

P3 Project Report

Sustainable Modular Adaptable Furniture for Children

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Approval Form

Industrial Project III

This is to certify that the Industrial Design Project entitled “Sustainable Modular Adaptable Furniture for Children” by Wasim Salih Thari is approved for partial fulfillment for the Master of Design degree of Industrial Design at IDC, Indian Institute of Technology, Bombay.

Professor Kums Kumaresan :
(Project Guide)



External Examiner :



Internal Examiner :



Chairperson :



Declaration Form

I, declare that this written report represents my ideas in my own words, and where other's ideas or words have been included I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not falsified, misinterpreted or fabricated any idea, data, facts or source in my submission. I understand that any violation of the above will be caused for disciplinary action by the Institute and can also evoke penal action from the source, from which proper permission has not been taken or improperly been cited.

Signature: 
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Date: 19/04/24

Acknowledgement

I would foremost like to sincerely thank my project guide, Professor Kums Kumaresan, for his valuable mentorship, support and guidance throughout my project.

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I would like to extend my thanks to my batch mates and lab assistants for their help and support.

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Abstract

The project "Sustainable Modular Adaptable Furniture for Children" is an exploration driven by the observation of constant change in our surroundings, recognizing its impacts on our lives. By studying the evolution of children and their furniture needs, the project seeks to address the shortcomings of existing furniture solutions, particularly for urban environments. The aim is to design adaptable furniture that grows with children, providing a flexible and affordable solution that accommodates their development from early childhood through adolescence. This project emphasizes sustainability, functionality, and affordability, aiming to create furniture that adapts to diverse needs, optimizes space, and contributes positively to the well-being and independence of children and their families.

Timeline

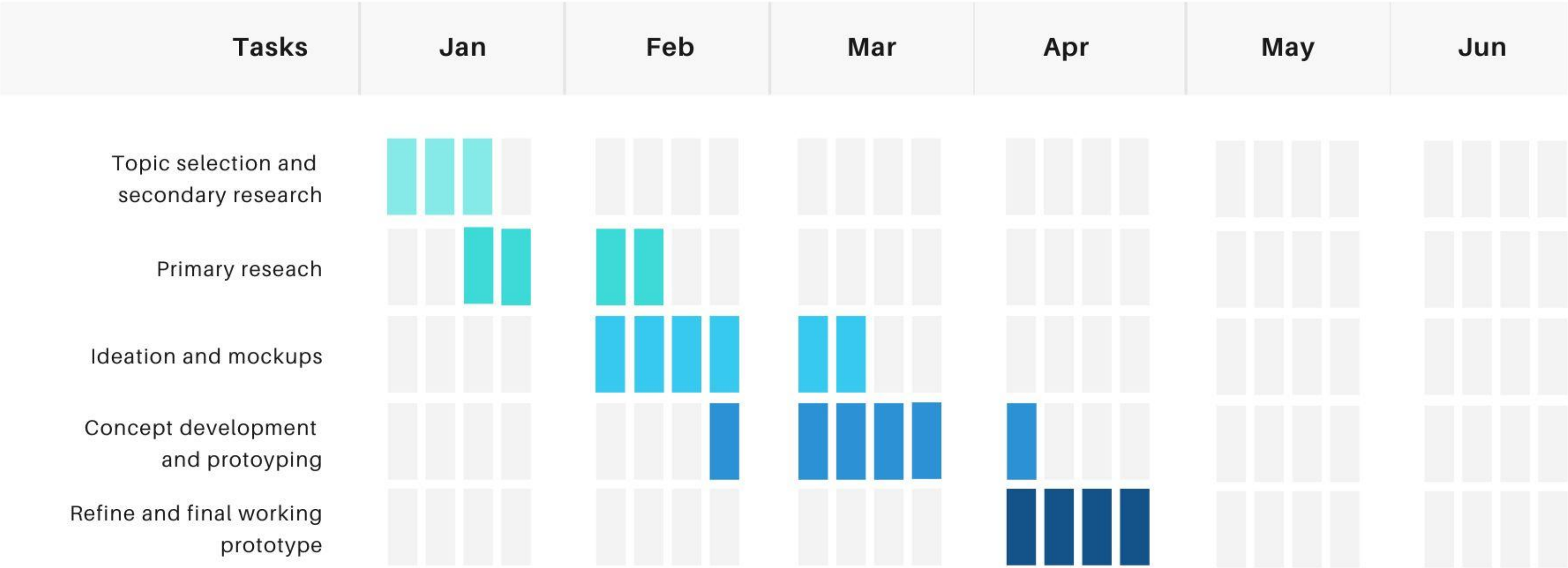
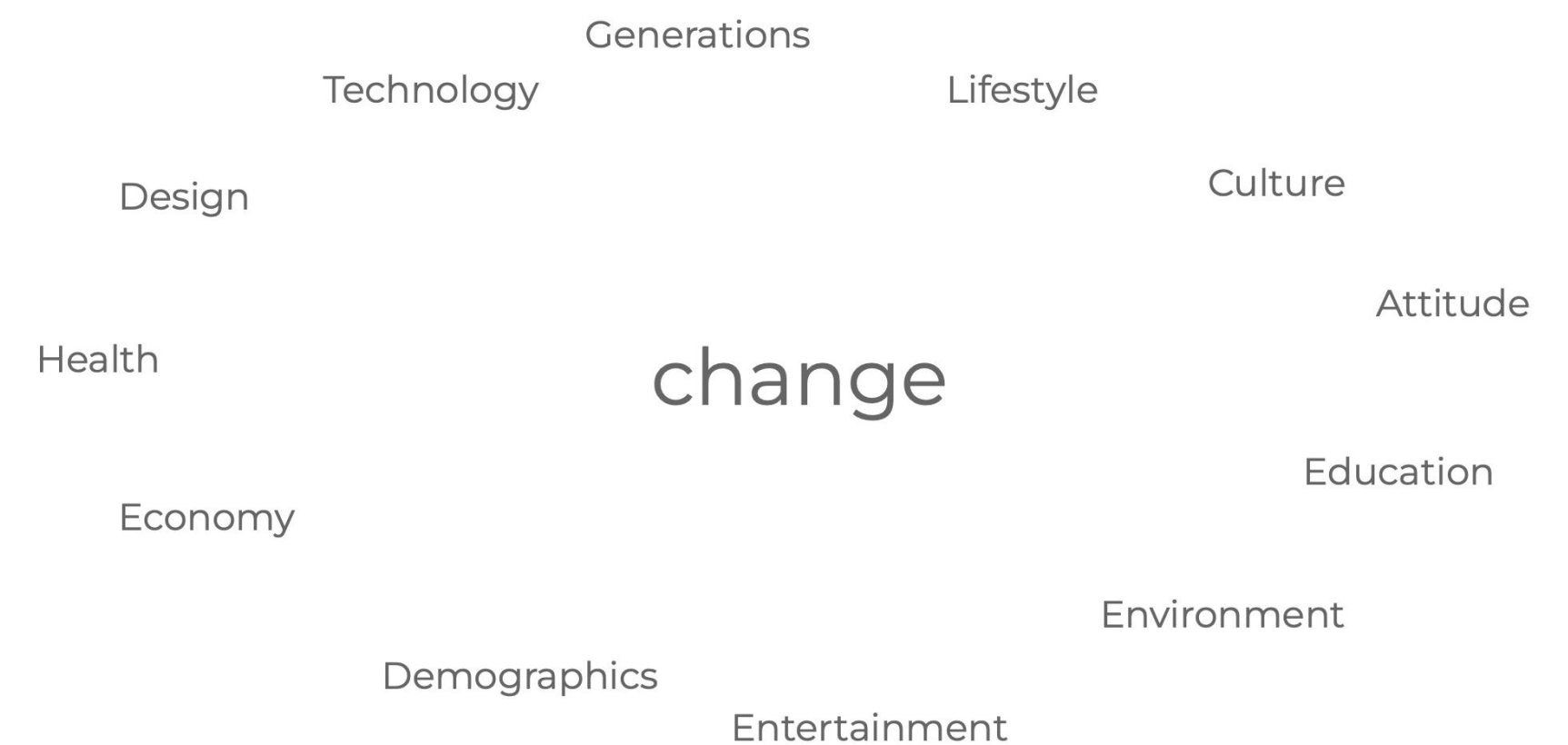
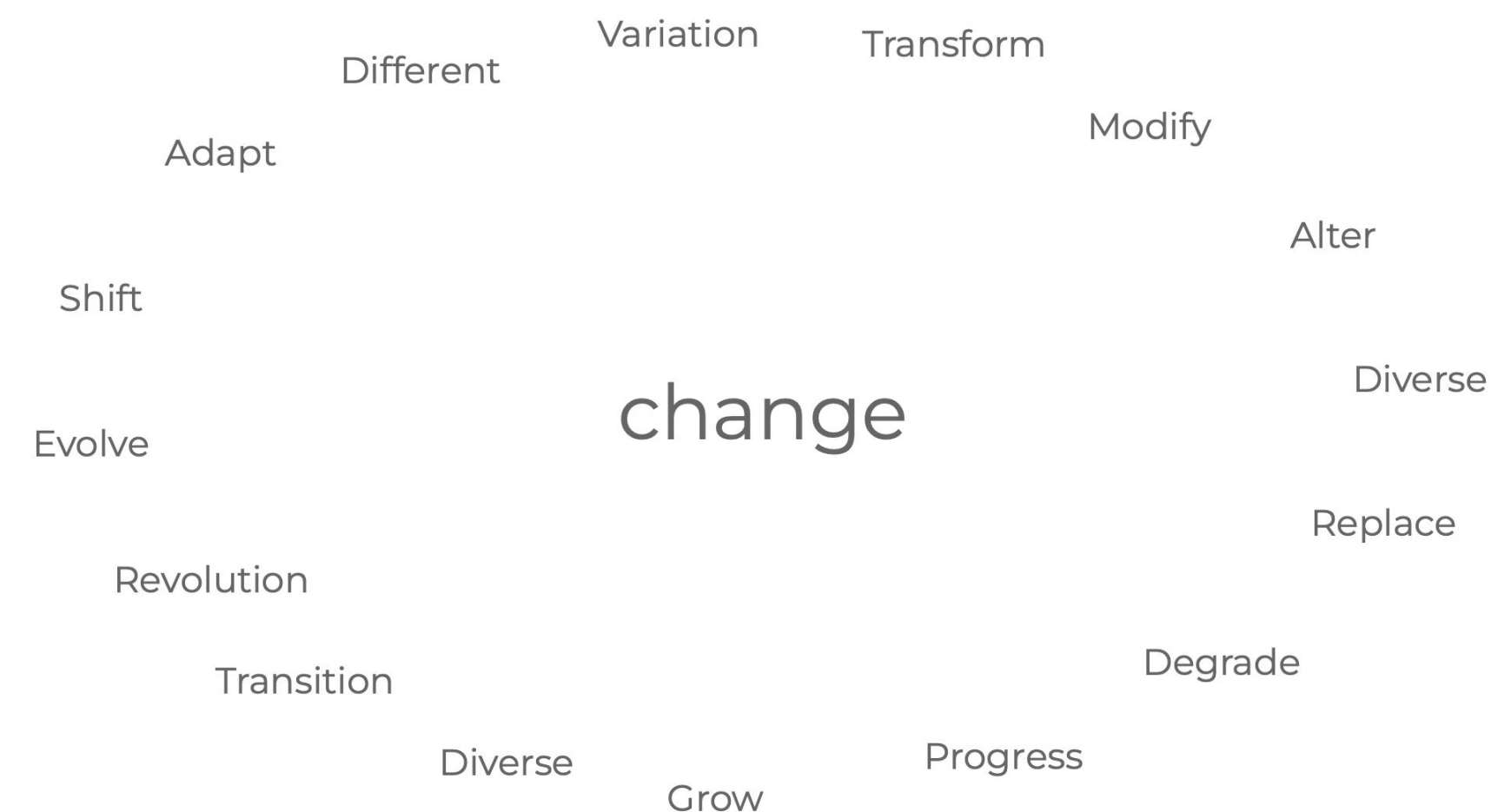


Table 0.1 - Timeline

Introduction

I've noticed that things are always changing around us. Whether it's the weather, how we spend our time, the habits we have, or even how we feel about things, change is constant. So, I started paying attention to all the different changes happening in my world. I wanted to see how they affect us. Sometimes, change can make things better, like when we learn new things or improve ourselves. Other times, it can make things worse. But what's interesting is that change can come in many forms. It can be a big transformation or just a small adjustment.



As I looked closer at all these changes, I realized they're connected to different parts of our lives. Like how new generations bring new ideas and ways of doing things, or how technology changes the way we live and work. Even in things like education and entertainment, change plays a big role.

Introduction

Deciding ‘change’ as my primary concept, I set out to explore its different aspects, looking for opportunities within them. One thing that really caught my attention was how kids grow up. It’s fascinating to see how they change over time, both physically and mentally, as they become adults. Change plays a big role in this process, guiding them through new experiences and helping them become the people they’re meant to be. As my focus shifted towards ‘growth,’ I began searching for the perfect challenge for my project.



<https://www.shutterstock.com/search/infancy-stage>

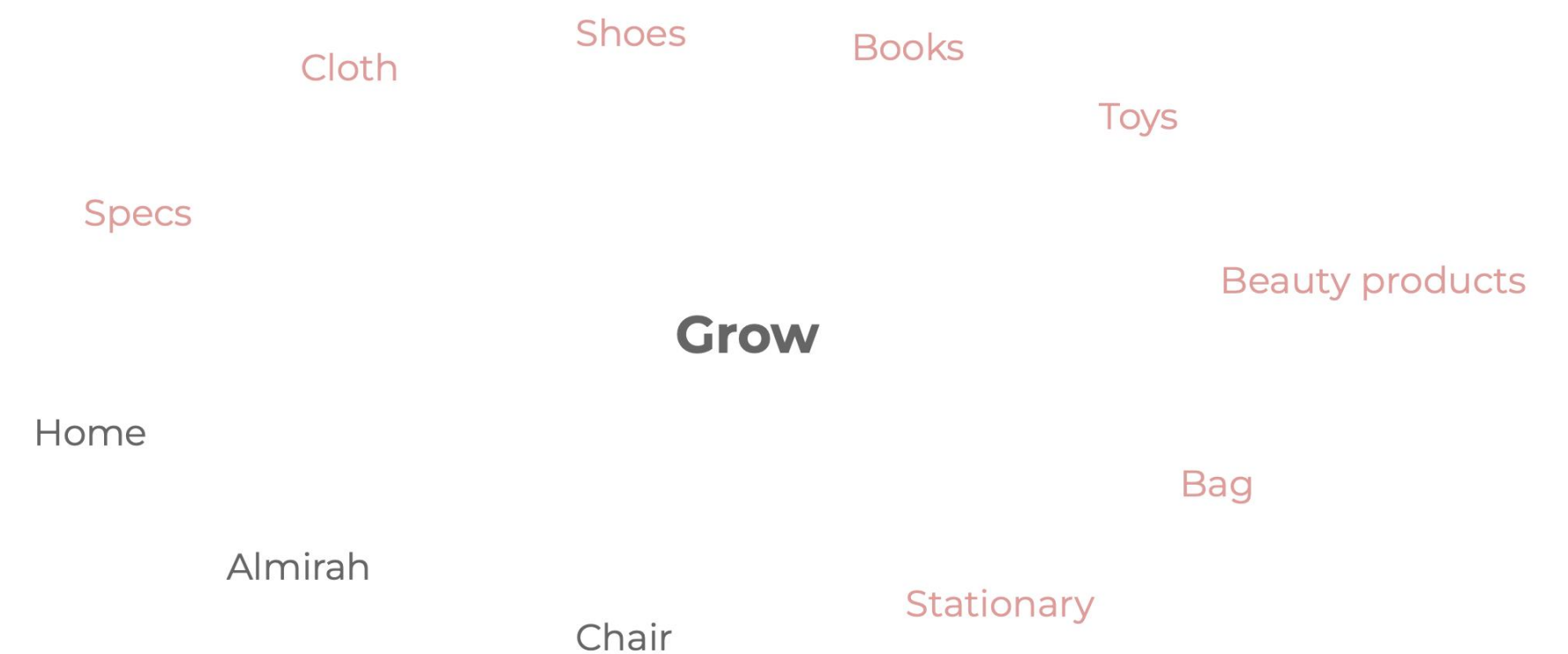
Fig. 1.1



Introduction

In many households, items often get swapped out because they're outdated, worn out, or simply don't meet the needs of the users anymore. For things like clothes and beauty products, changes in trends or personal preferences can prompt replacements. Since these items are usually affordable, it's not a big deal to buy new ones when needed. However, larger investments like furniture, such as cabinets or desks, are a different story. They're pricey, so people tend to hold onto them for longer periods, even if they're not perfectly suited to their evolving needs.

Unfortunately, children's furniture often gets overlooked in this cycle. Parents may not prioritize investing in furniture specifically designed for kids, leaving them to either make do with adult-sized options or sit on the floor. Even if children do have their own furniture, it's common for it to remain static and not adapt to their changing needs as they grow, creating discomfort and inconvenience for them.



Problem statement

Existing furniture for kids lacks the capacity to adapt the evolving in needs of growing child.

The current furniture options available for children often fall short in meeting the evolving needs of a growing child. While these pieces may initially serve their purpose, they lack the versatility to adapt as children mature and their requirements change. This limitation poses a significant challenge for parents and caregivers who seek furniture solutions that can seamlessly accommodate their child's developmental stages.

Existing children's furniture designs often lack the flexibility to transition smoothly from one stage to another. Moreover, the inability of children's furniture to adapt to changing needs can result in discomfort and frustration for the child. They may find themselves outgrowing their furniture or struggling to use pieces designed for younger ages, impeding their sense of autonomy and hindering their development.

Design Objective

Develop furniture with the capacity to flexibly adapt to the changing needs of a growing child.

What if the furniture can also grow with the kid ?



Fig. 1.2

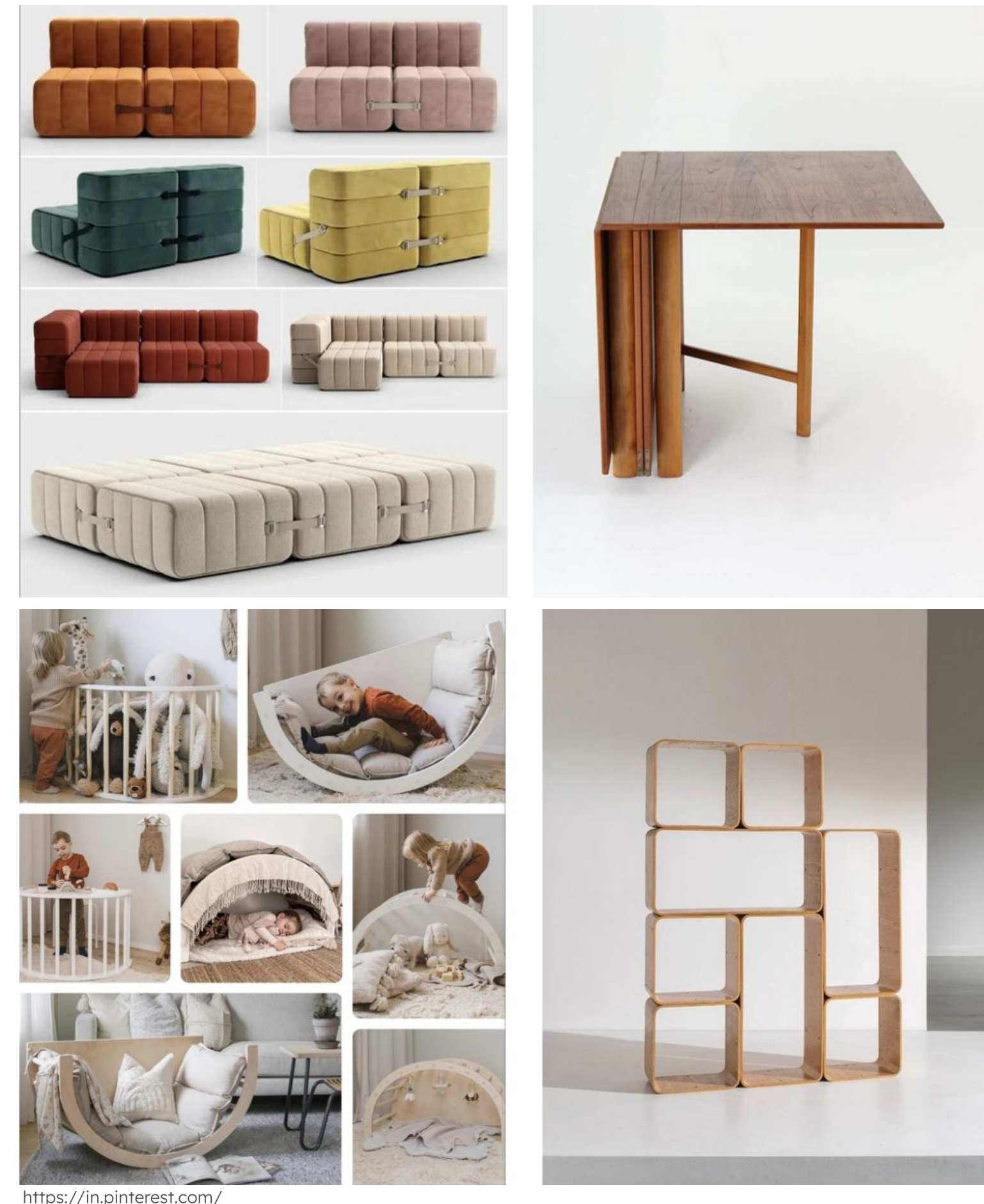
What is adaptable furniture

Furniture which can change its form, size, function for different needs

Adaptable furniture is furniture that can be easily changed or adjusted to suit different needs or situations. It's designed to be flexible and versatile, often featuring modular components or adjustable elements that can be rearranged or modified. Adaptable furniture allows users to customize their space according to their preferences, lifestyle changes, or spatial constraints, ensuring that it remains functional and relevant over time.

Adaptable furniture can be divided into three categories.

- Modular furniture
- Convertible furniture
- Adjustable furniture



<https://in.pinterest.com/>

Fig. 1.3

Modular Furniture

Modular furniture is designed with individual components that can be rearranged or combined in various configurations to create different layouts or functions.

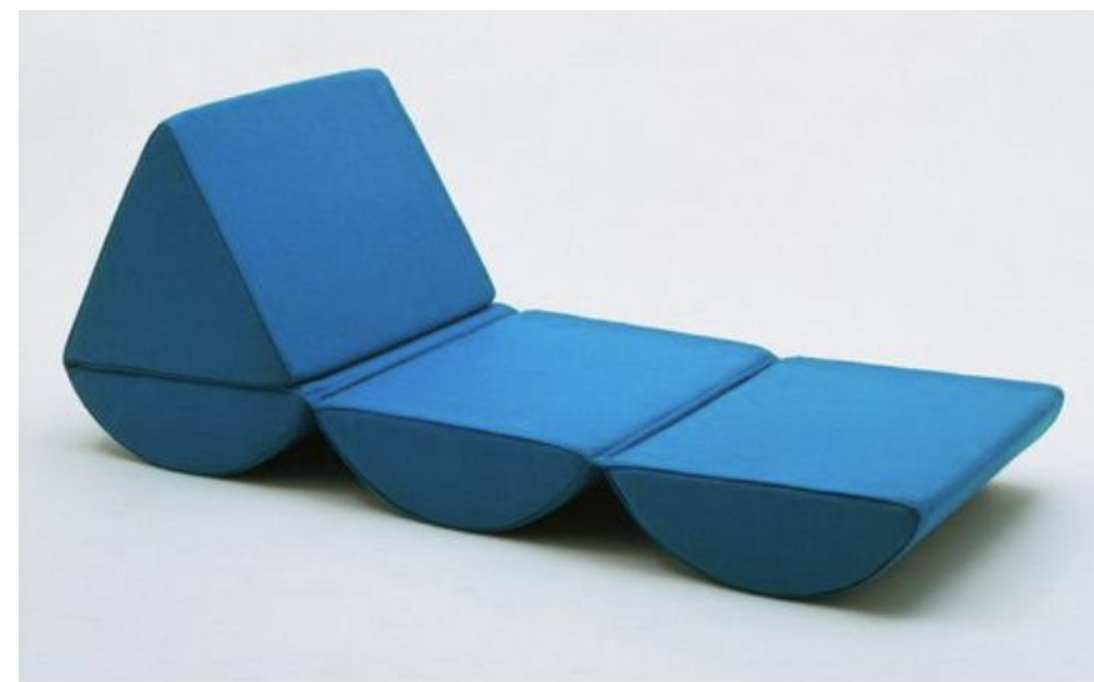


<https://in.pinterest.com/>

Fig. 1.4

Convertible Furniture

Convertible furniture refers to pieces that can be transformed to serve multiple purposes or functions.



