

Modeling my final concept in this way primarily served to confirm design alterations from the developed concept (including changing the overall height, symmetry, and slope of "leg" openings) **and to be a guide for future 3D modeling.** Having an understanding of the interaction of parts in a 3D space was beneficial in conceptualizing the final 3D model and render of the design.

The process of research, concept development, and prototyping brought me to a final concept, 3D modeled in SolidWorks and rendered in Keyshot.

Final Concept: Loch

Final Renderings



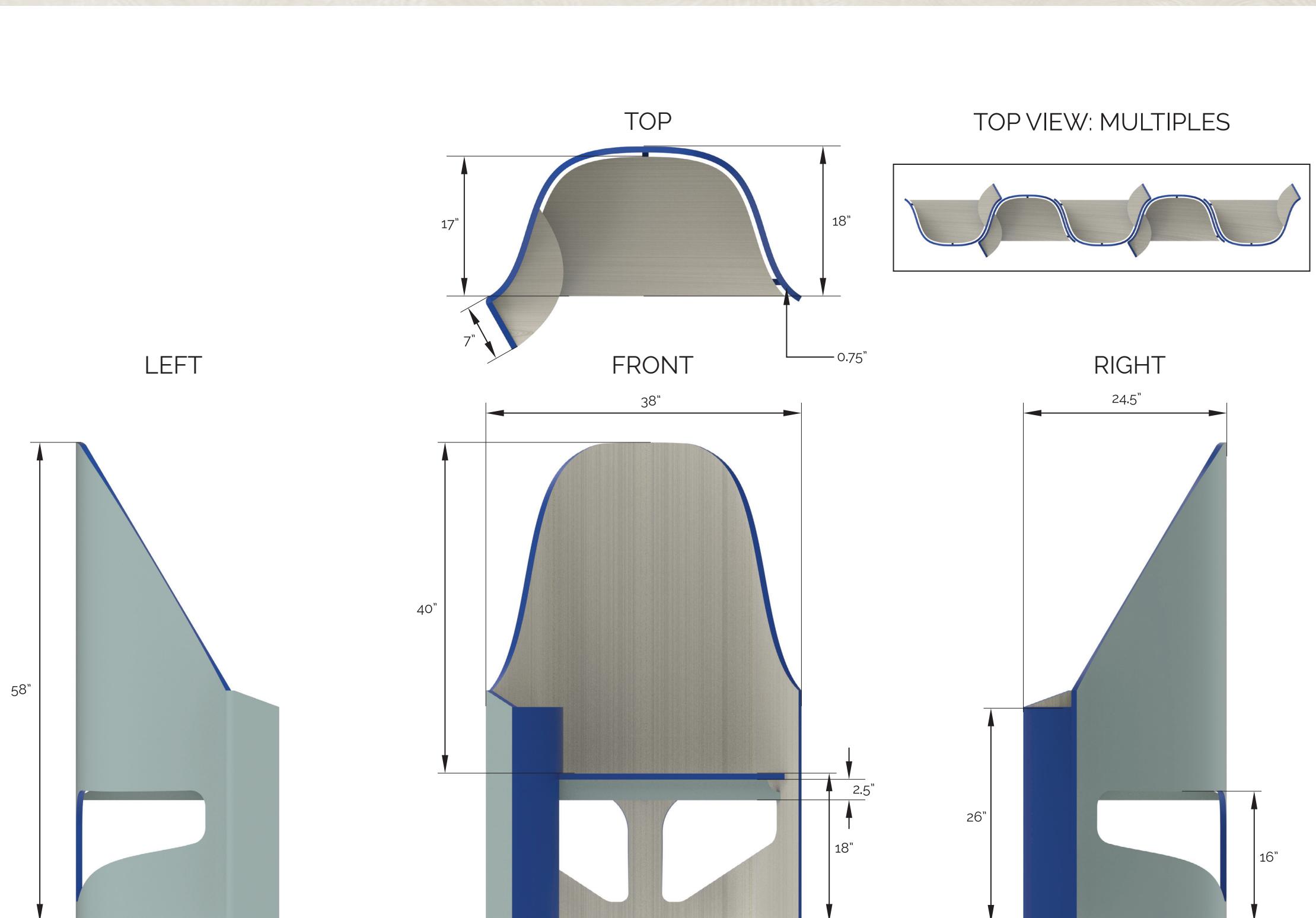
Rendering the final design allowed me to be able to **better visualize the coupling of the chair's forms with the existing Formica® products that I intended to use**. In order to achieve relatively accurate renderings of the reference swatches, I inputted the exact RGB values of the color samples into Keyshot.