<https://in.pinterest.com/>
Fig. 1.5

Adjustable Furniture

Adjustable furniture consists of pieces that can be modified or changed to accommodate different preferences, needs, or situations. Here funion remains same



<https://in.pinterest.com/>
Fig. 1.6

Why adaptable furniture



Fig. 1.7

Child Development and Well-being

Empowering Independence

Personalized environment

Reduce waste through longer life span

Economical for parents

Adaptable furniture offers numerous benefits, starting with its positive impact on child development and well-being. By evolving alongside children, it supports their growth and comfort at every stage, promoting their physical and emotional development. Moreover, adaptable furniture empowers independence by providing children with personalized spaces that they can modify

to suit their needs and preferences, fostering a sense of ownership and autonomy. Additionally, its versatility reduces waste by extending its lifespan, contributing to sustainability efforts. For parents, it proves economical as it eliminates the need for frequent replacements, providing long-term value and peace of mind.

Challenges of existing furniture

- Short lifespan
- Limited adjustability
- Inefficient use of space
- Limited personalization
- Environmental impact

Traditional furniture presents numerous challenges, each with its own adverse effect on the environment. These issues encompass a short lifespan, which leads to premature disposal and waste accumulation. Furthermore, limited adjustability inhibits the furniture's ability to evolve with changing needs, necessitating frequent replacements and heightened resource consumption. Inefficient space utilization contributes to clutter and disorganization, compounding environmental issues. Moreover, restricted personalization options constrain individual expression and satisfaction, underscoring the need for innovative furniture designs to address these environmental concerns effectively.

Context

Indoor

Study environment

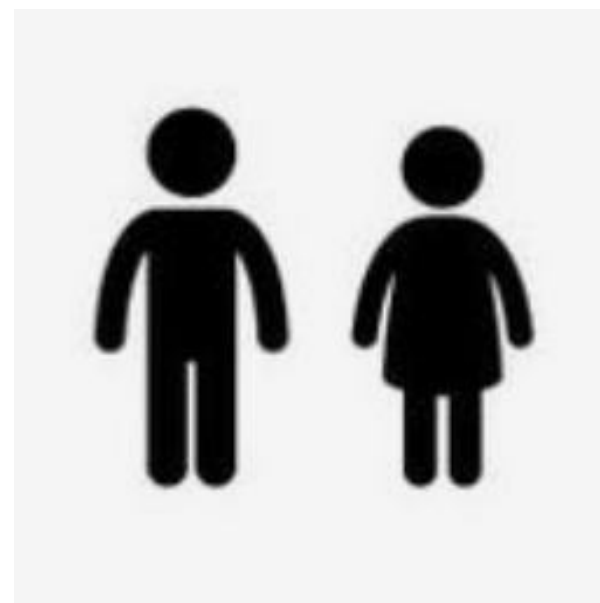
Urban life- limited space

Price range: Rs 6,000/- to Rs 10,000

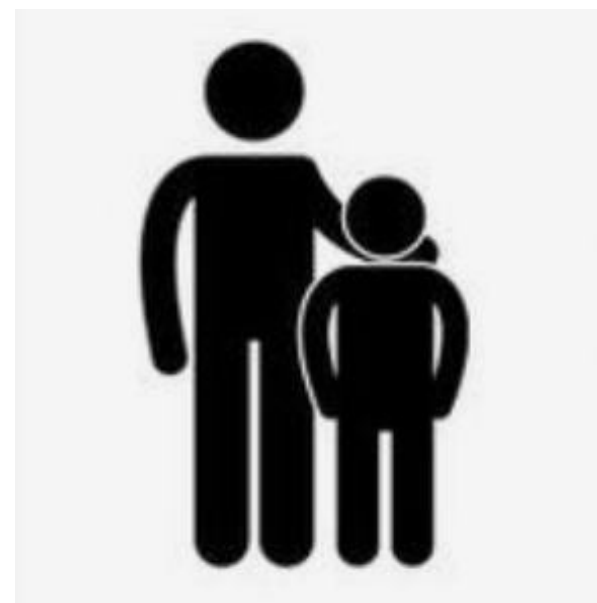
Urban environments often present challenges such as constrained living areas, higher cost of living, and a need for efficient use of space due to smaller residential footprints. In such settings, families may prioritize multi-functional furniture that maximizes utility and minimizes clutter. Additionally, the design of the study area needs to be conducive to learning and concentration amidst potential urban distractions. Furthermore, cultural and lifestyle aspects specific to urban living, such as busy schedules and reliance on digital technology, can influence how the study area is integrated into daily routines and equipped with tools for educational support.

Users

There are various users for the furniture



Consumer - children



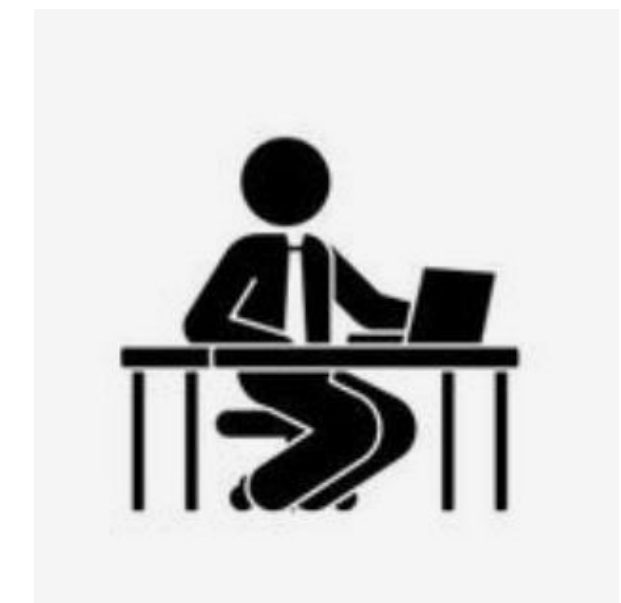
Customer - Parents



Retailer



Manufacturer

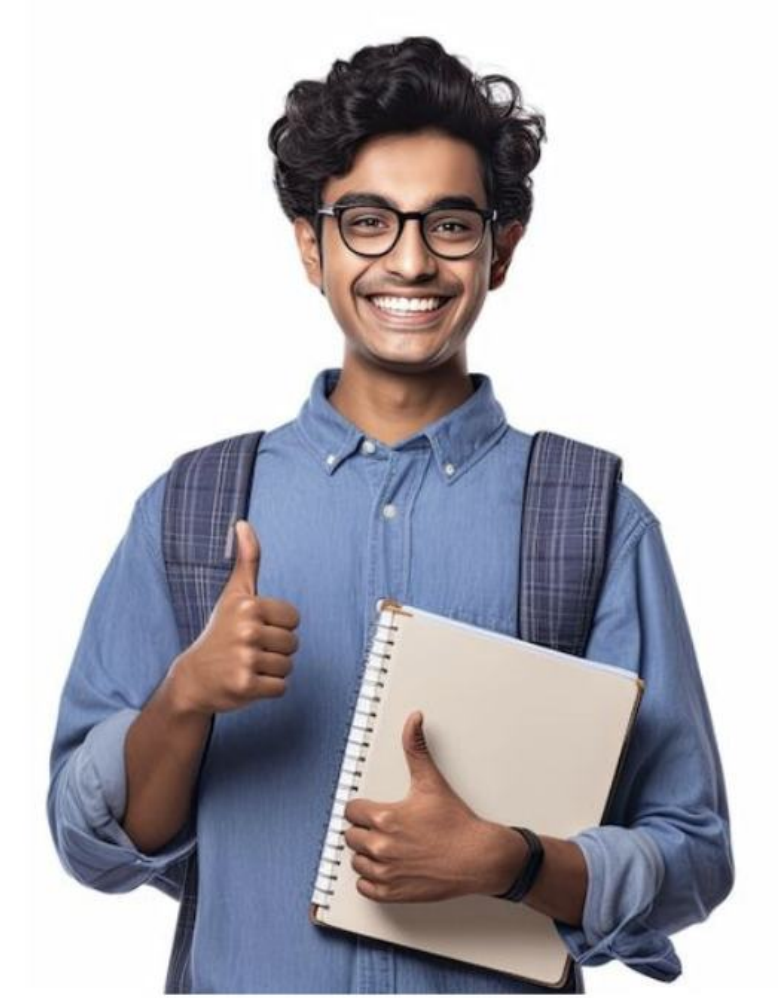


Stake holder

Designing furniture to accommodate all users, including children, parents, retailers, manufacturers, and stakeholders, is a holistic approach. The primary focus is on meeting the needs and preferences of children, who are the main consumers. Understanding their requirements is crucial. Addressing the concerns of parents, who are the customers, is also important. The furniture design should be appealing to both children and parents,

encouraging them to make a easy purchase decision. For retailers, ensuring easy transport and efficient storage of the furniture is essential. Manufacturers should aim for streamlined production with minimal time and effort. Ultimately, the product should provide value to stakeholders and be financially viable.

Users



<https://in.pinterest.com/>

Fig. 2.1

Preschoolers

(1st to 3rd Std)

Early Elementary

(4th to 6th Std)

Late Elementary

(7th to 8th Std)

Early Teens

(9th to 10th Std)

Late Teens

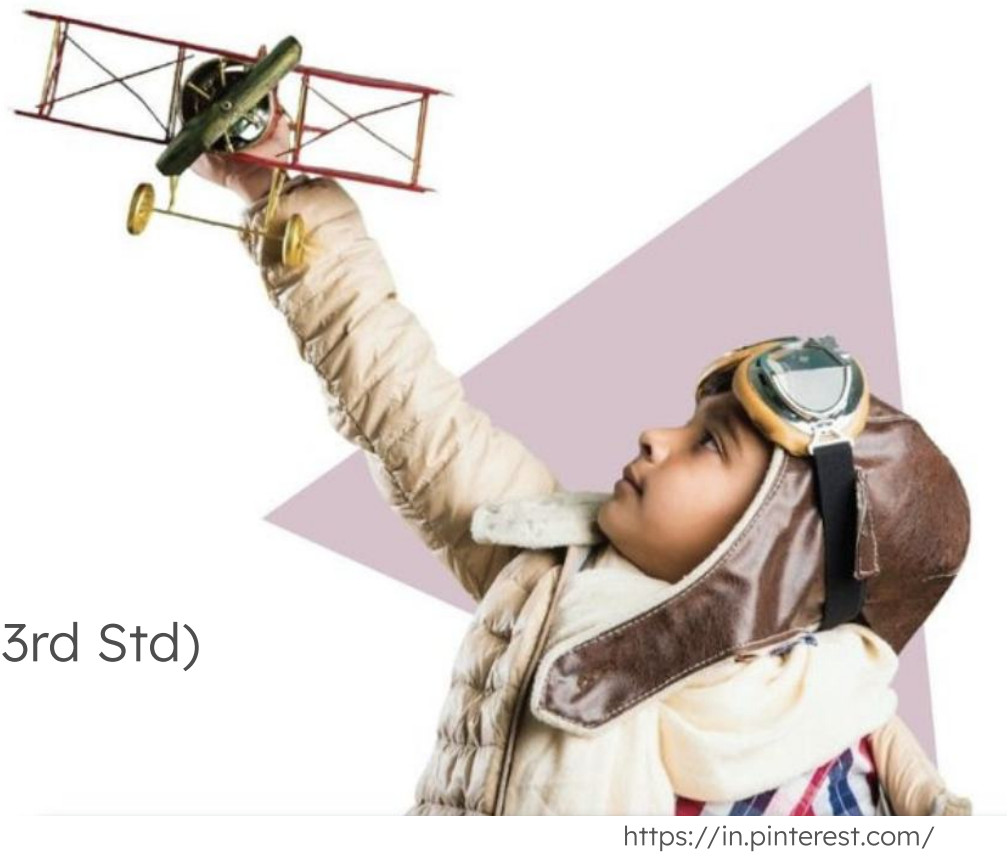
(11th to 12th Std)

Designing adaptable furniture to cater to students ranging from 1st standard to 12th standard involves a comprehensive understanding of diverse user needs across different age groups and educational

levels. The furniture range should be carefully considered based on the specific requirements and developmental stages of students at various grades.

Users

Preschoolers (1st to 3rd Std)



<https://in.pinterest.com/>

Fig. 2.2

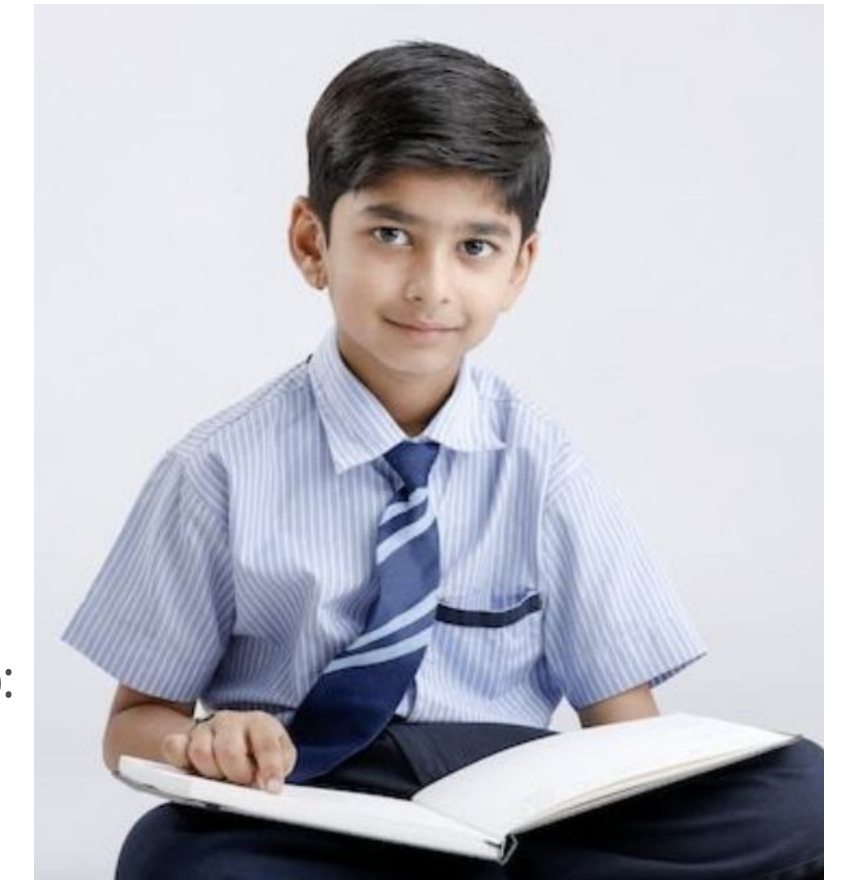
Behavioral Traits:

- Curiosity-driven exploration.
- Limited attention span.
- Preference for colorful and playful aesthetics.

Seating and Storage Needs:

- Safety features to prevent accidents.
- Easily accessible storage for toys and learning materials.
- Bright and engaging designs to stimulate curiosity.

Early Elementary (4th to 6th Std):



<https://in.pinterest.com/>

Fig. 2.3

Behavioral Traits:

- Developing independence.
- Growing sense of personal space.
- Interest in educational activities and hobbies.

Seating and Storage Needs:

- Adjustable seating for growing bodies.
- Organized storage for books, school supplies and toys
- Customizable elements to reflect individual preferences.

User

Late Elementary (7th to 8th Std):

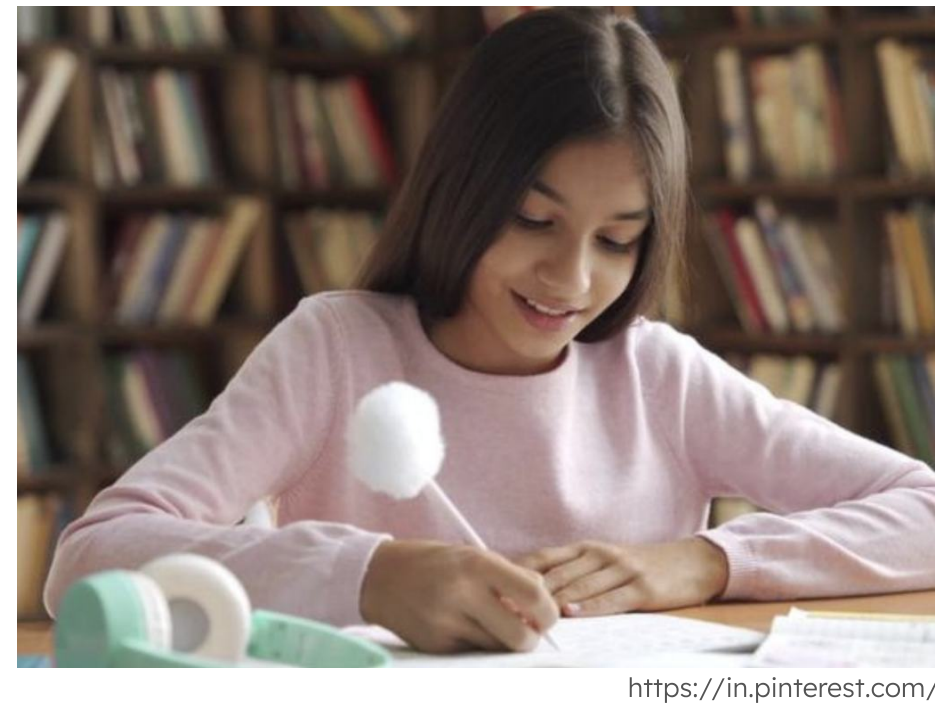


Fig. 2.4

Behavioral Traits:

- Increasing focus on studies and social interactions.
- Desire for personalization and self-expression.
- Emerging independence in decision-making.

Seating and Storage Needs:

- Storage for textbooks and devices.
- Multi-functional furniture to accommodate diverse activities.
- Design flexibility for personalization.

Early Teens (9th to 10th Std):



Fig. 2.5

Behavioral Traits:

- Heightened peer influence.
- Increased digital engagement.
- Evolving preferences in aesthetics and style.

Seating and Storage Needs:

- Tech-friendly furniture with charging stations.
- Adaptable spaces for socializing and studying.
- Storage solutions for personal items and gadgets.

USER

Late Teens (11th to 12th Std):

Behavioral Traits:

- Focused on academic achievements.
- Preparing for future goals and aspirations.
- Developing a mature sense of personal style.

Seating and Storage Needs:

- Spaces for exam preparation.
- Storage for academic materials and career-related resources.
- Versatile furniture that supports both academic and leisure activities.



<https://in.pinterest.com/>

Fig. 2.6

Secondary Research

The study underscores the critical role of furniture design in shaping children's development

- 1. Safety First:** Ensure that all furniture designs prioritize safety to protect children from potential hazards or accidents.
- 2. Practicality and Functionality:** Create furniture that is not only aesthetically pleasing but also serves practical needs, considering the physical and psychological requirements of children across different age groups.
- 3. Interest and Engagement:** Incorporate elements of novelty, creativity, and fun into furniture designs to engage children's curiosity and enhance their overall enjoyment of their living spaces.
- 4. Intellectual Stimulation:** Design furniture that promotes cognitive development, creativity, and learning through interactive and educational features.
- 5. Ergonomic Considerations:** Implement ergonomic principles to ensure that furniture dimensions and functionality are suited to children's physical characteristics and promote healthy posture and habits.
- 6. Adaptability and Sustainability:** Aim for furniture designs that can adapt to children's growth and changing needs, emphasizing sustainability and longevity.

User Research

I began visiting apartments in urban areas of Mumbai, conducting interviews with children and parents to understand their study environments and daily activities at home. I observed the objects they use for play and study, as well as their personal items and storage methods. Additionally, I noted the sitting posture of children at desks and chairs, and analyzed the constraints and limitations of their existing table, chair, and storage units.

Below are some of the individuals I encountered during my research, along with my initial observations.



3rd STD Girl

Sits on sofa and use her own study table

- Bad posture due to small table height
- Not sufficient space on the small table
- Separate storage space for books and stationary
- Foldable table- space saving
- Uses for tea, snacks, games
- Limited space environment

Fig. 2.7

User Research



2nd STD Boy

Use height adjustable personal desk

- Good posture due to height adjustability
- No adjacent storage space
- Not customisable with time
- Will be replaced within a few years with a bigger table



8th STD Girl

Sits on bed and use table

- Bad posture due to small table height
- Changes posture alternatively for comfort
- Not sufficient space on the small table
- Separate storage space for books and stationary
- Foldable table- space saving, portable
- Limited space environment

Fig. 2.8

User Research



Fig. 2.9

1st STD Girl

Sits on personal table and chair

- Better posture due to correct table height
- Separate storage space for books and stationary
- Foldable table- space saving, portable
- Uses in front of TV, for eating food
- When child grow big, the furniture will be thrown out
- Light weight, frail



Fig. 2.10

1st STD Girl

Use dining table

- Bad posture due to bigger table height
- Sometimes stands and use table
- Had to clean up when serving food
- Get disrupted between activities
- Separate storage space for books and stationary
- Table will be used by everyone at home
- Sturdy long lasting table

User Research

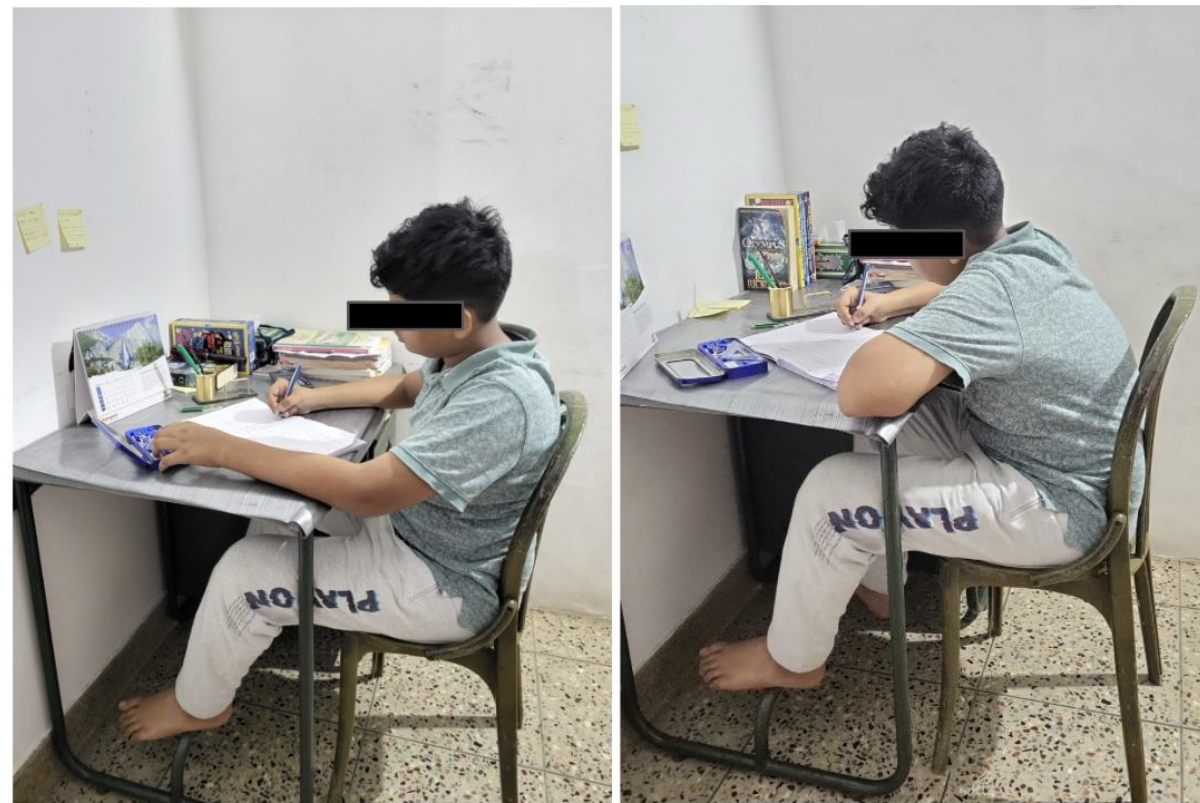


Fig. 2.11

9th STD Boy

Use Study table

- Bad posture due to bigger table height
- Leg placed on rod for comfortable posture
- Table is unstable and light weight
- Full table surface not been able to use
- Storage is included. Unused table surface is also used as quick storage
- Personal desk
- Not customisable



Fig. 2.12

3rd STD Boy

Use personal table and chair

- Boy grew bigger, table was not big enough
- Parents plan to purchase a new table
- Table and chair height is not good enough
- Sometimes eats food on this table
- Table is lightweight, portable
- Separate storage space for books and stationary
- Not customisable

User Research

Concerns parents (customer) raised regarding purchase of children's furniture

- Some furniture are space consuming
- Too expensive for a one installment purchase
- Does not adjust height based on child's need
- Get replaced/thrown away while not in use
- Extra expense for replacing furniture
- Heavy and difficult to move
- Less adaptable to use for different purposes
- Gets old or damaged. It has to be replaced as a whole
- Difficult to find required size table
- Foldable mechanism are too frail, get damaged easily

Key insights gathered from user research :

- Users do believe that at least a table for a child is important
- Space constraints are a major reason not considering for a table
- Small sized budget friendly tables and alternatives are used
- Foldable, portable furnitures are preferred
- Small table bought for child get thrown out when the child grow
- Table is not only for academics, but also for snacks and games
- Quality, sturdiness, long lasting are factors while purchasing a furniture
- Purchasing a table with one time installment is found difficult

Market Study

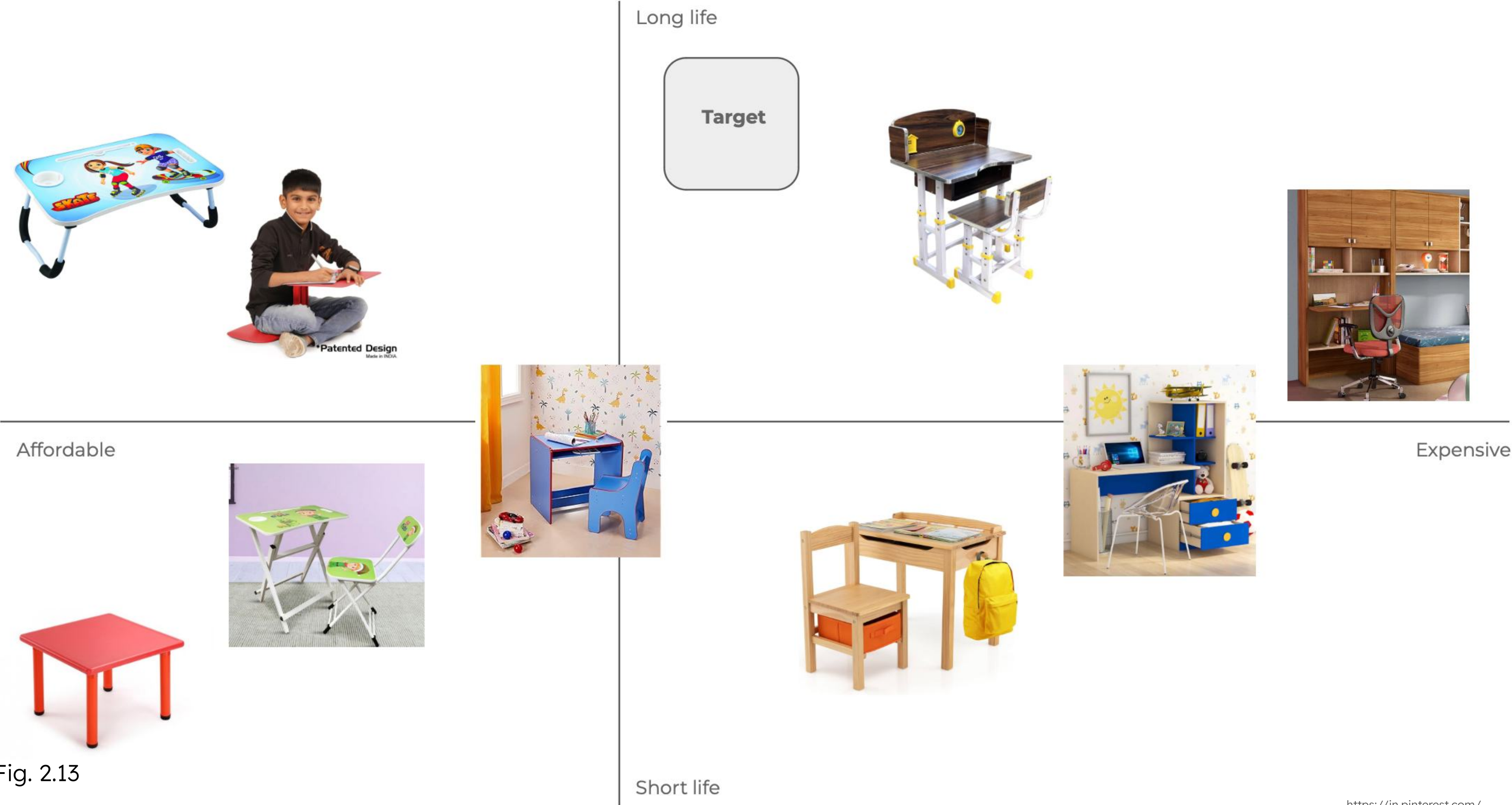


Fig. 2.13

<https://in.pinterest.com/>

Market Study

Key inferences gathered from Quick Market Research :

- Most affordable furniture are short lived and become burden to the environment
- Customization has very limited role in existing furniture in market
- Modularity, transformation, multipurpose has not much explored in market
- Selling attachable parts separately could contribute to making the product more affordable.

Problems with some of the existing products



<https://in.pinterest.com/>

Fig. 2.14

- Adaptability is limited (only height adjustment)
- Lacks customization
- Become obsolete after a few years
- Not cost effective

Study Table



Table top shelves

In designing a study table, it's essential to consider all aspects and elements related to the table to ensure functionality and usability. This includes attention to the tabletop size and material, storage options such as drawers or shelves for organizing study materials, the choice of a comfortable and ergonomic chair, appropriate lighting for optimal visibility, and incorporating personalization options to suit individual preferences and study habits.



Drawers

Keyboard tray

Fig. 2.15

Wire manager



Fig. 2.16

Storage

Children employ a range of storage solutions for their belongings, such as drawers for personal items, tabletop shelves for frequently accessed objects, wall-mounted shelves for additional storage, and handy storage baskets to keep things organized and accessible. Each storage method serves a specific purpose in maintaining a tidy and functional space for children.



Drawers (personal items)

Table top shelf (frequently used)



Shelf



Wall mounted shelf



Storage baskets



Fig. 2.17

Sitting



Chair

Stool

Children utilize chairs, stools, cushions, or the floor for various activities based on their preferences and needs, ensuring comfort and flexibility in their indoor environment. Each seating option serves a specific purpose in accommodating different tasks and play.

Sitting on cushion / floor



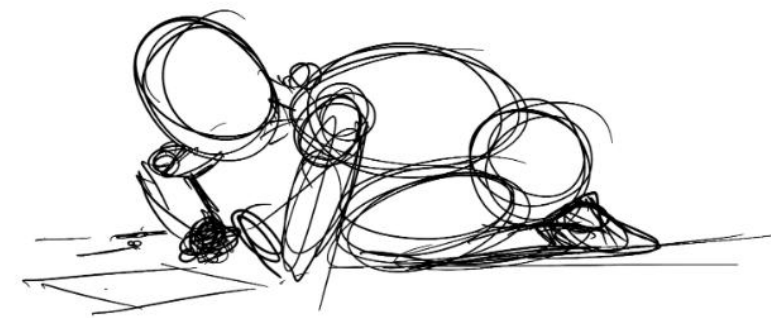
Fig. 2.18



Use case scenarios



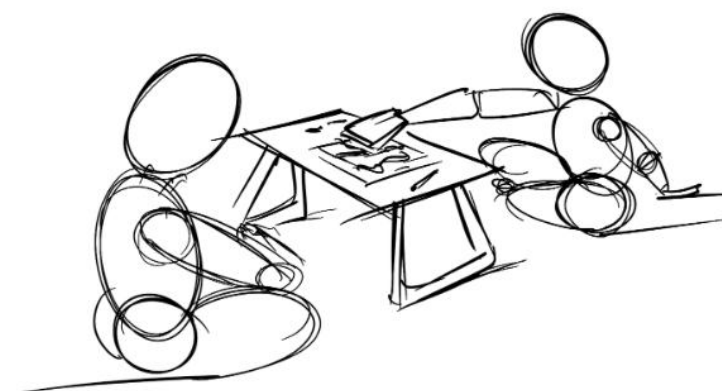
Sitting on floor and use portable table



Sitting on floor and do activities



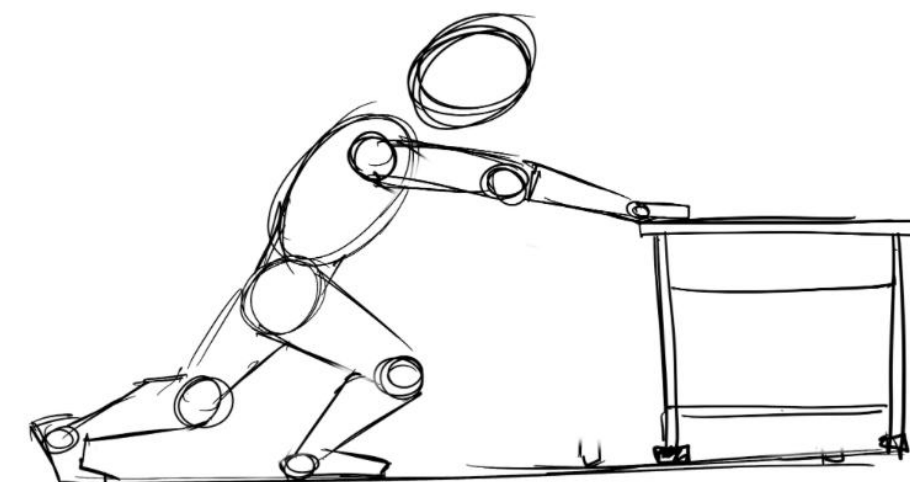
Sitting on chair to use table



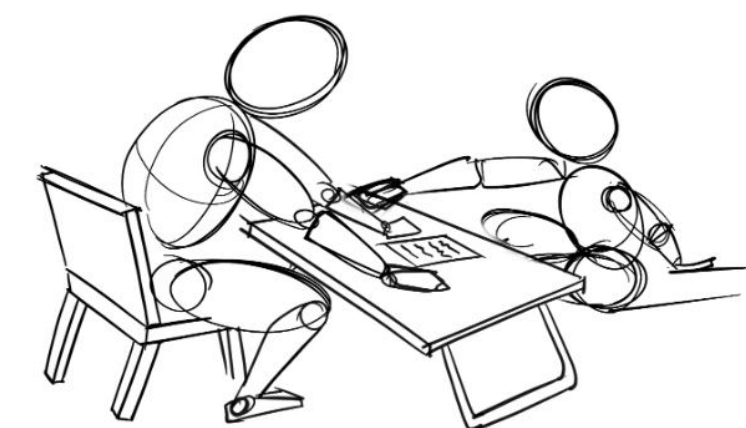
Sitting on floor both sides of table to play games



Watch TV while eating food on portable table



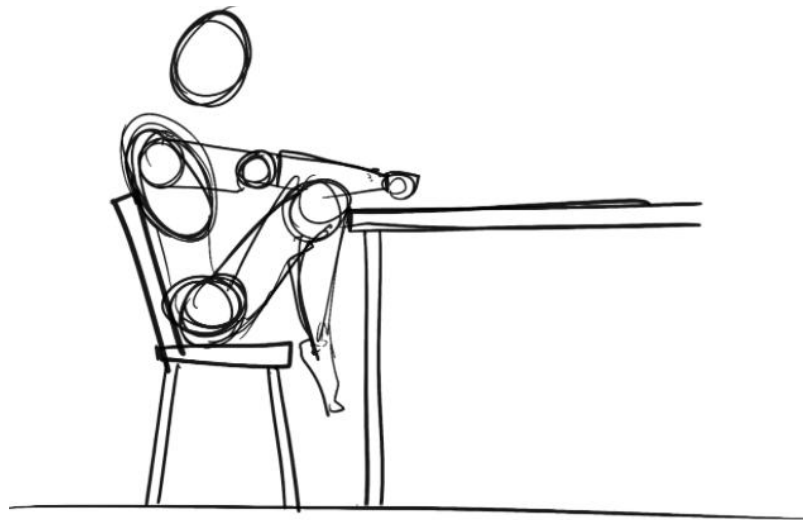
Push table to move to desired location



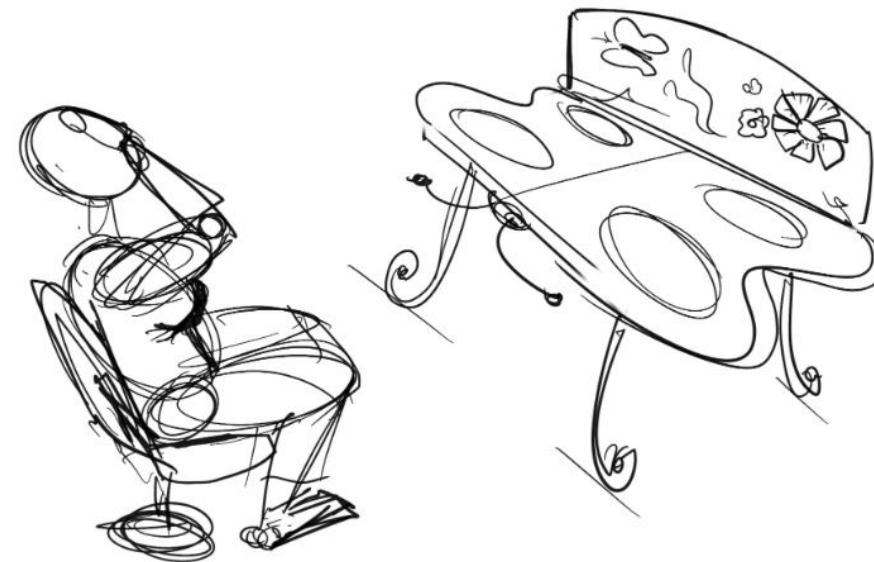
Parent sits with the kid to teach

Imagining and sketching various use-case scenarios involving tables, chairs, and storage units is a critical step in understanding potential hazards and design shortcomings. By visualizing how these furniture pieces are likely to be used in different contexts, such as studying, playing, or storing items, designers can identify safety concerns and usability issues. Using these scenarios as a checklist helps prioritize design improvements and enhances the overall functionality and safety of the furniture for its intended users.

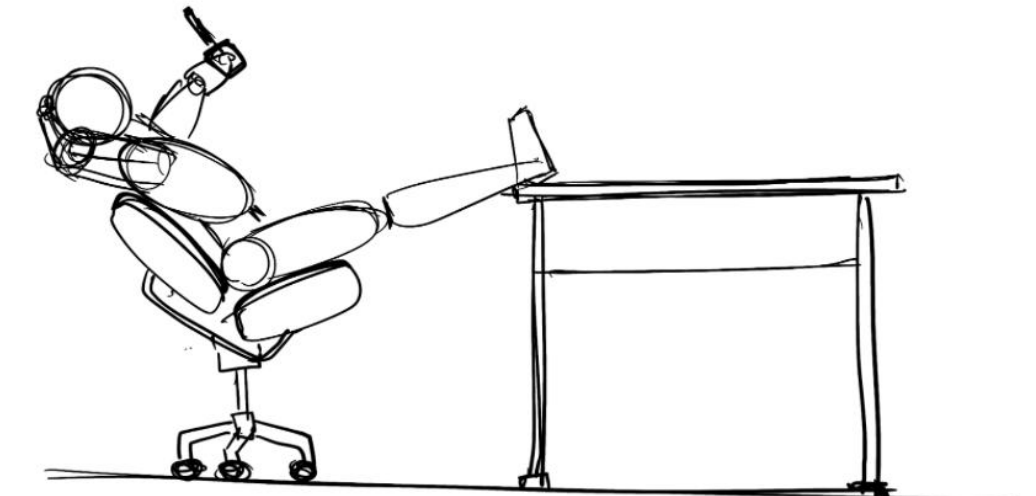
Use case scenarios



Sits in the posture of personal preference



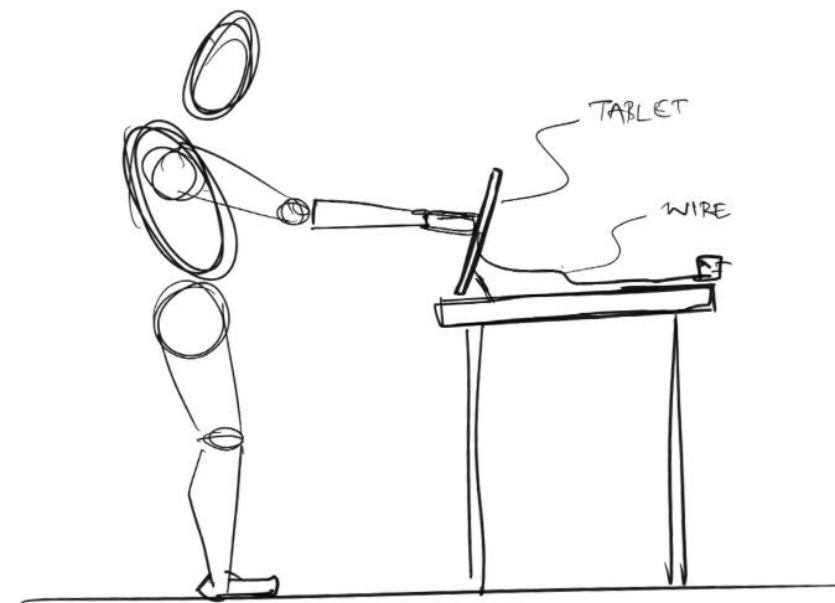
Aesthetic of the table get outdated



Sits relaxed position keeping leg on table



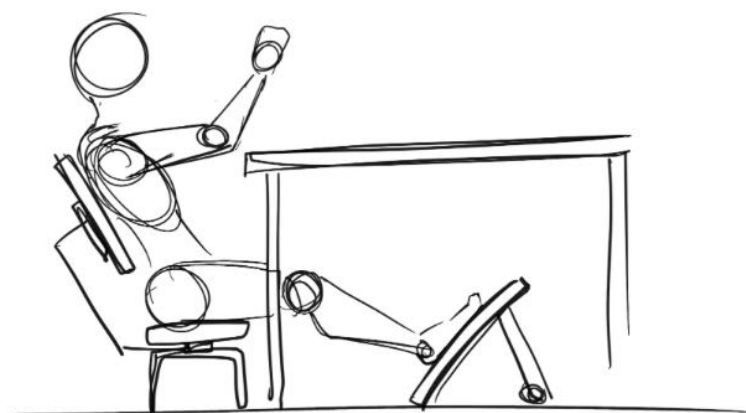
Siblings study together



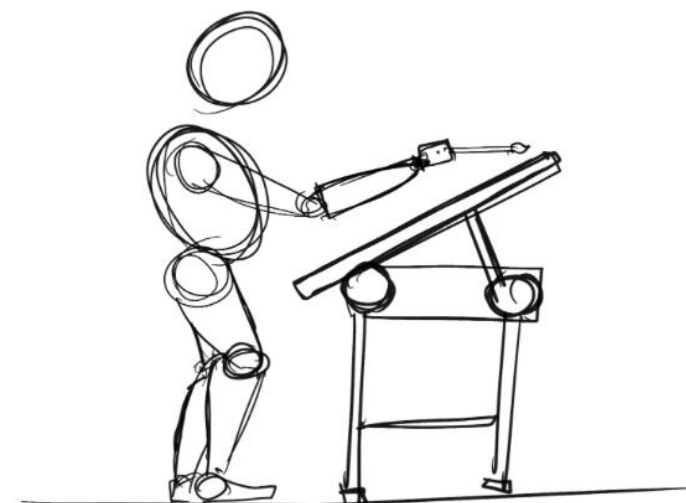
Use tablet/phone to record videos/study/games



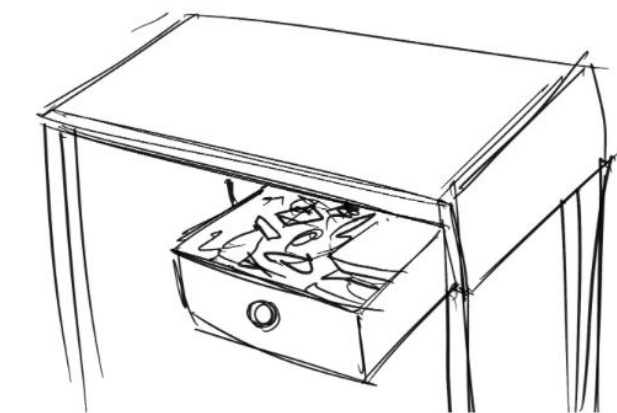
Cleaning under the table



Use foot rest under the table

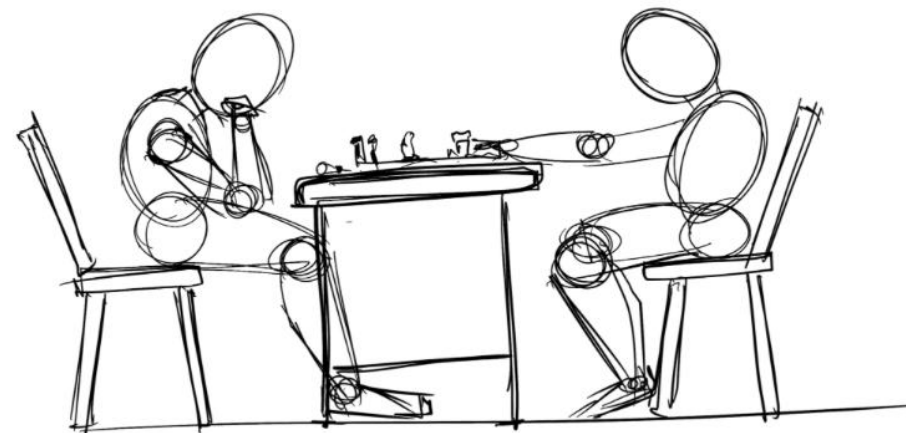


Paints with surface at a different angle

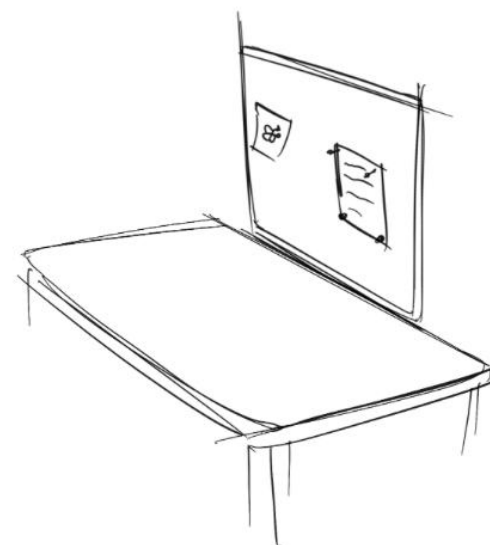


Lot of items in drawer and difficult to pick needed item

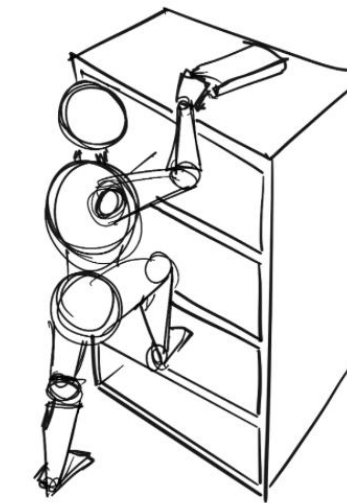
Use case scenarios



Sitting both sides of table to play chess



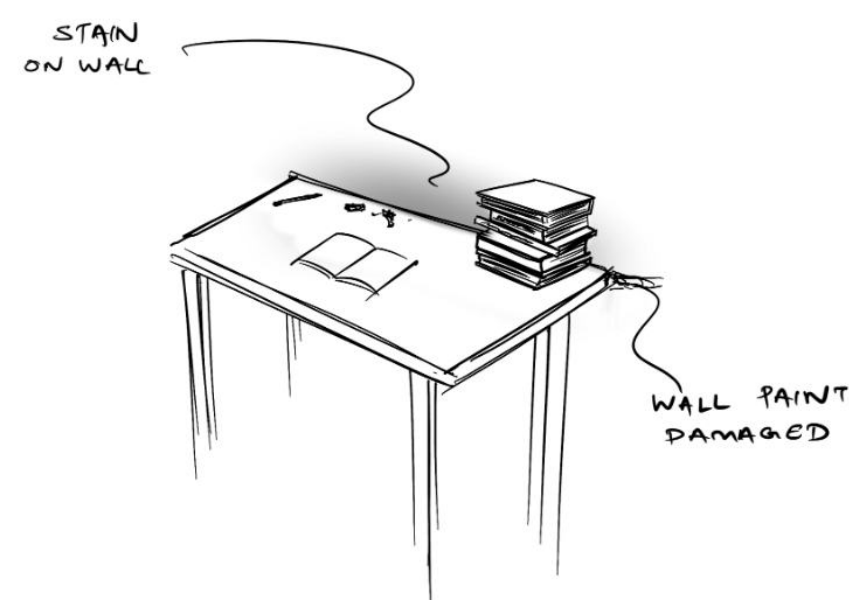
Sticky notes, poster pinned on board



To reach the higher shelf, step on the bottom shelf



Sitting top of the table



Wall get stain from use

Inferences

- Moving table around has to be considered
 - Light weight
 - Dimensions
 - Should not topple
- Should be rigid and strong after assembly
 - Build quality
 - Weight bearing
 - Long lasting joints
- Adaptable to various needs
 - Extracurricular activities
 - Sharing
 - Easy cleaning
- Storage needs to be considered
 - Easily accessible
 - Add more space when needed