The Formica® products that I used include (from the commercial laminate line) Liquid Glass and Spectrum Blue, as well as (from the antimicrobial subset of commercial laminates) White Ash.

Loch features:

- 1) A curved form that, when placed next to repeated seats, forms an undulating interaction,
- 2) A high back with sloped sides to increase user privacy,
- 3) A calming color scheme coupled by antimicrobial wood grain surfaces (particularly on the areas of the chair most touched by the user),
- 4) An arm rest/surface that provides a work area for the user.

Engineering/Orthographics



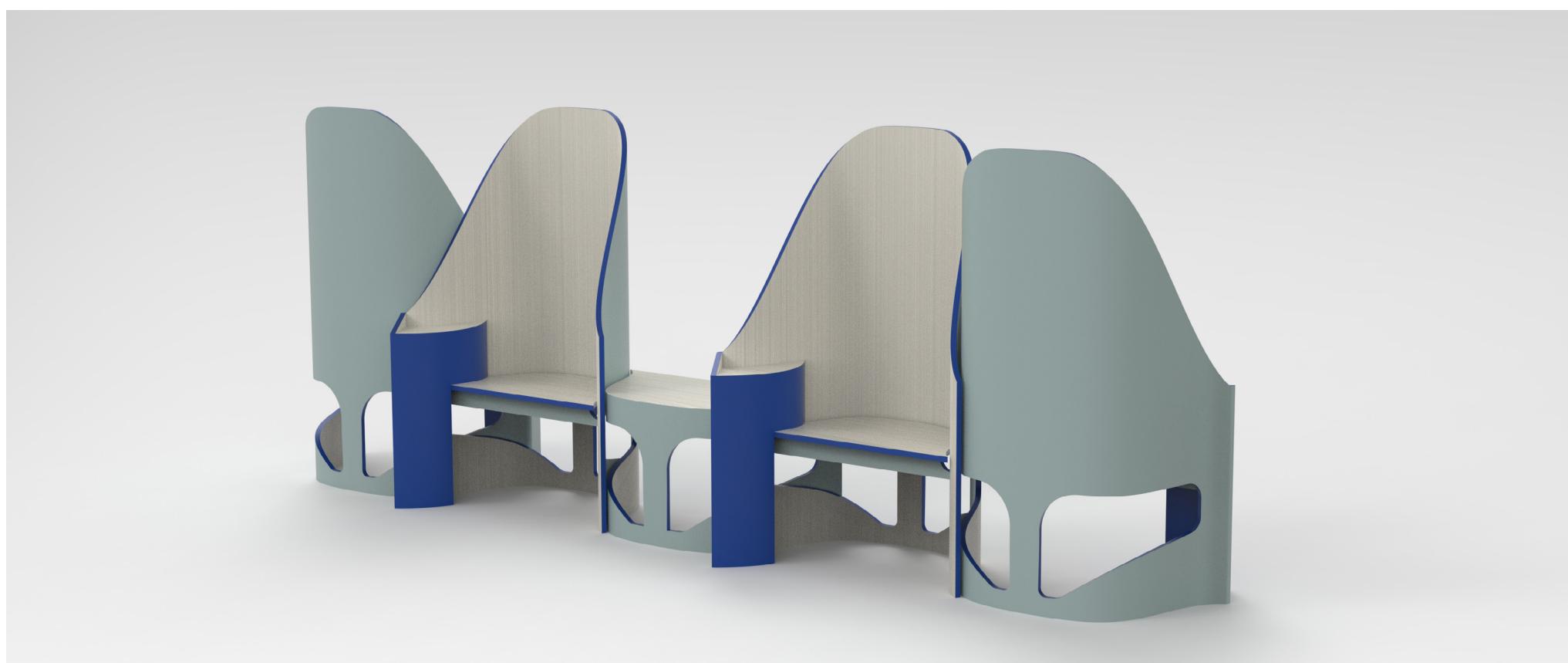
Though the FORM Student Innovation Competition allows for a design with maximum dimensions of 6' x 6' x 6', Loch does not fill this whole space. **When "nested" together, as pictured in the upper right view, two seats can fit within a 6 foot cube.**