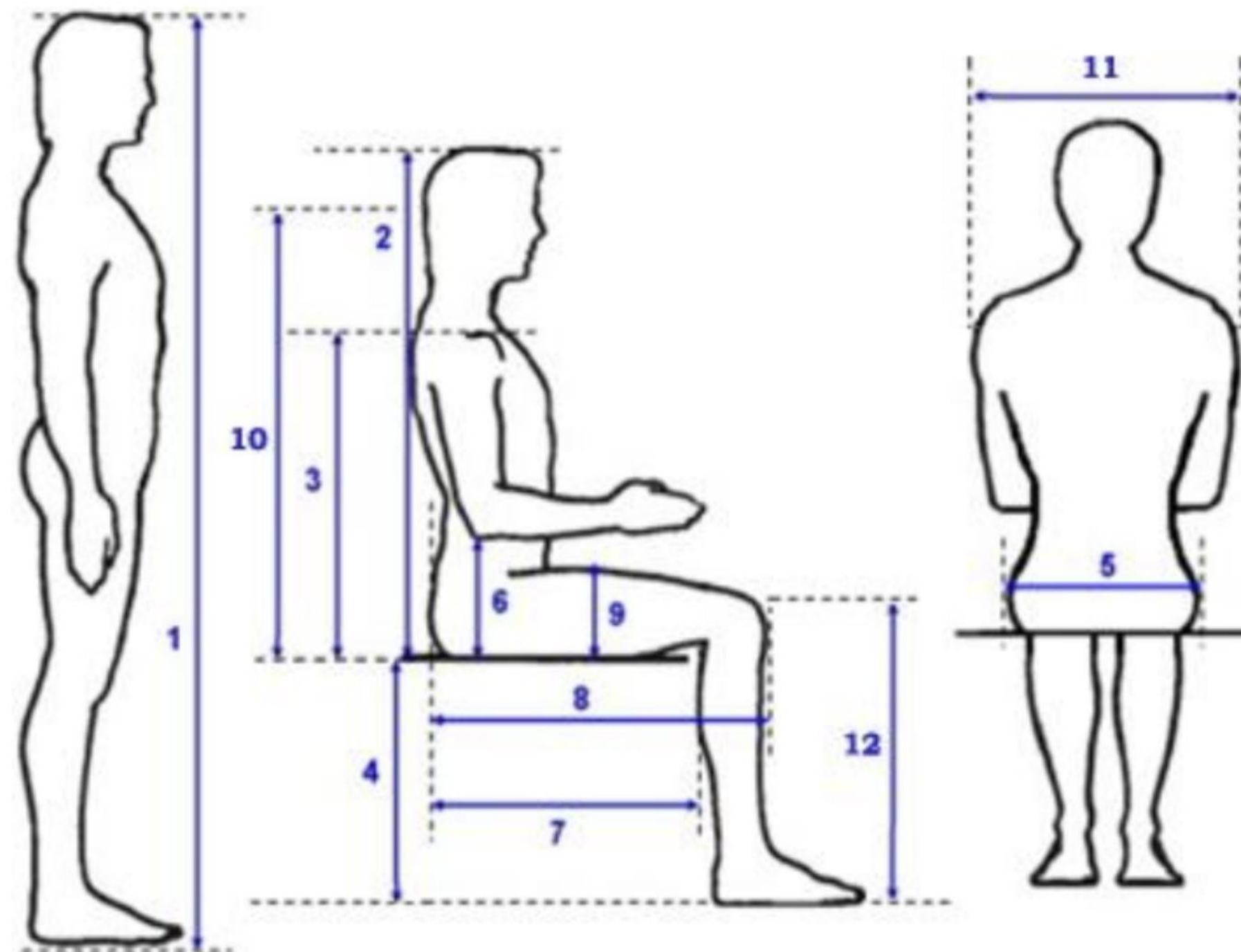
Design scope

Based on research findings and observations, the scope of the design has been delineated. This process involves clarifying the specific objectives and parameters that will guide the development of the furniture solution, ensuring alignment with identified user needs and preferences.

- Design of Study table, chair and stationary/games product storage
- Size adjustable for chair and table
- Modular storage unit, adaptable for storing and carrying
- Approachability - affordable by modular
- Long lasting furniture, sturdy and stable
- Safety of users
- Portable chair and storage unit
- Customization, personalization

Must have	May have
• Height adjustability • Easy assembly • Rigid, weight bearing • Easily accessible storage • Customizable	• Portable • Change of angle for painting • Easily cleanable • Doesn't make stain on wall

Anthropometry



R.no.	Parameters	Min	Max	Percentiles			Mean	± SD
				5 th	50 th	95 th		
1	Stature	141	182	147	161	172	160	8.78
2	Sitting height	61	91	67	79	90	79	7.12
3	Shoulder height	38	73	46	54	67	55	7.44
4	Popliteal height	30	64	34	40	45	41	3.2
5	Hip breadth	26	43	30	34	38	34	2.76
6	Elbow rest height	47	100	53	62	73	64	6.26
7	Buttock popliteal length	21	53	37	44	49	44	3.83
8	Buttock knee length	32	65	41	50	64	50	6.82
9	Thigh clearance	11	18	11.5	15	18	14.5	1.7
10	Sitting eye height	57	80	55	68	79	67	8.2
11	Shoulder breadth	26	52	31	40	48	40	5.25
12	Knee height	32	95	40	47	54	47	4.88
13	Weight	35	84	40	53	72	56	11.5

http://rei.pef.um.si/images/Izdaje_revije/2017/1/REI_10_1_cl_8.pdf

Fig. 3.1

Anthropometry

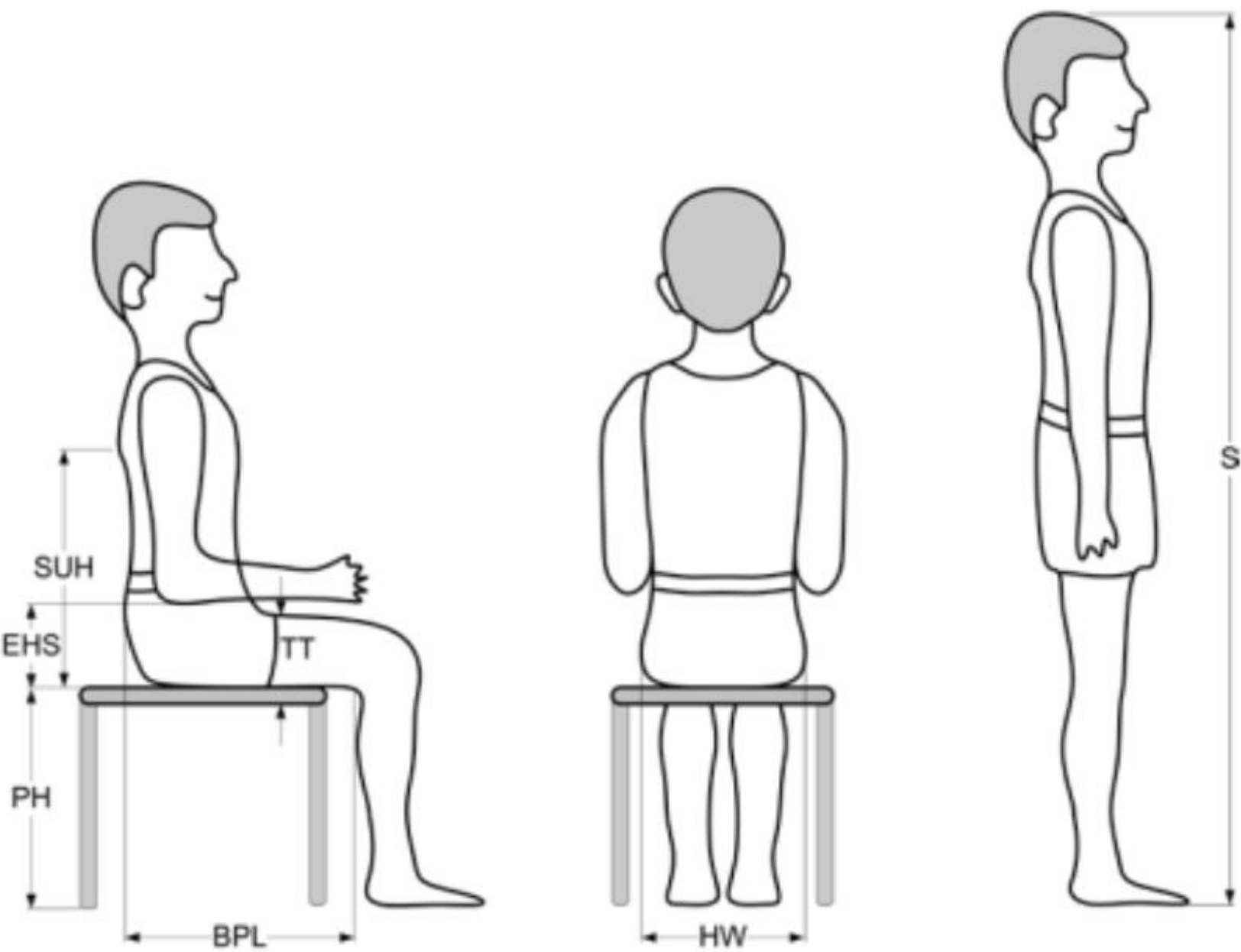


Fig. 3.2

Age Category	Approximated Age	Children's Table Height	Children's Chair Height
Preschool/School Age	4 to 6 years old	19" (48 cm)	11" (28 cm)
School Age	6 to 8 years old	20" (50 cm)	12" (30 cm)
School Age	6 to 9 years old	21" (53 cm)	13" (33 cm)
School Age	9 to 10 years old	22" (56 cm)	14" (35 cm)
School Age	9 to 11 years old	23" to 25" (58 to 63 cm)	15" (38 cm)
School Age	10 to 11 years old	24" to 26" (61 to 66 cm)	16" (41 cm)
School Age	12 to 13 years old	24" to 29" (61 to 74 cm)	17" (43 cm)
School Age	13 + years old	26" to 30" (66 to 76 cm)	18" (46 cm)

<https://www.autonomous.ai/ourblog/correct-children-table-height-size-chart>

Anthropometry

After reviewing anthropometric details, it was determined that precise centimeter-level adjustments for table and chair height are not necessary to achieve optimal posture for children. Instead, a practical approach with height adjustments of approximately 5cm was deemed sufficient for user-friendliness and ease of use. An updated anthropometry sheet has been developed to serve as a reference point for finalizing the design of the chair and table with adjustable height features.

Table height	Chair height
45 CM	30 CM
55 CM	35 CM
65 CM	40 CM
75 CM	45 CM

Design Brief

To design an adaptable furniture system that meets the changing needs of growing children in urban apartment environments, accommodating various activities such as studying, painting, playing, and other tasks suitable for children from 1st to 12th grade.

The furniture should incorporate height-adjustable features in the table and chair to accommodate children's growth.

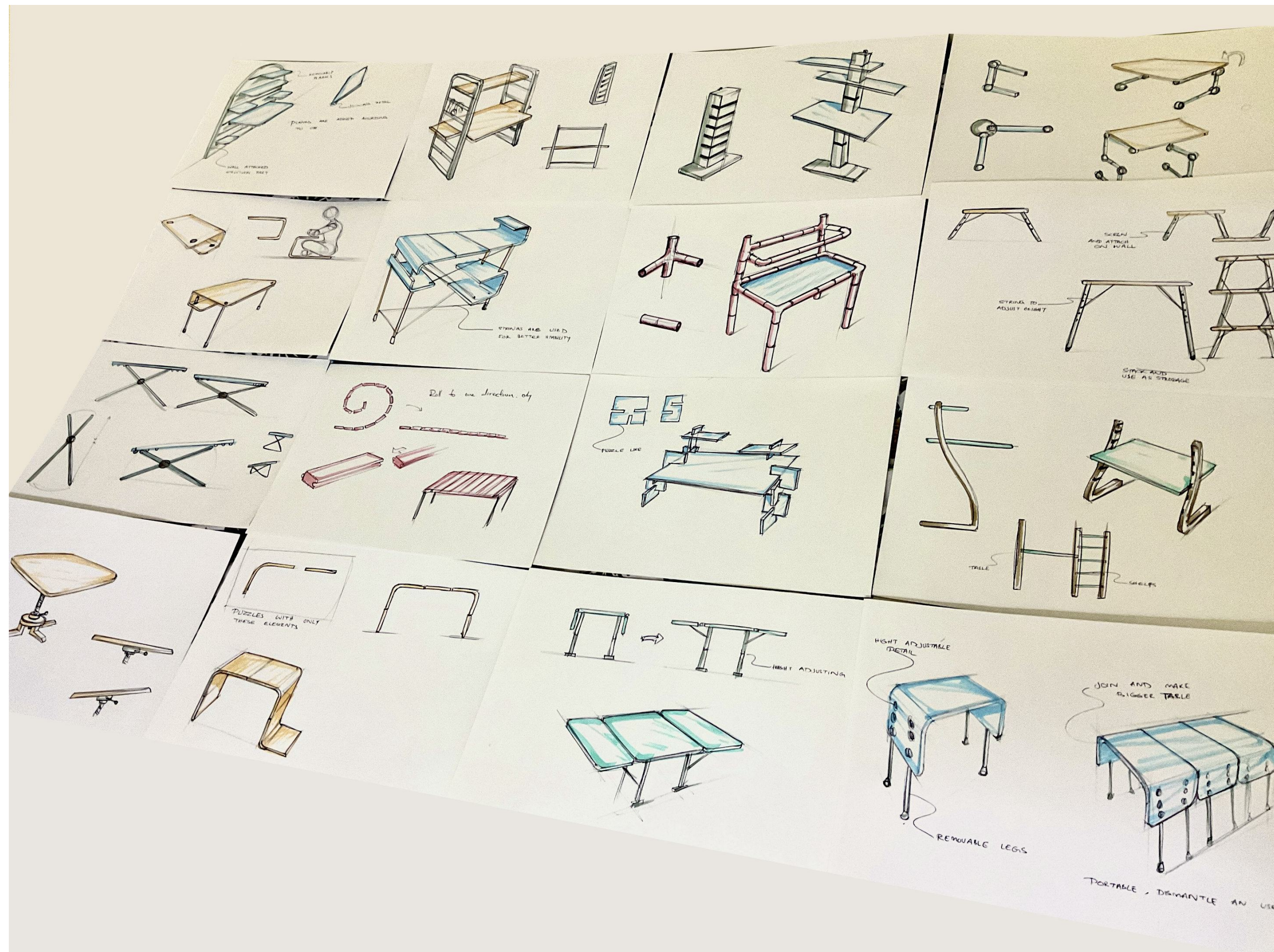
The furniture should be affordable by purchasing one module at a time and purchase other modules later years when the requirement arrives, with each module priced at no more than 6000 rupees.

Ensure optimized space utilization tailored to user lifestyle preferences, with a focus on lightweight and portable design to meet user needs.

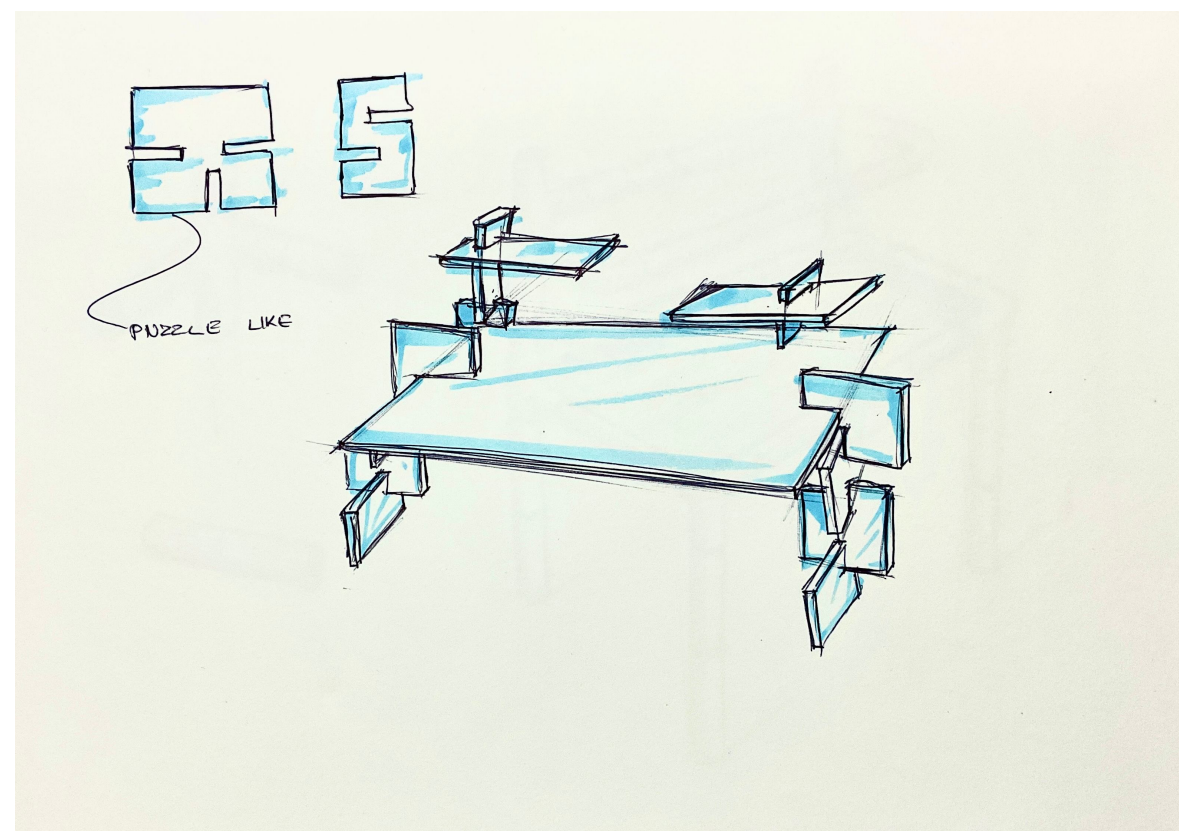
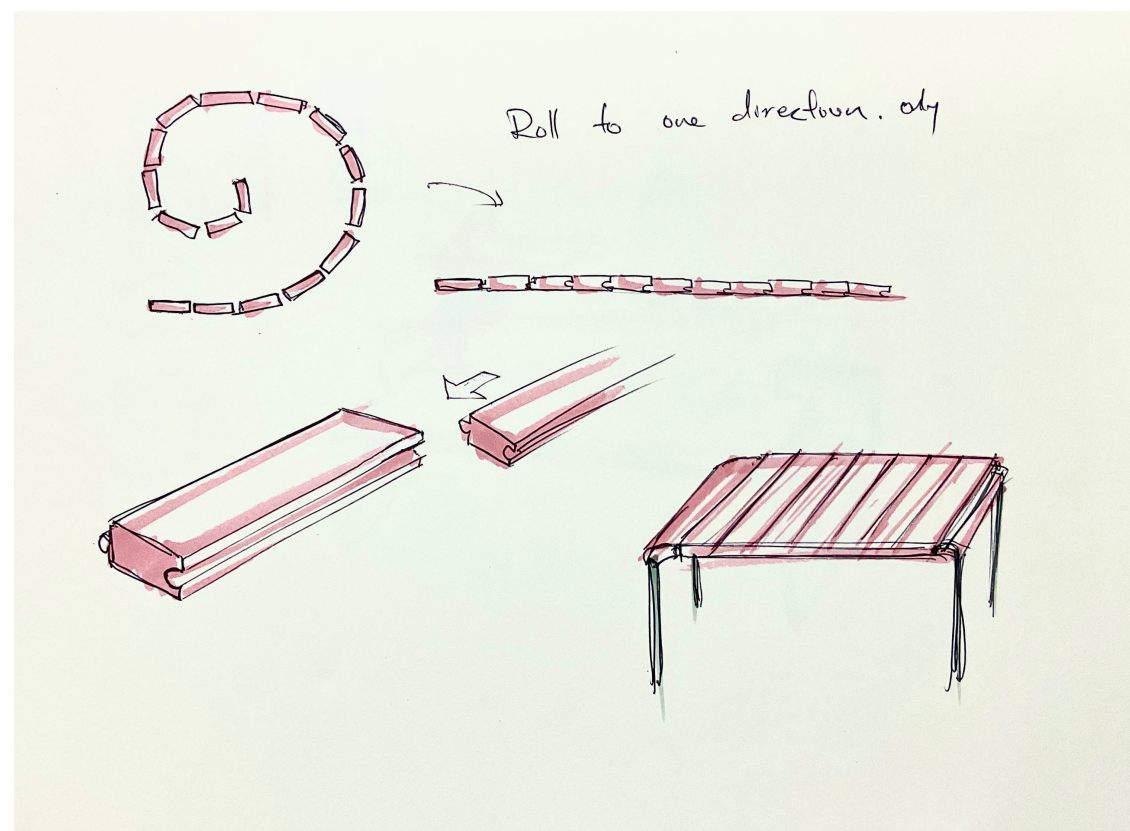
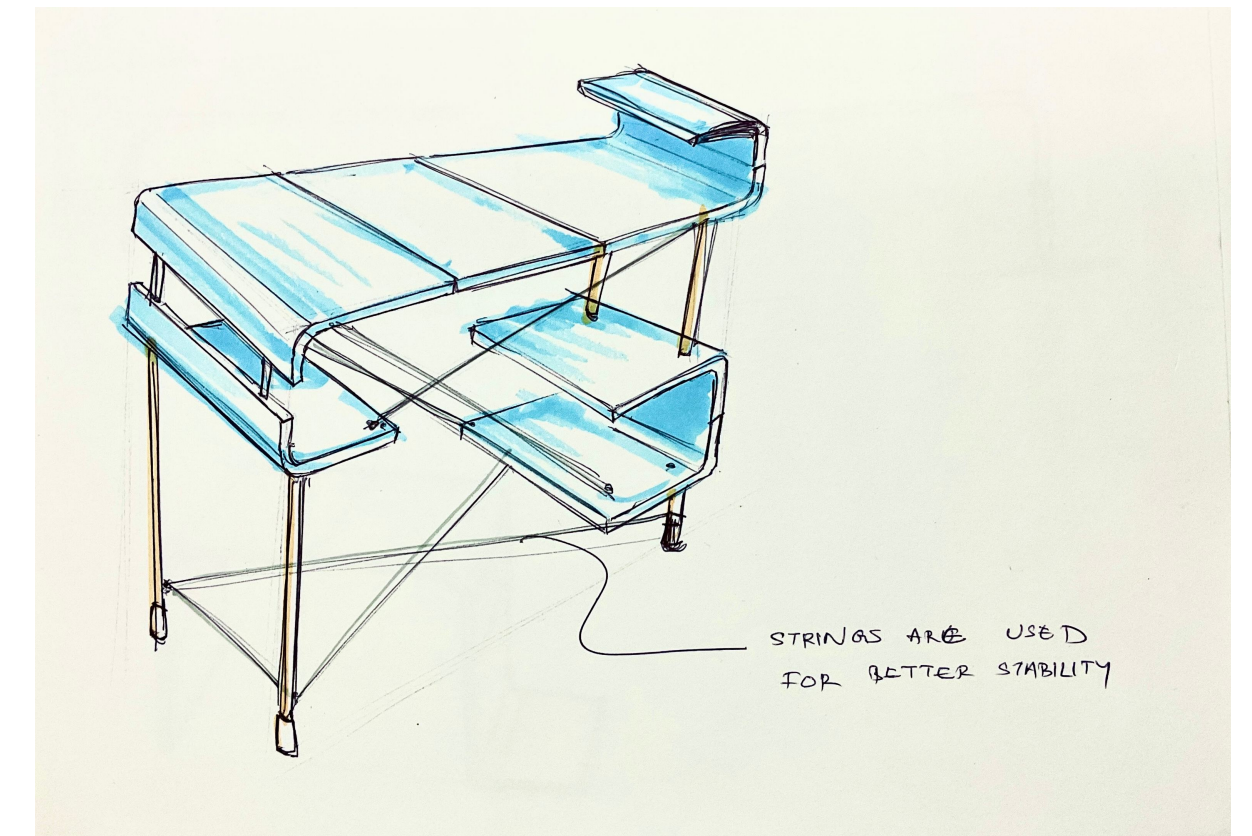
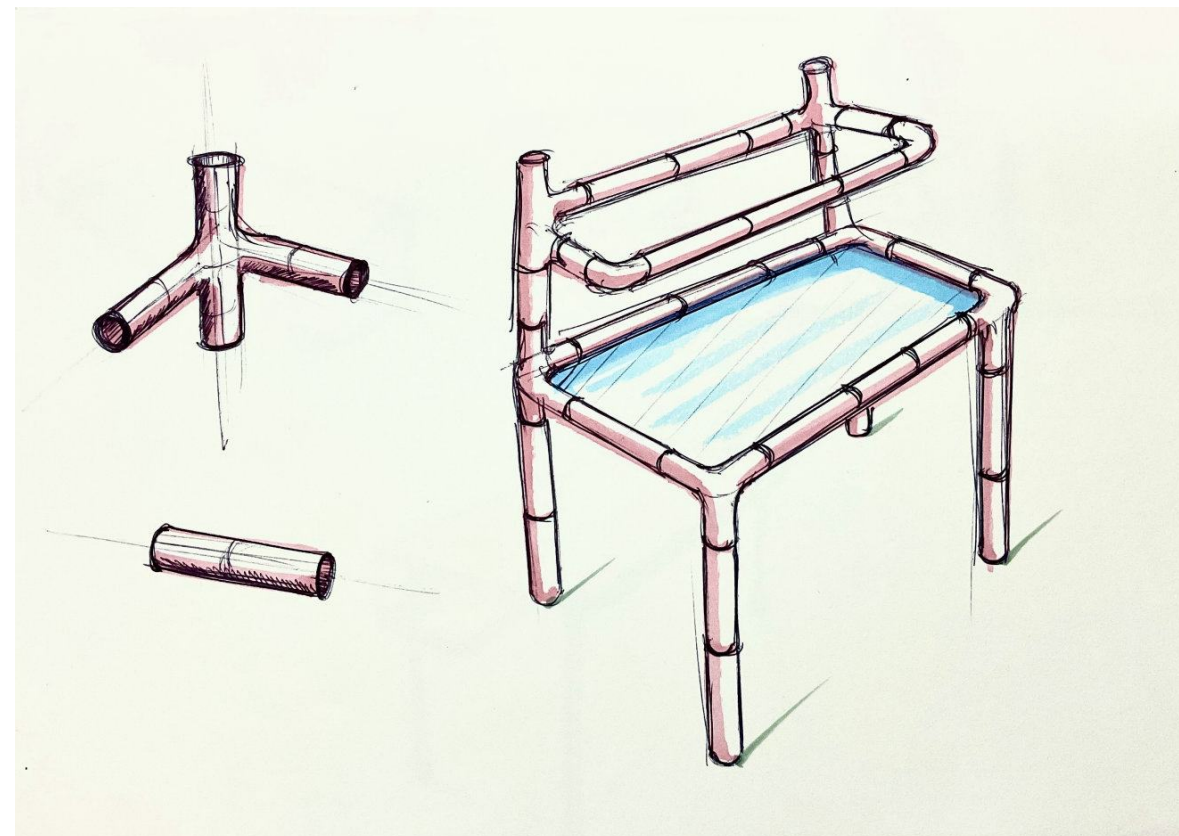
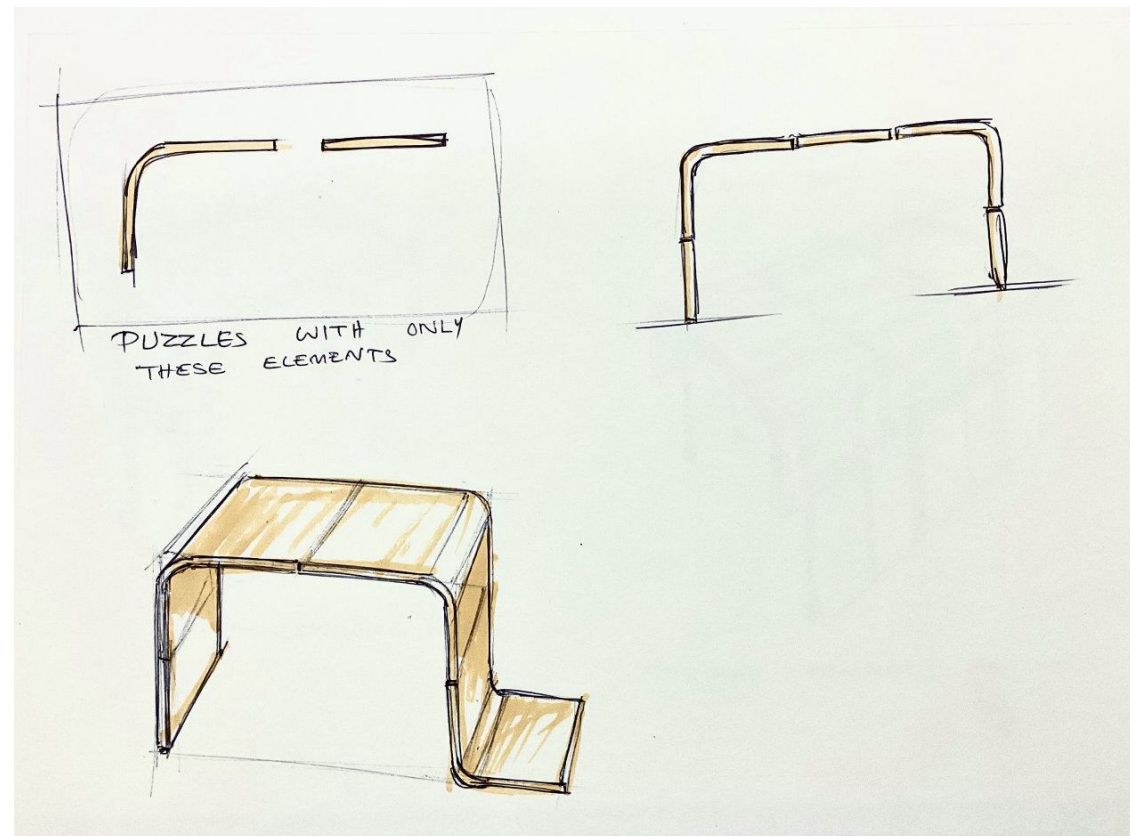
The furniture should be rigid, safe, and of high quality to meet personal requirements, aiming to re purpose rather than discard the furniture for another use.

Promote customization options that enable personalization aligned with each child's unique personality.

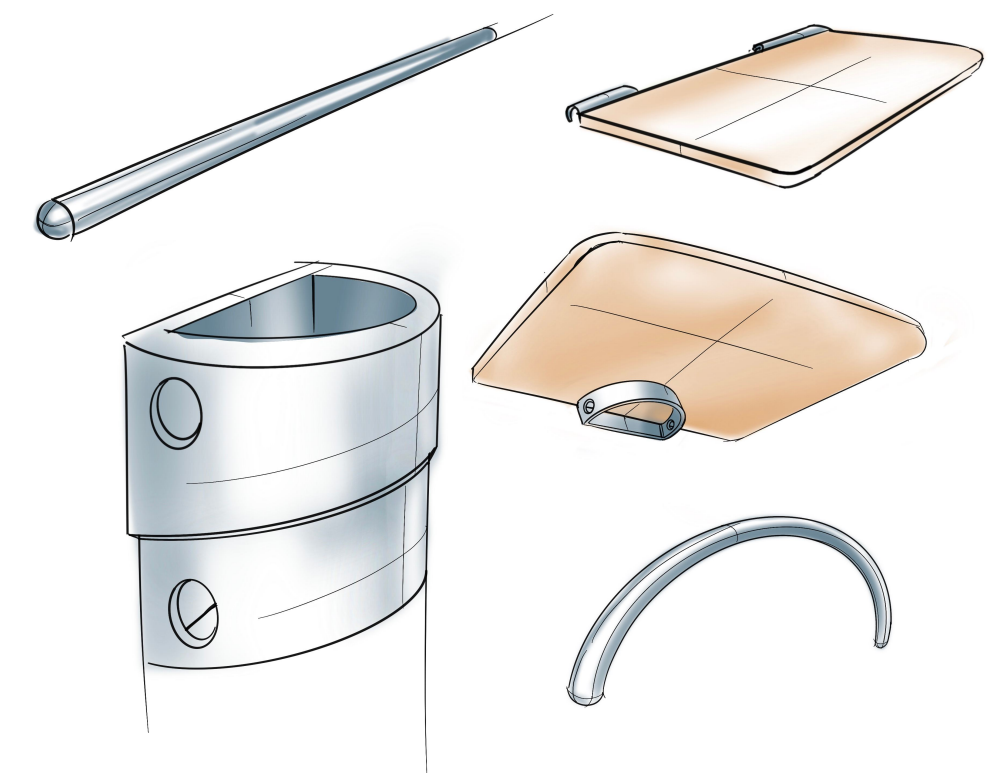
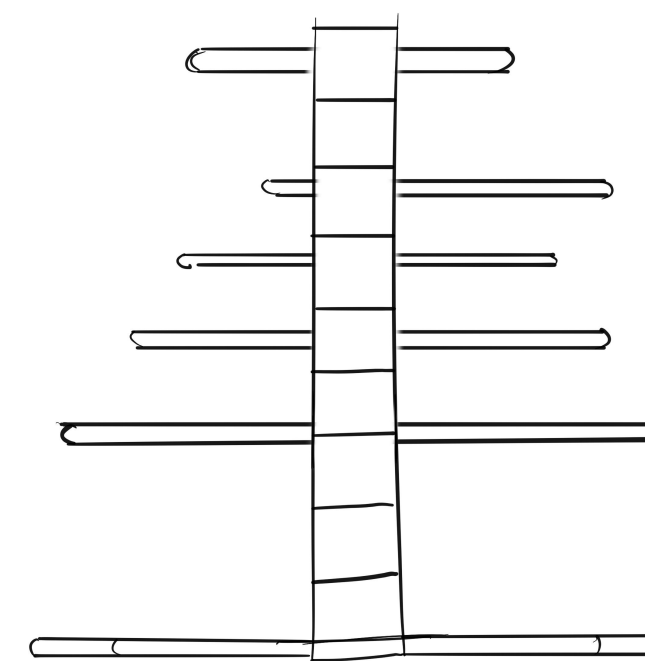
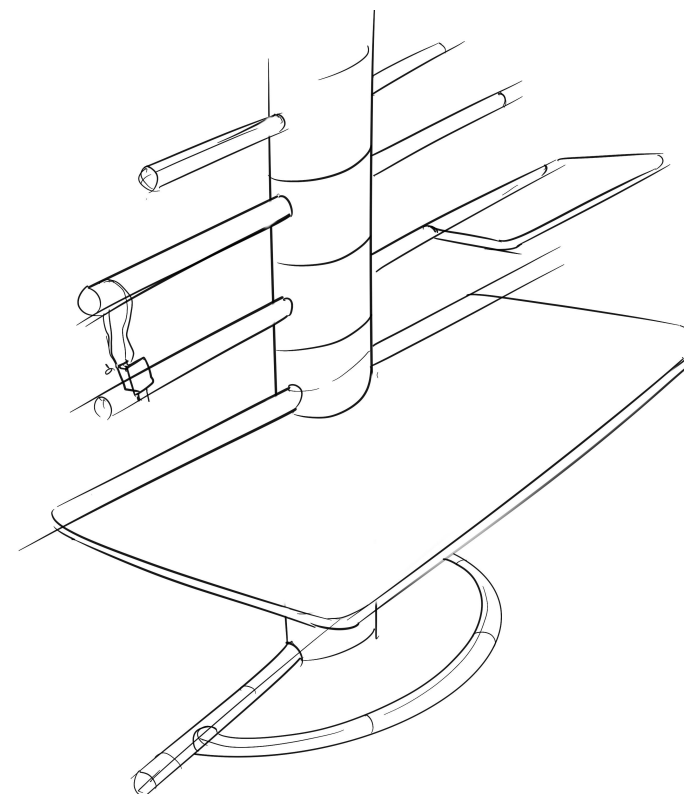
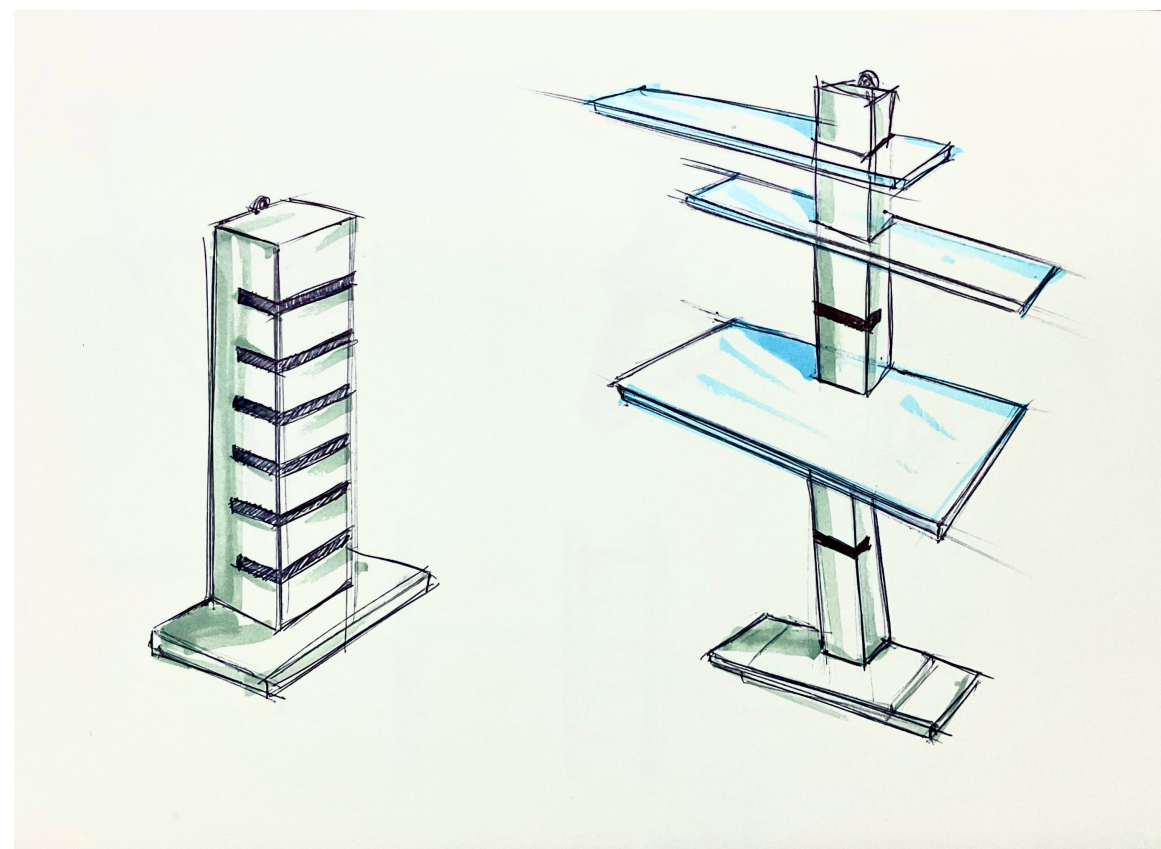
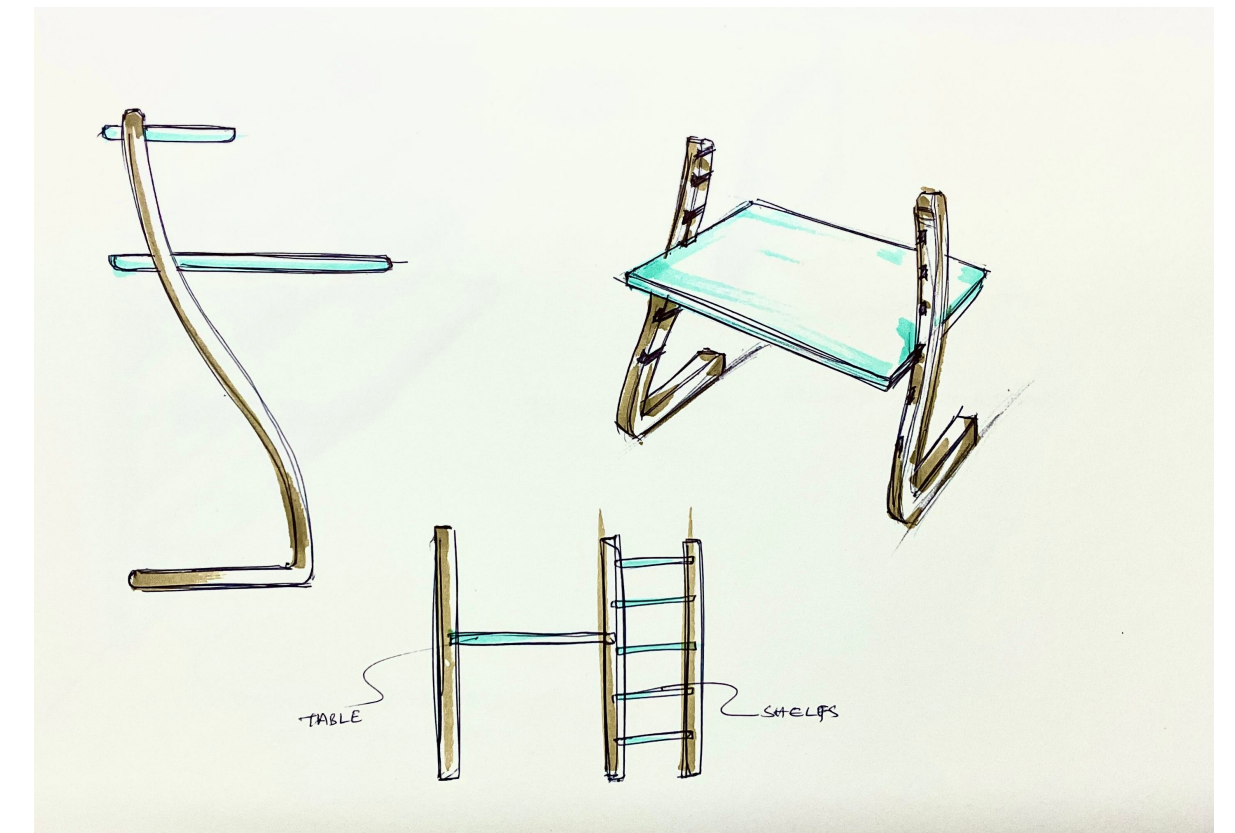
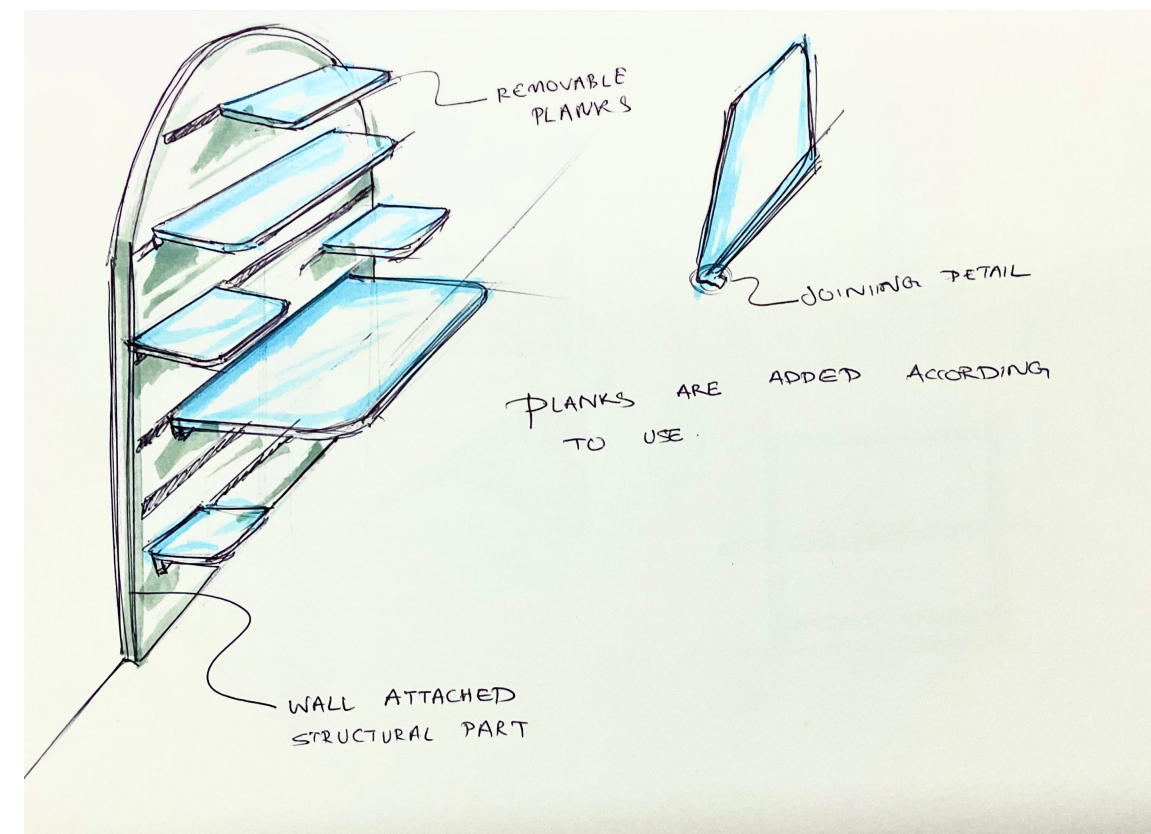
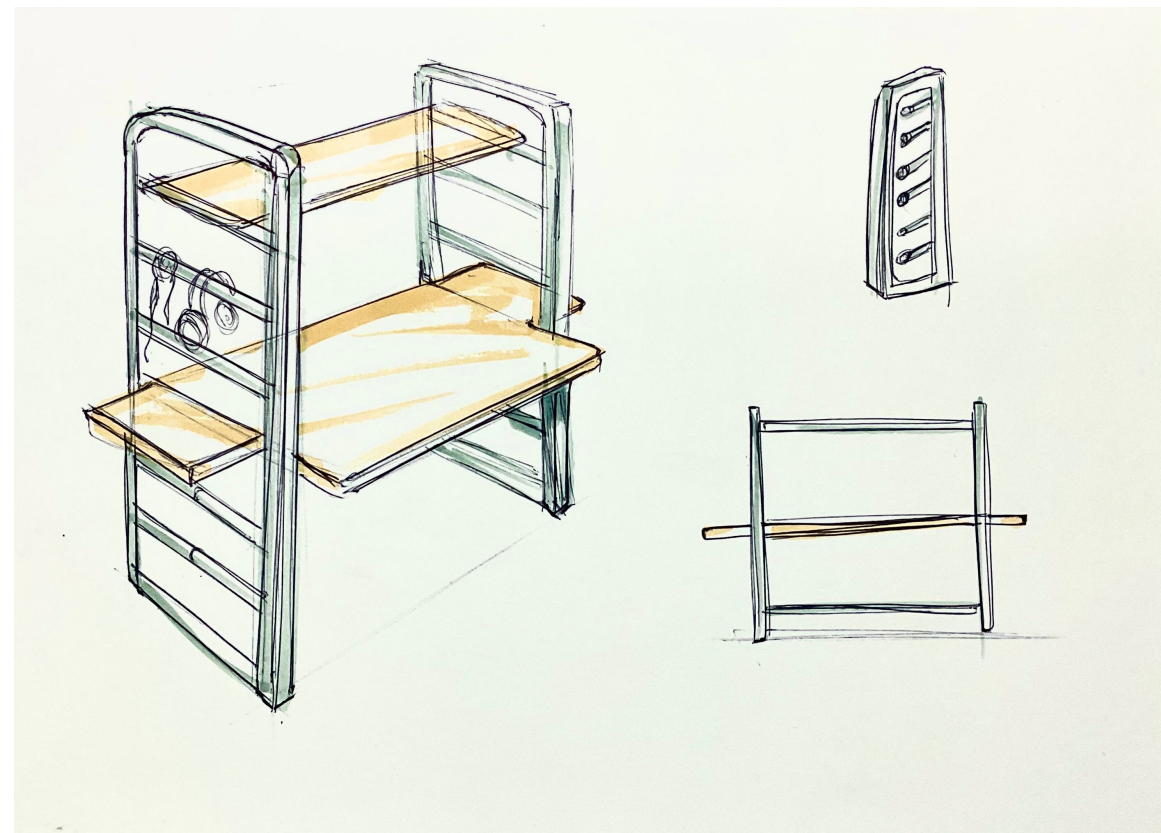
Ideation