The overall dimensions of the seat measure 38 inches wide, 18 inches deep, and 58 inches tall. The tall back allows for the back of most user's heads to be covered, and their lines of sight obstructed by the sloping sides. The seat is 17 inches deep and 18 inches from the ground, fitting most adult dimensions. The work surface (including the wall thickness) is around 7 inches wide at its largest point, allowing for activities such as filling out paperwork to be completed. The substrate has a consistent thickness of three-quarters of an inch throughout the design.

Additional Views



Rendering Loch in the context of its intended setting (a healthcare waiting room, top image) helped me **visualize how my design could hypothetically exist in reality**, and how it would interact with general features of a waiting room.



I also modeled and rendered a possible table solution (bottom image) that could be placed between individual seats. While this did not ultimately become part of my final entry, **coordinated furniture does present itself as an interesting direction to explore in the future**.

Through research, conceptualization, and peer feedback, I arrived at a design that could successfully improve a healthcare setting. **Loch's form ties directly to its functions**; its high, sloping back and sides create a private space for the user, and its curvature allows for multiple seats to nest laterally, saving space. The form is intriguing yet unified, and would fit well within a healthcare waiting room. Because an unlimited number of units can fit together side by side, **Loch has the potential to meet the needs of a variety of healthcare spaces**. In terms of materiality, the use of Formica® products was intentional, such as through the placement of Antimicrobial White Ash laminate on the most touched surfaces. Even though Loch was not manufactured, **the construction of the design was considered**, and led to design inclusions such as a support brace for the seat.

However, components of Loch could be considered to improve the overall design. While the seat could fit in many settings, it is not a universal design that would necessarily improve all healthcare waiting rooms, especially when the visibility of users is necessary (for safety reasons or otherwise). Creating a secondary version of Loch with a more open design could aid in this. Furthermore, **Loch is not completely accessible to the wide variety of individuals that might come in contact with it**. The constraints of the material cause the chair (without a cushion) to possibly be too uncomfortable for elderly or underweight patients. It also would not qualify as "bariatric" seating. Because of this, it could be beneficial to create an option for attaching a cushion to the existing seat, and to create an alternate design for those in larger bodies.

In total, I think that Loch holds a unique place in the commercial furniture market. **Its design is intended to solve a problem**: the discomfort and lack of privacy that characterizes many existing seats in the waiting rooms of hospitals or doctor's offices. The integration of Formica® into a design for healthcare settings is natural and advantageous, as the non-porous and cleanable qualities of laminate meet the needs of the space. Beyond the version of Loch presented, **the design has a great amount of room to grow and expand to meet the needs of a variety of users**. From the possibility of adding a coordinated table to creating versions to fit the needs of different bodies, the potential applications of this design are numerous.

Conclusion

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Course and project led by Professor Richard Prisco.

The following packet will be submitted to Formica®: a submission form, three renderings of my design, and my project statement.

Entry Packet