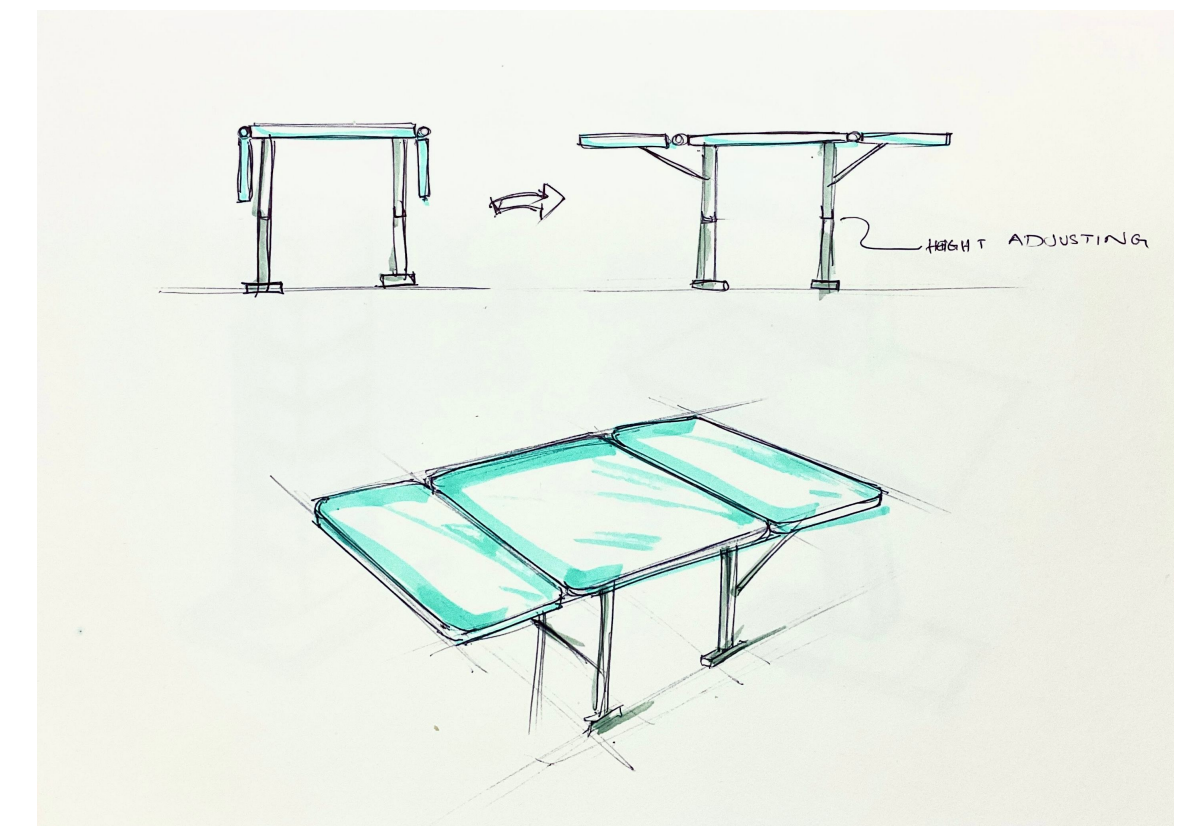
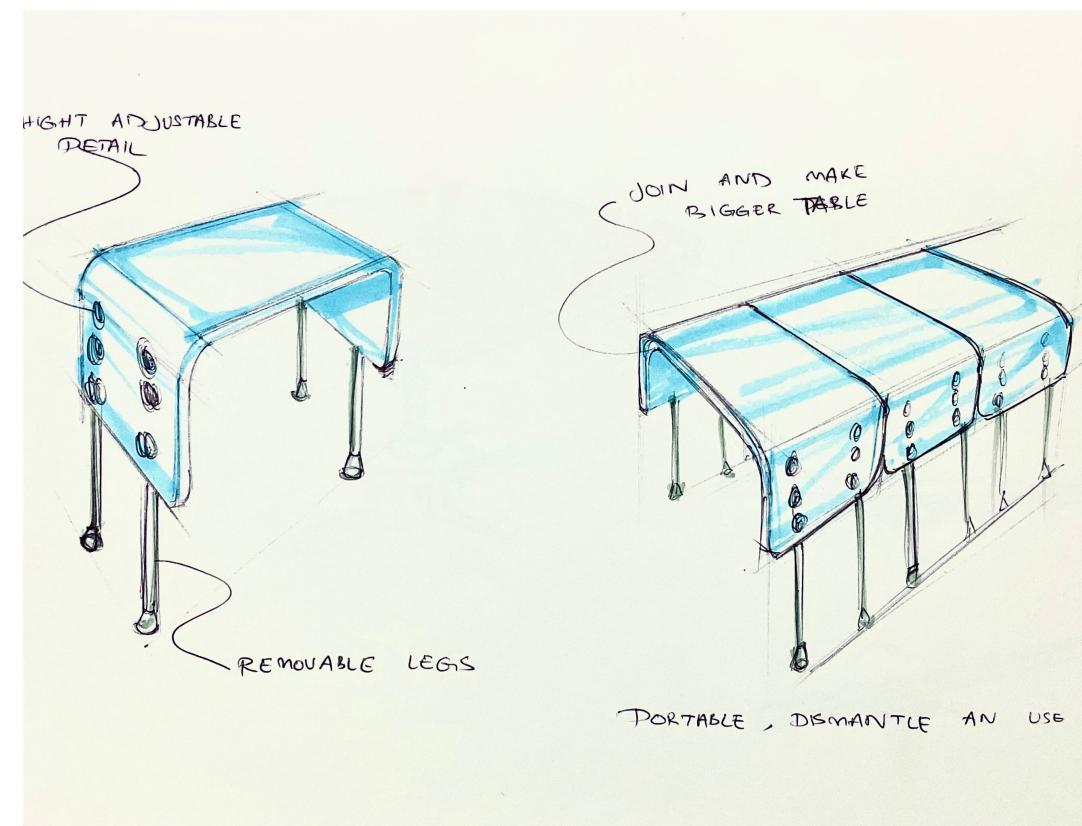
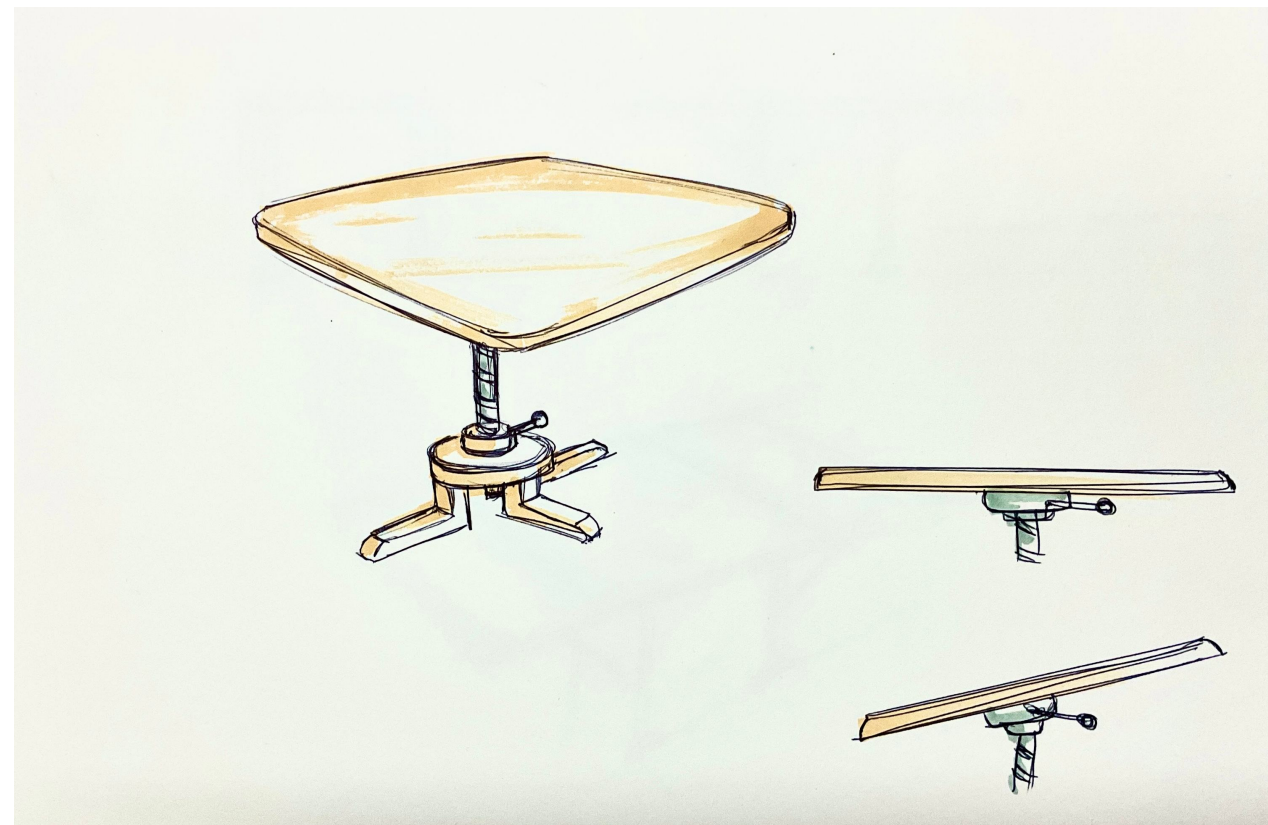
Ideation - Puzzle like



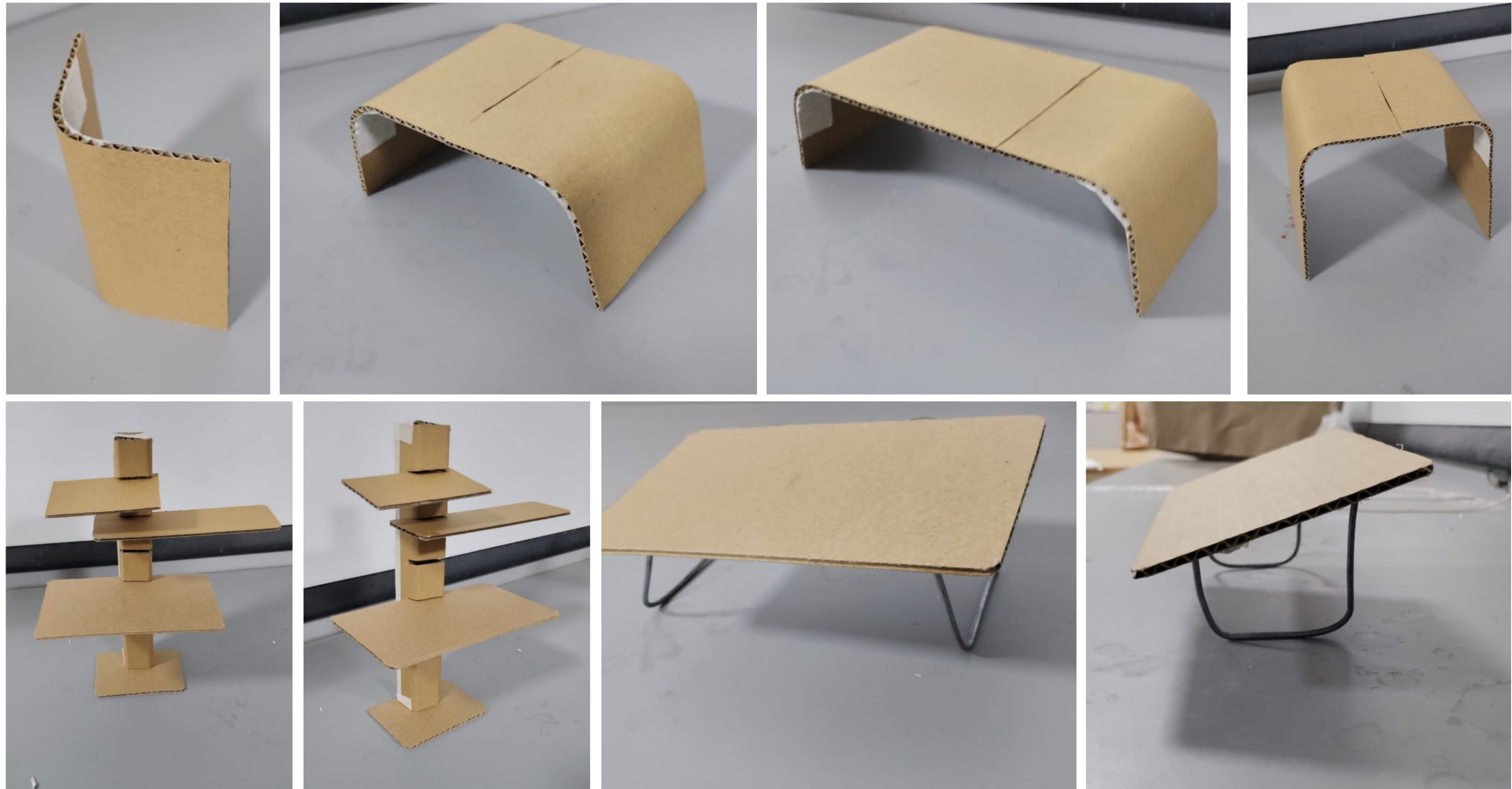
Ideation - Cantilever



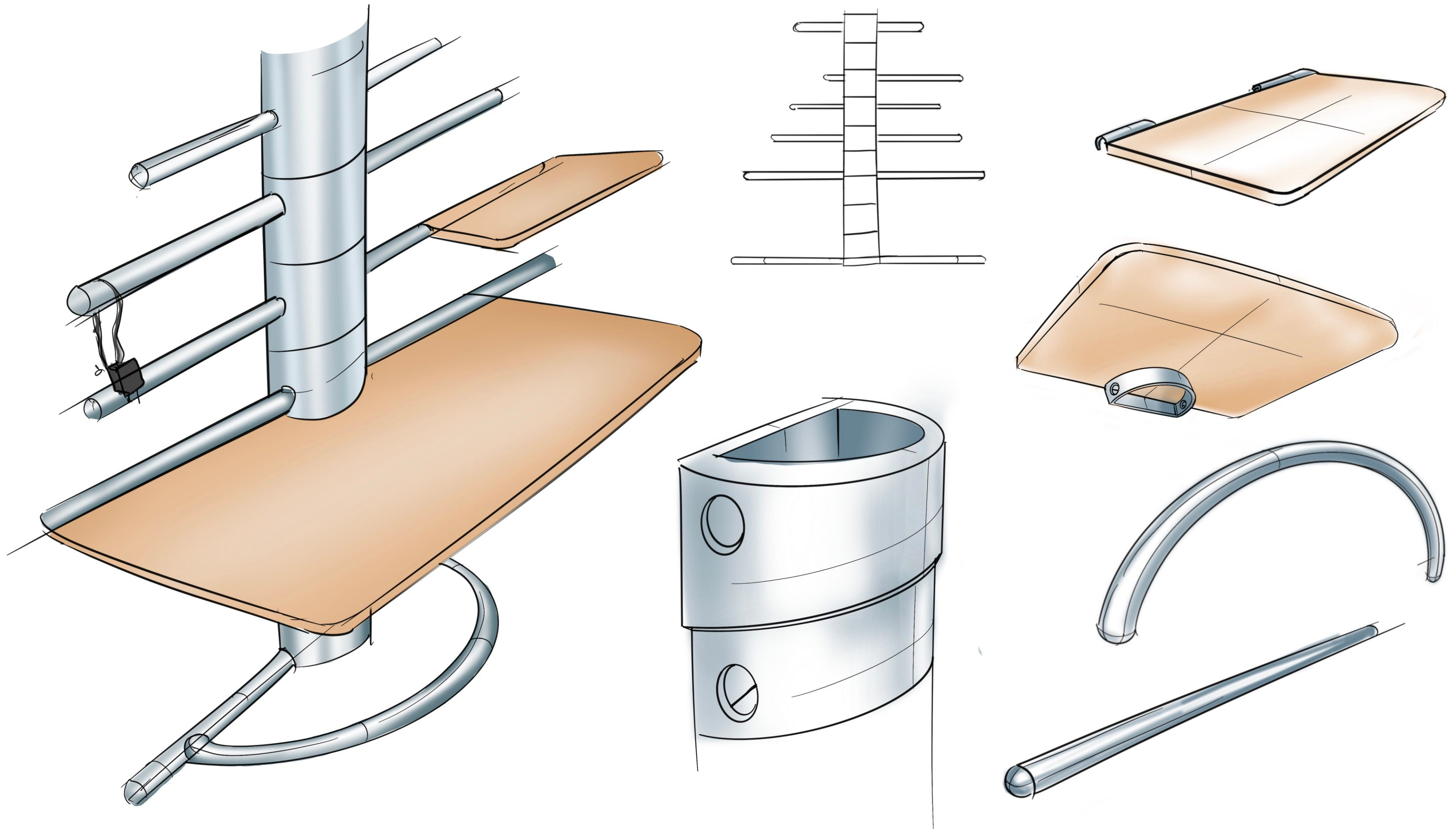
Ideation - Height adjustable



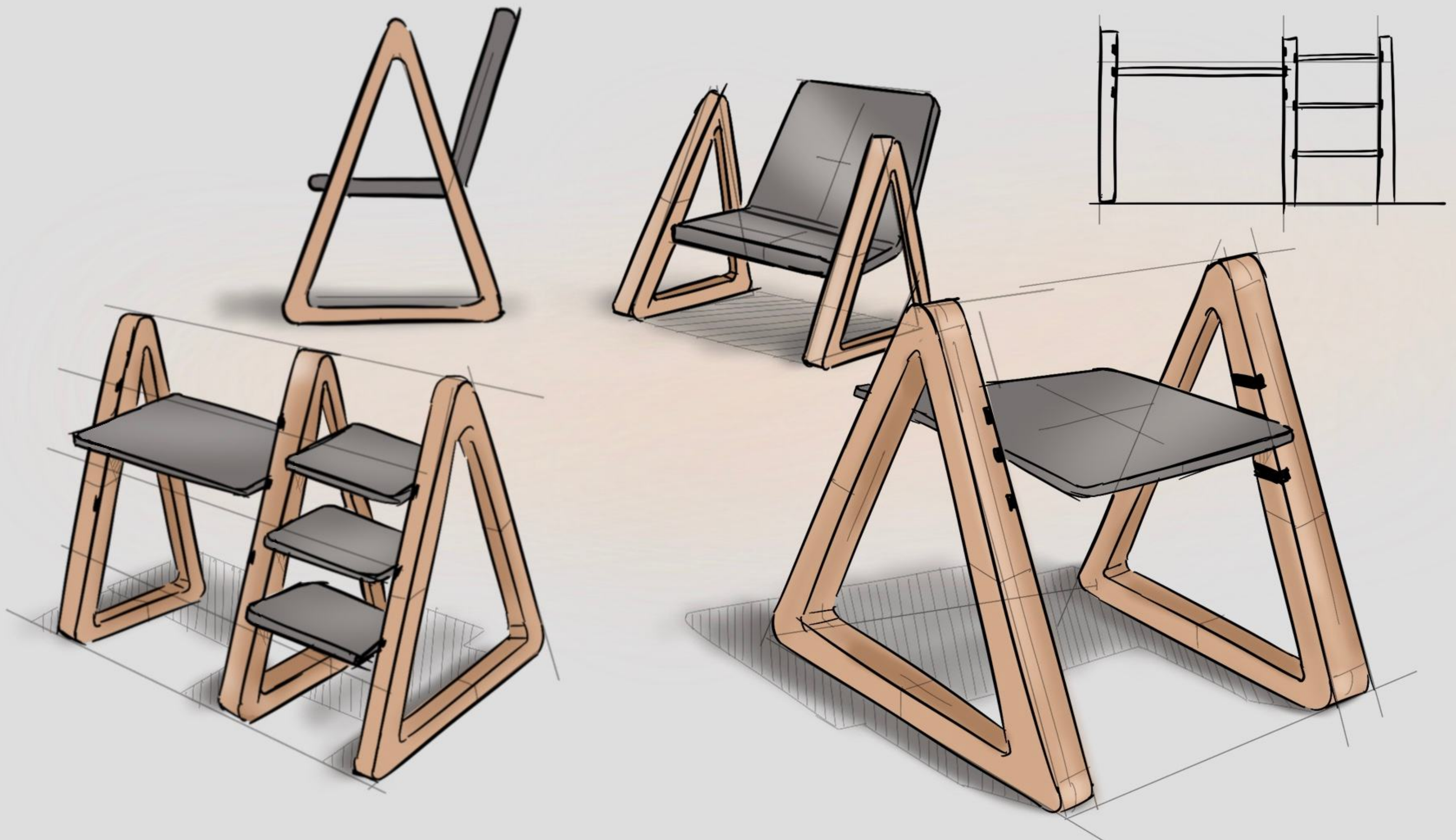
Quick and dirty mockups



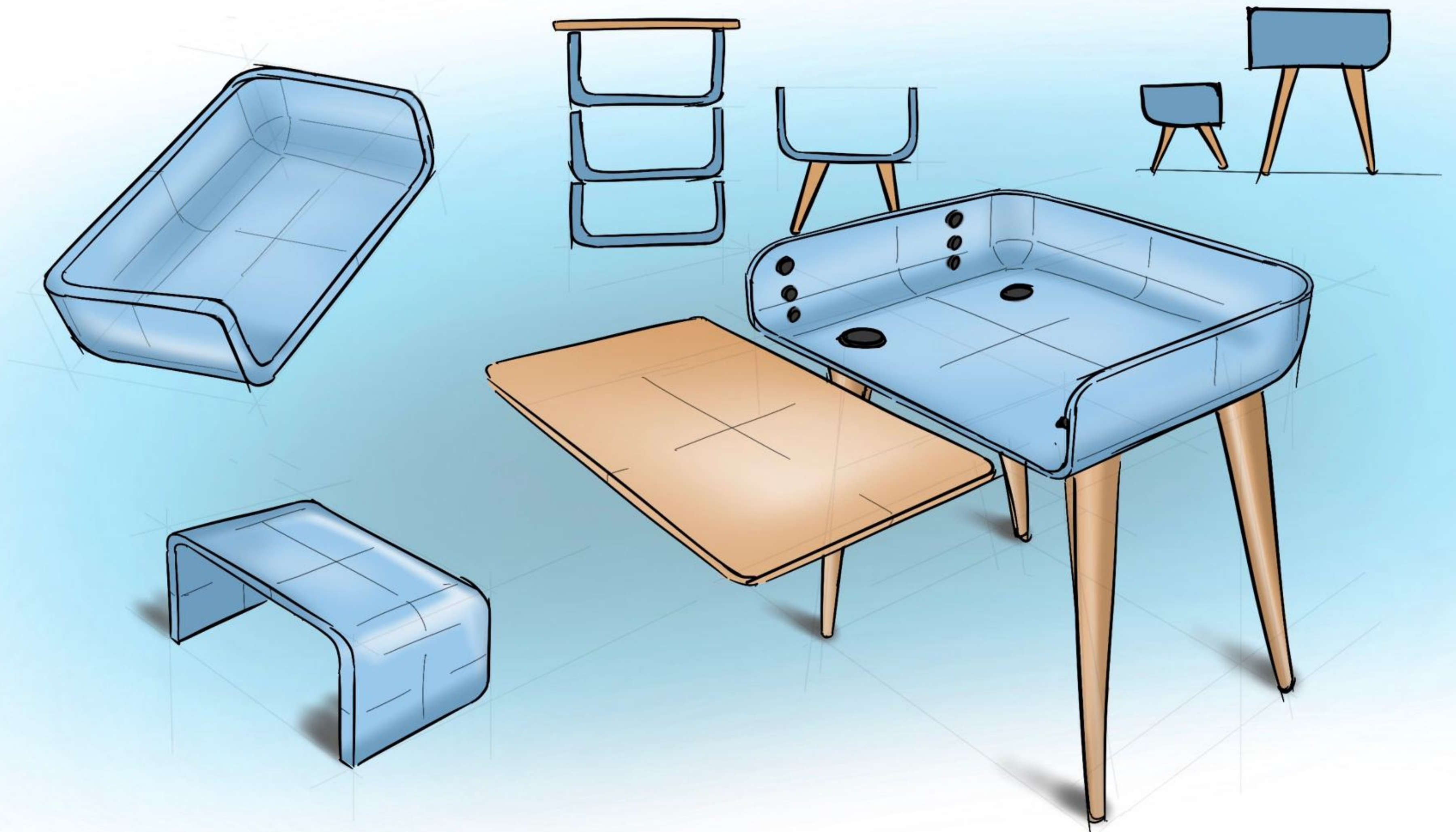
Concepts



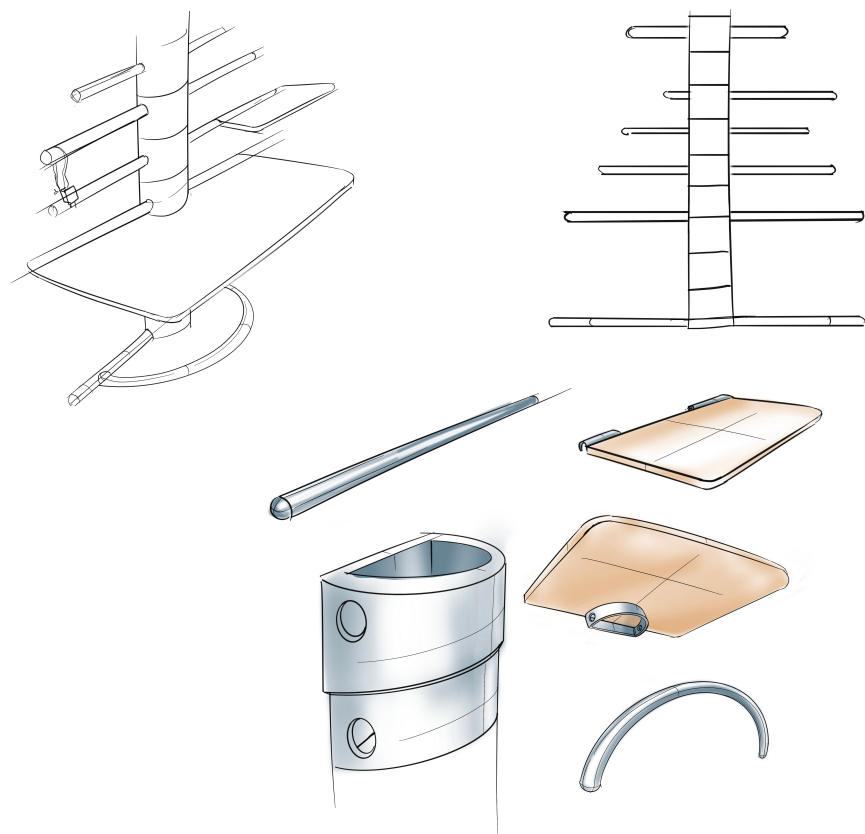
Concepts



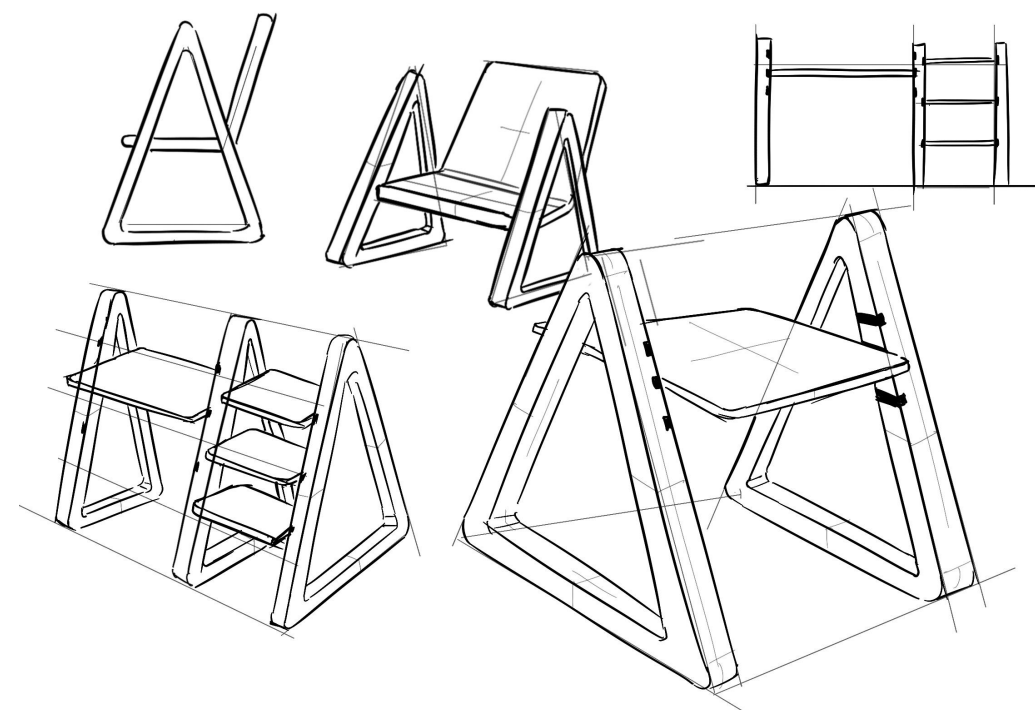
Concepts



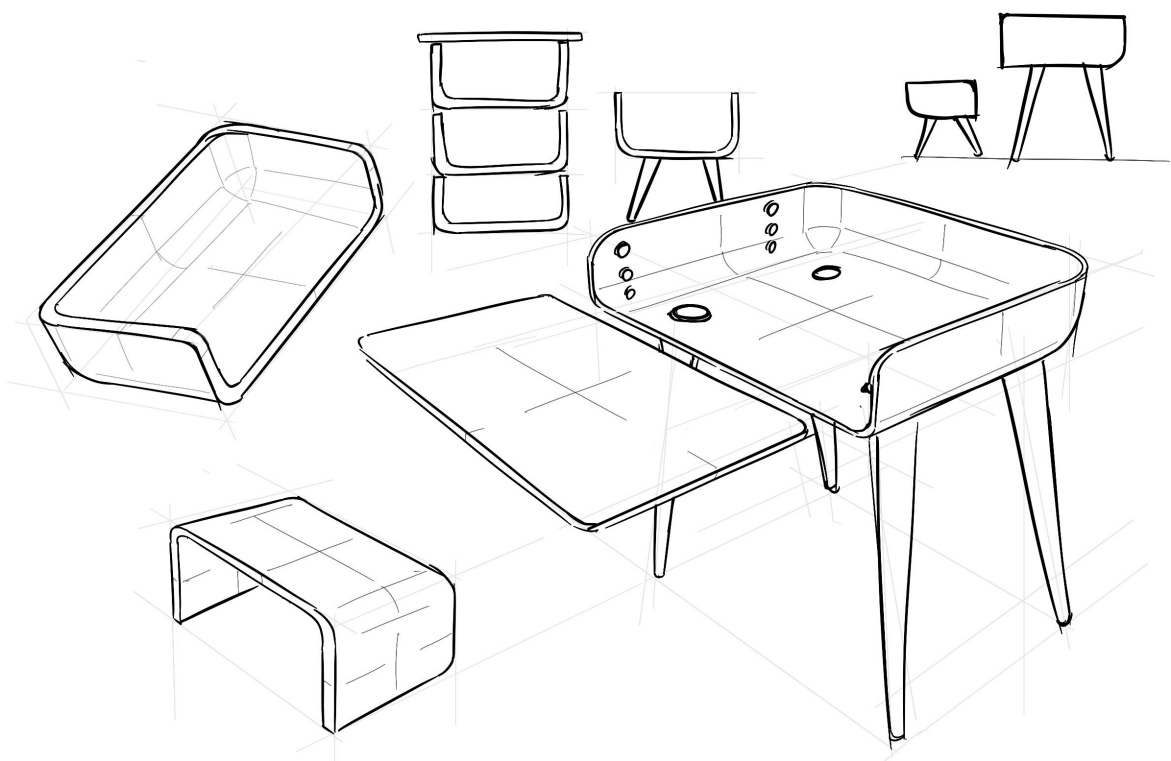
Concept Comparison



- Modular and DIY assembly
- Micro-adjustment capability
- Not portable
- Too many parts to assemble
- Stability, safety related concerns.



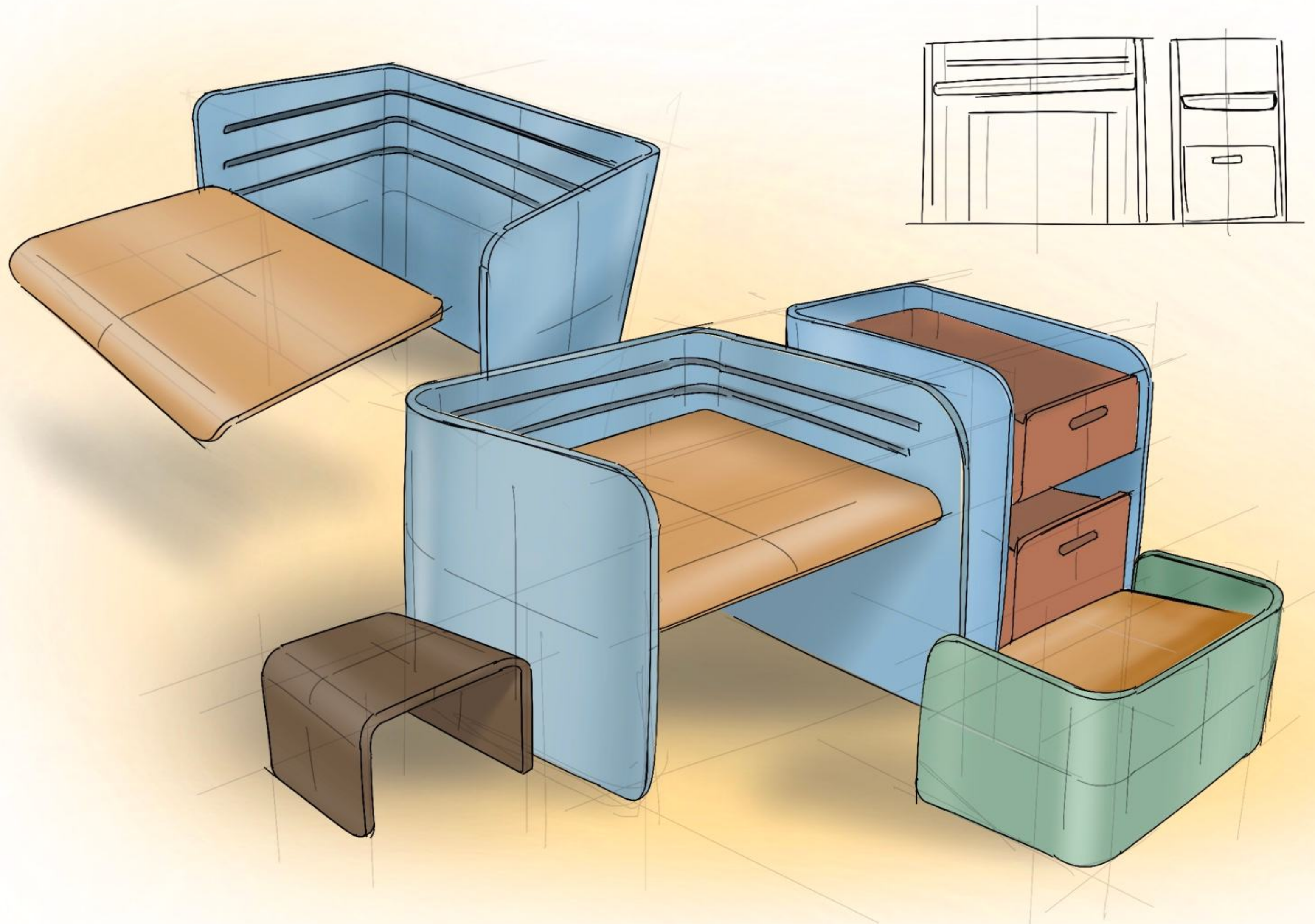
- Modular assembly
- Sturdy and durable structure
- Portable and lightweight
- Limited adjustment possible



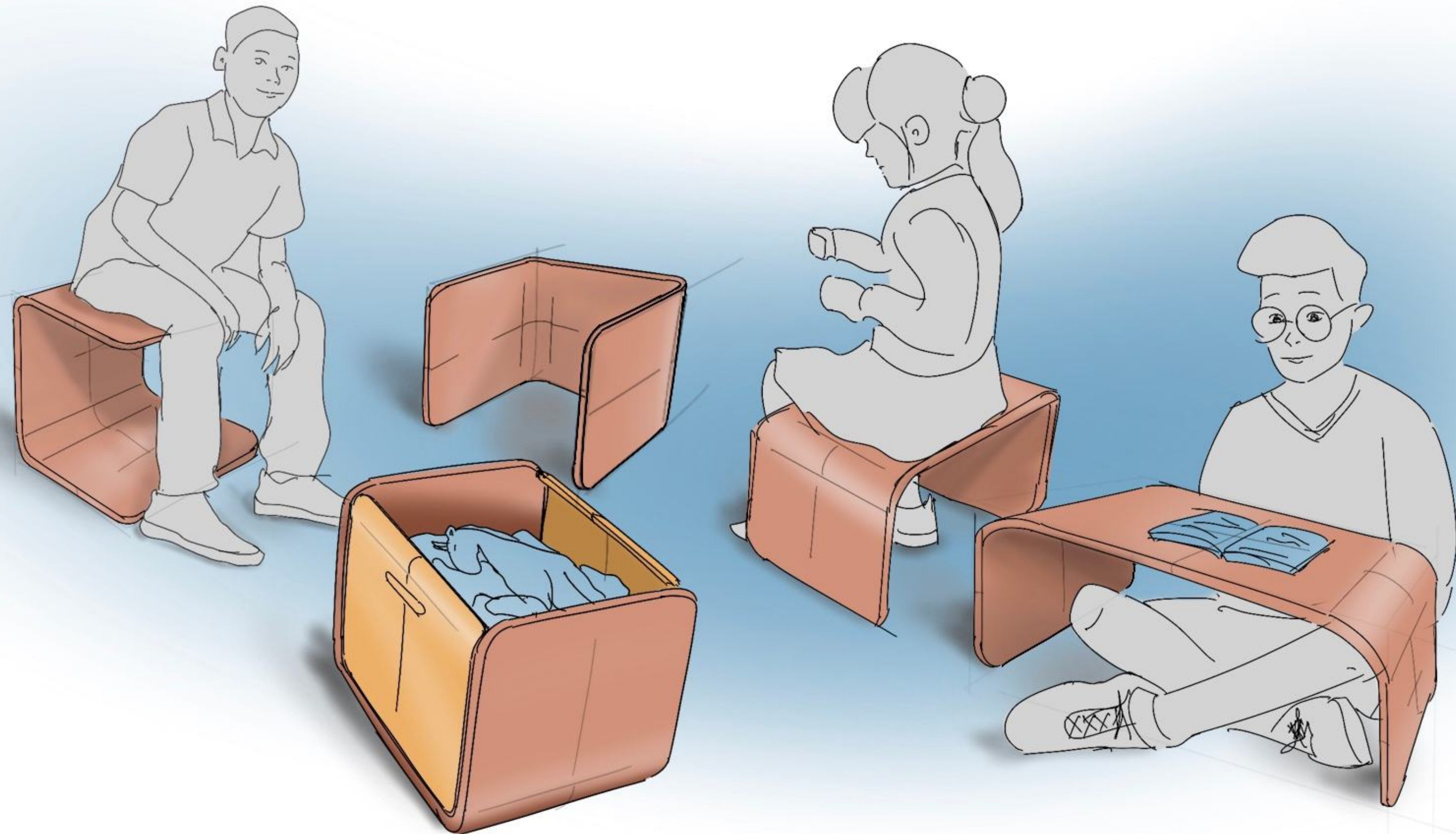
- Modular assembly
- Sturdy construction
- Portable and stackable
- Limited adjustability
- Repurposeable components

The ideations did not fully satisfy all the points outlined in the design brief, necessitating a new approach to finding a comprehensive solution. This required exploring alternative methods and perspectives to address each aspect effectively and align with the project's objectives and requirements.

Concept Development



Concept Development

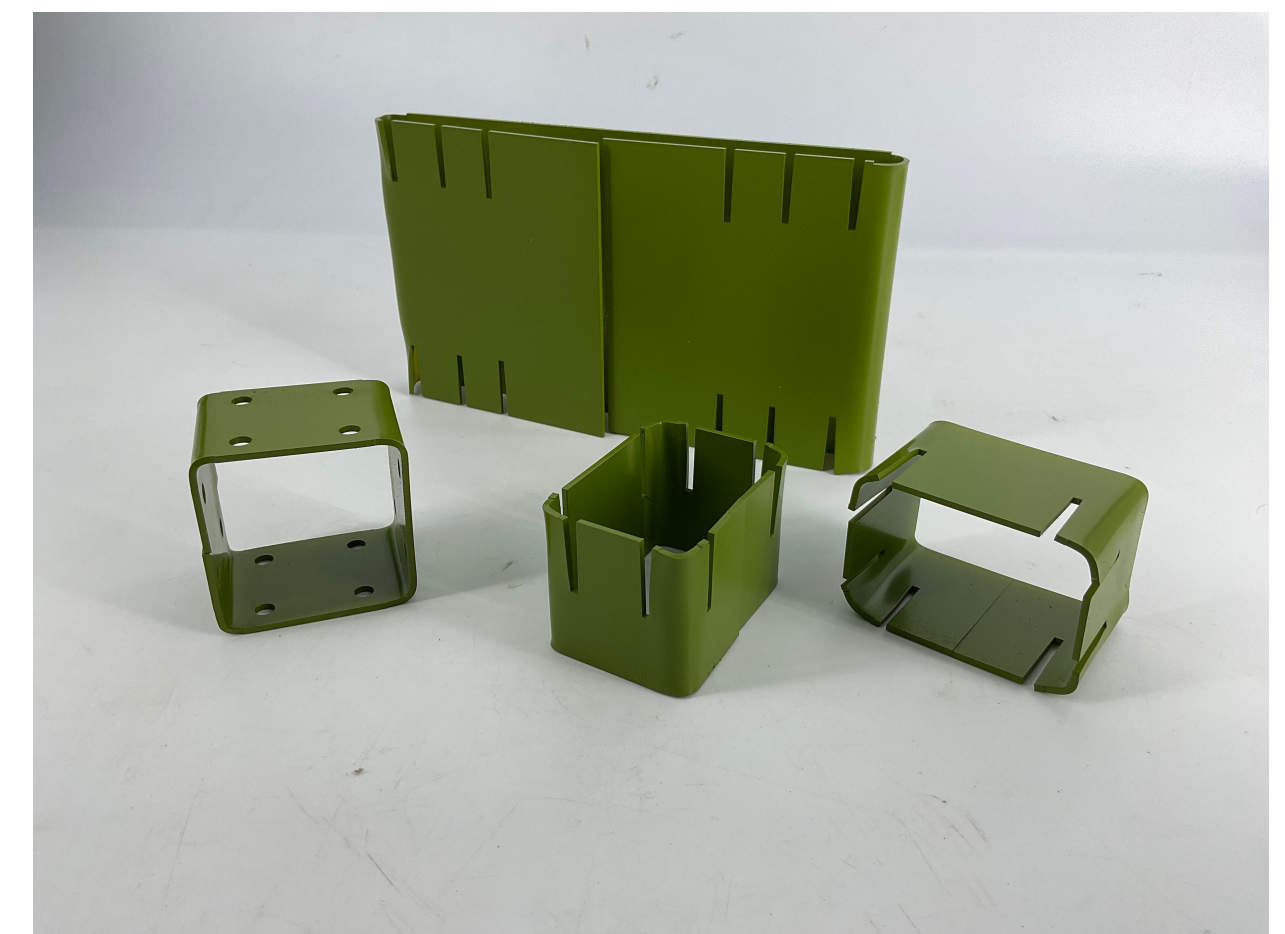


Mock-up Journey

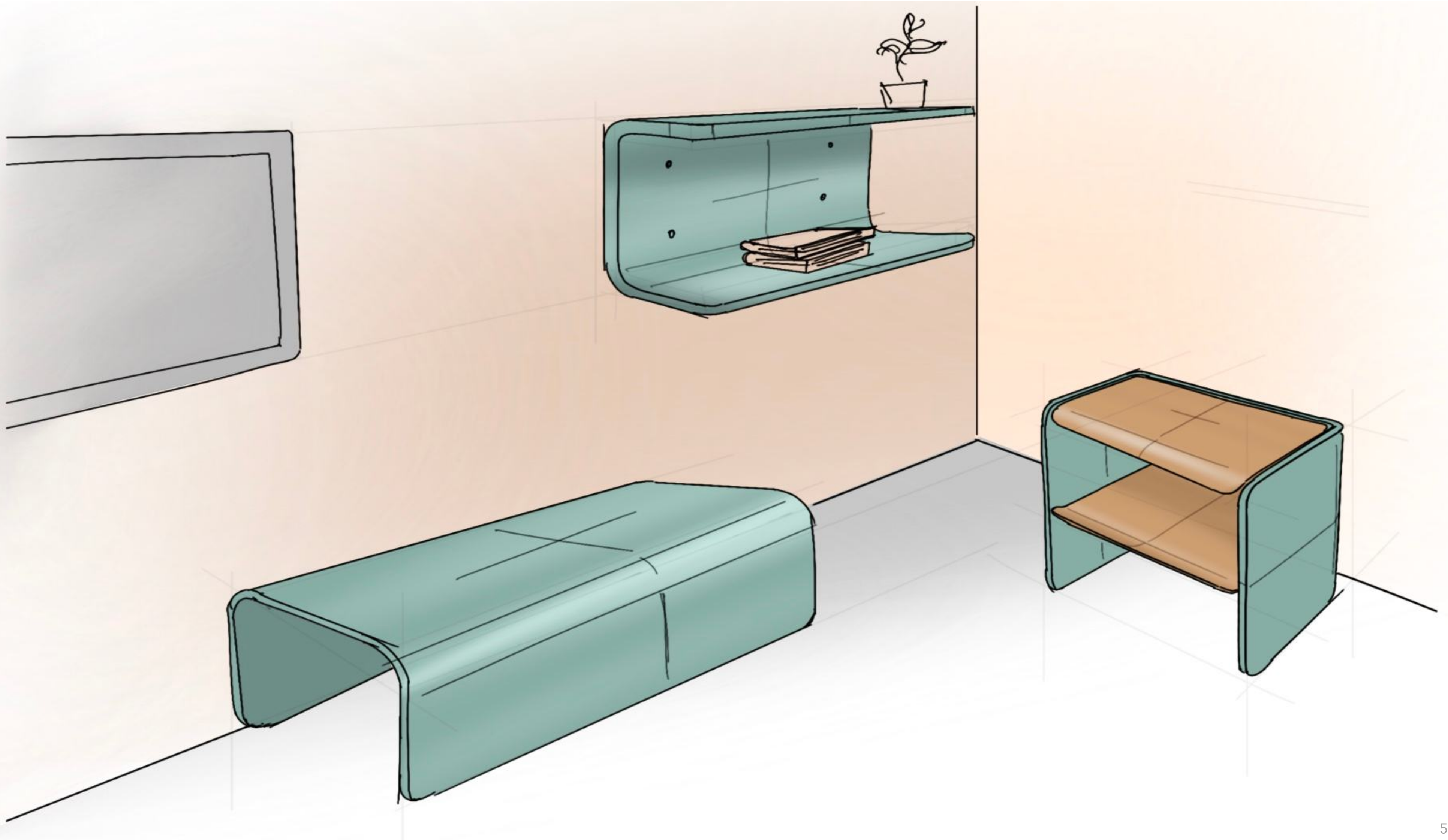


Receiving positive feedback from peers regarding the modular form's puzzle-like design, I decided to delve deeper into its fundamentals. This led me to create cardboard mock-ups, breaking down the structure to minimal surfaces for inherent stability. I explored joinery details and incorporated puzzle-like elements into the design.

Continuing the exploration, I advanced to creating mock-ups using laser-cut acrylic sheets, meticulously bending them to conform to furniture proportions. This process yielded intriguing joinery details and innovative forms, enriching the design exploration.



Concept Development



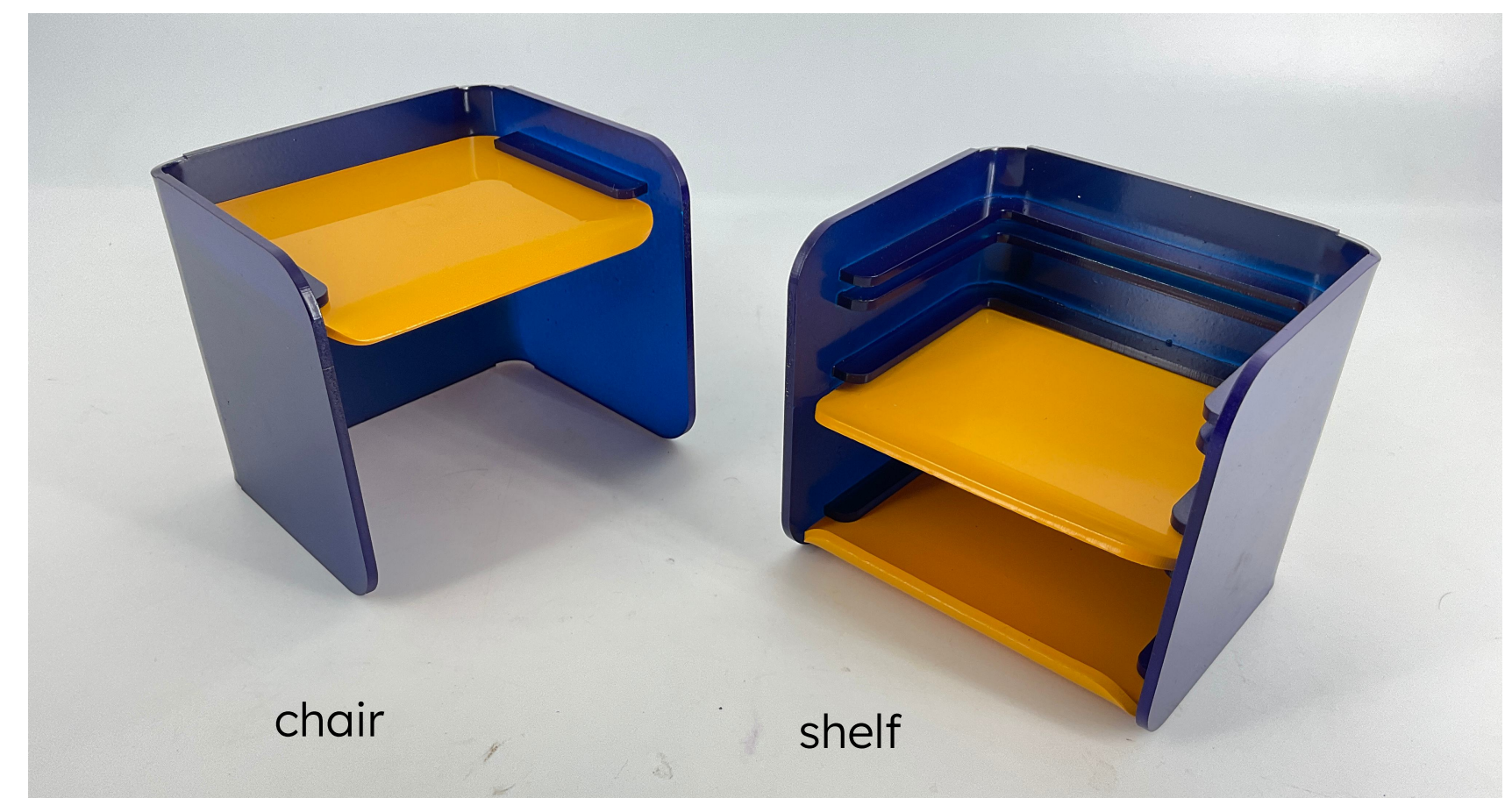
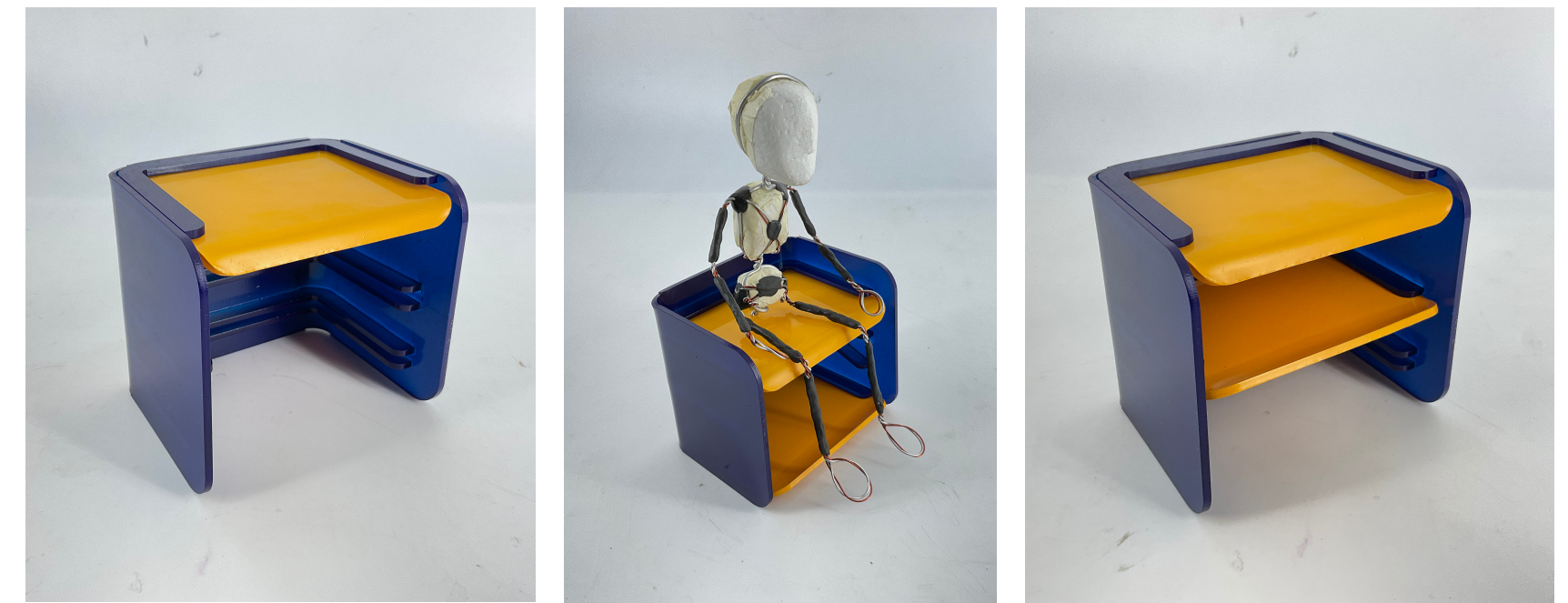
Mock-up journey



In the later stages of my explorations, I developed an intriguing furniture form that can be arranged in various configurations to serve different functions. This concept aligns with the principle of convertibility, allowing for versatile use. Subsequently, I began incorporating adjustability into the design.



Introducing a removable layer added functionality and clearly defined its purpose. Placing the layer on top transforms it into a chair, while adding another layer in between creates additional storage space.

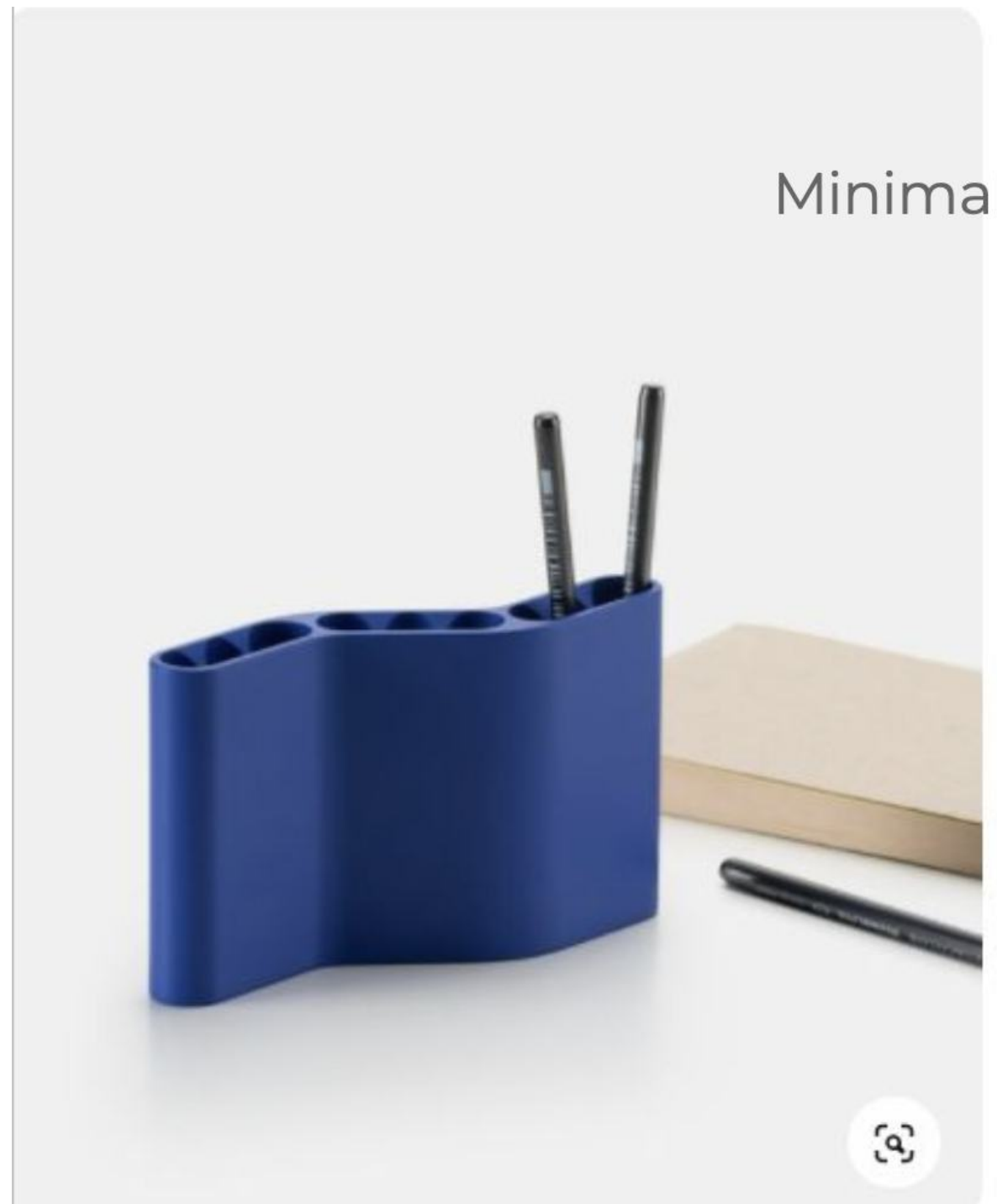


Detailing



When implementing a concept into a real-scale practical model, numerous details must be meticulously addressed. Material selection is crucial to ensure the product's durability and functionality align with user preferences. Additionally, the design for manufacturing and assembly must be carefully considered during the detailing process.

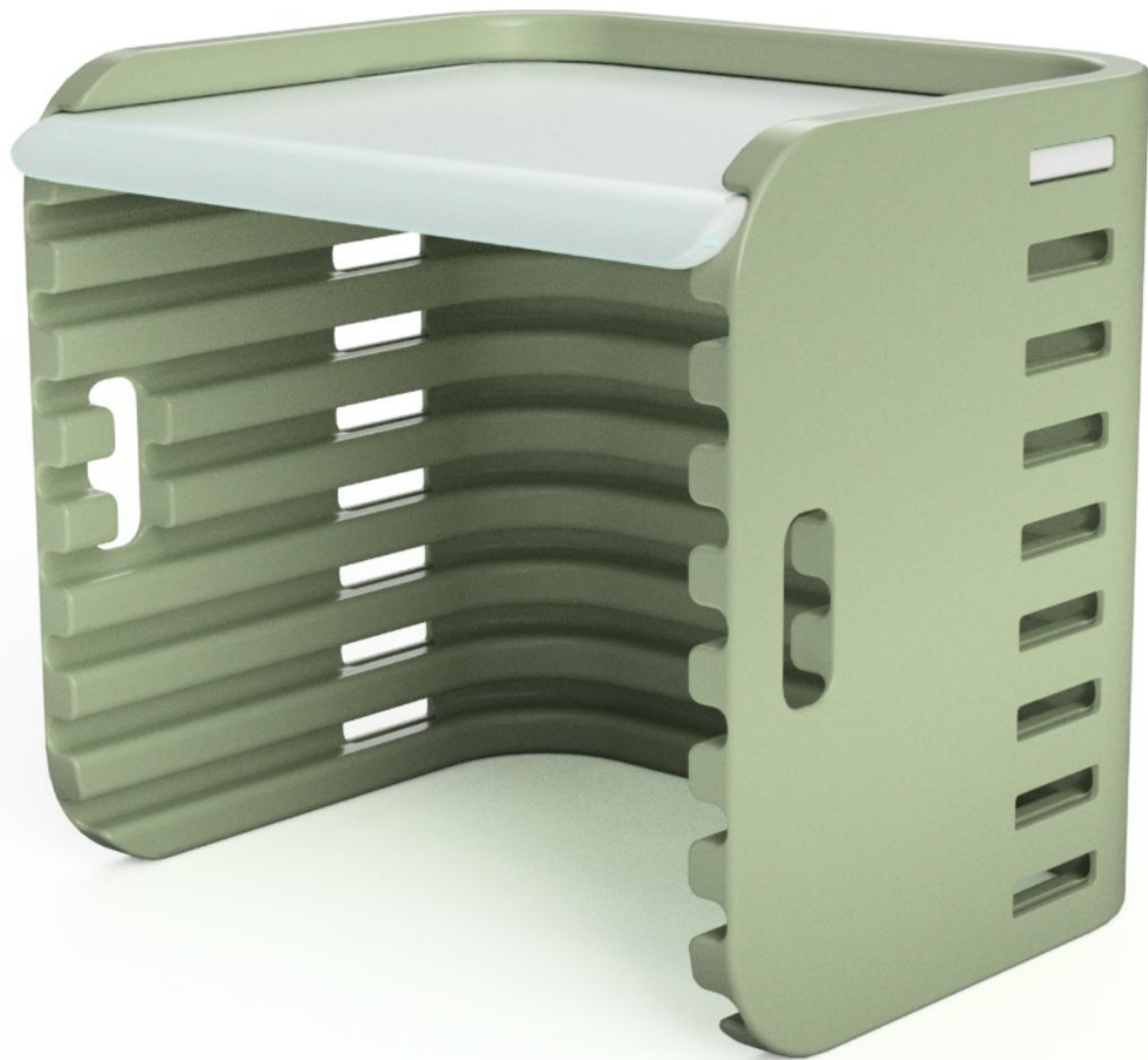
Moodboard



Rounded rectangle



Explorations



Explorations



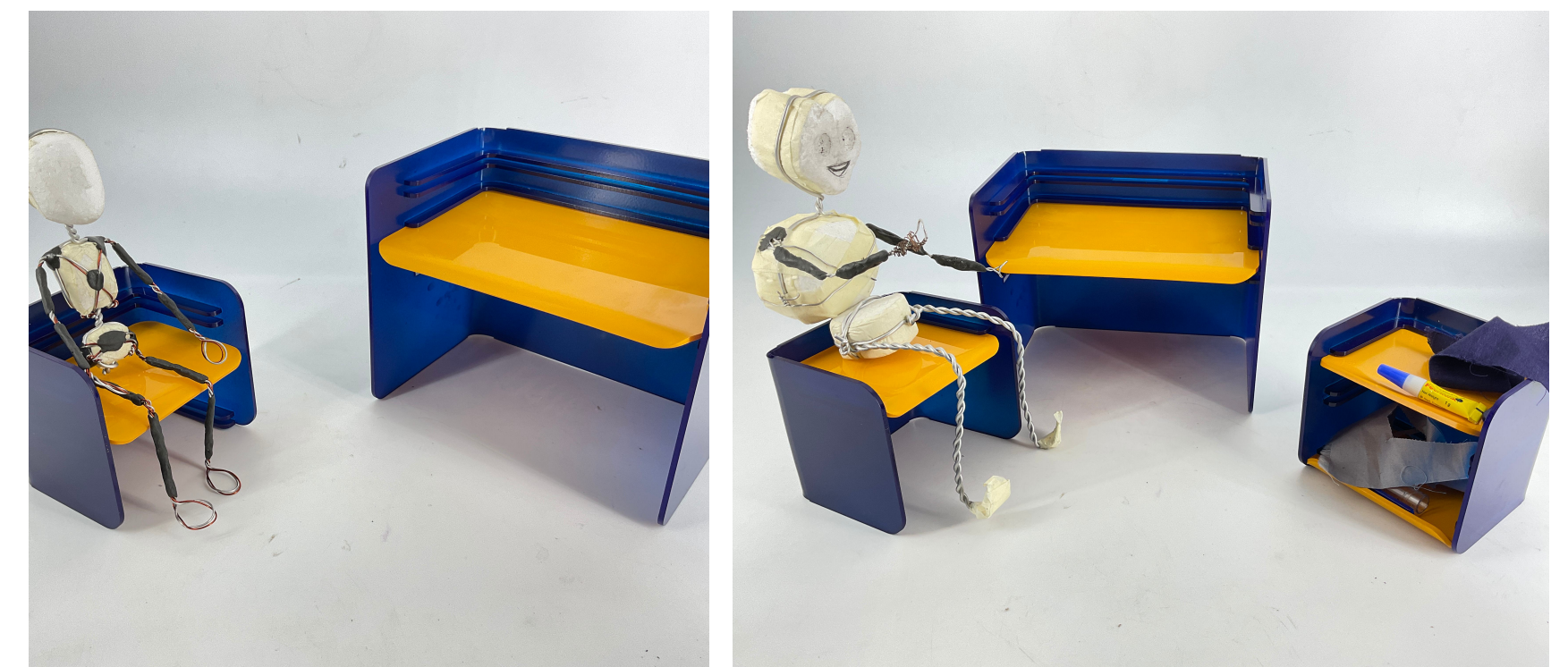
Concept Development



Children prefer portable storage units such as simple baskets or buckets for their ease of use and portability. With the same form factor, a portable storage unit has been introduced with portability in mind.



Expanding on the model, a height-adjustable table can be developed. This table can be modified to accommodate changes in children's height and various use cases. Unlike the chair, which can be rotated and positioned for different uses, the table, being heavier, will remain stationary.



Final Design



Concept Development

The storage needs of children vary, with some requiring personal items to be stored in a closed environment like a drawer. To accommodate this, a drawer unit can be incorporated into the design. Users have the flexibility to purchase the drawer unit separately based on their needs and can integrate it seamlessly with the overall design concept to maintain uniformity across the furniture system.



I extended my exploration of the furniture system to address additional user requirements. One challenge was incorporating a backrest into the chair design, which children prefer over stools, while maintaining transformable storage functionality. Adding an extra backrest part with some modifications to the chair's detailing successfully addressed this challenge.



I observed users using a table desk as a portable study desk that is also affordable. I created a mockup of the same and explored opportunities to incorporate it as a module that can be repurposed.



Prototyping & Testing



Concept Development

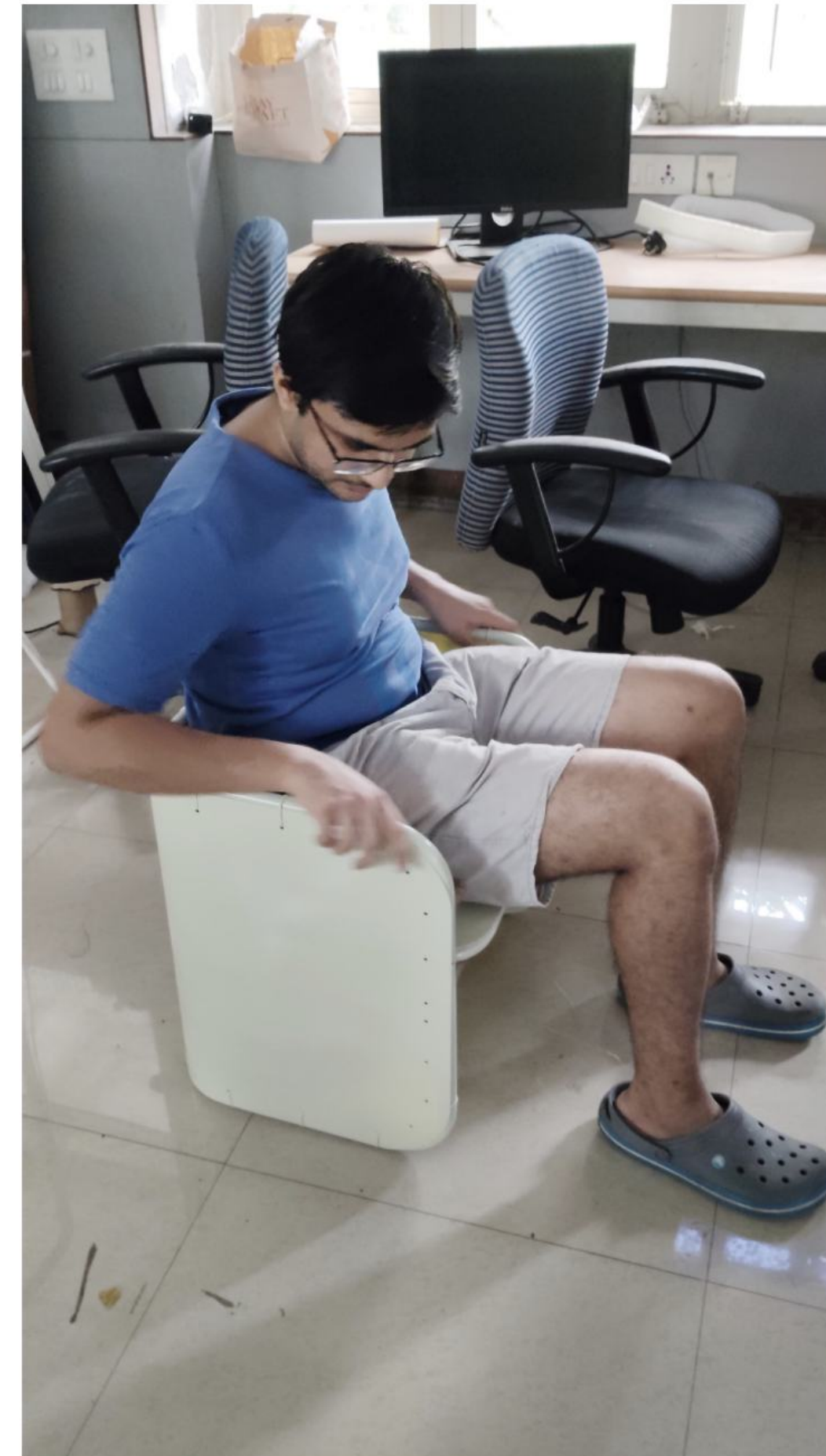
Drawing from my ideation sketches, I introduced another addition to the design: a wall-mounted shelf that can also serve as a bench. Users have the flexibility to choose and purchase this module based on their needs.



All the mockups were created at a 1:5 scaled-down dimension, enabling visualization of proportions and identification of necessary changes. Rounded edges and fillets emerged as a common design language across all furniture pieces.

Currently, I am in the process of selecting the appropriate materials and refining the furniture details.

Prototyping & Testing



Prototyping & Testing



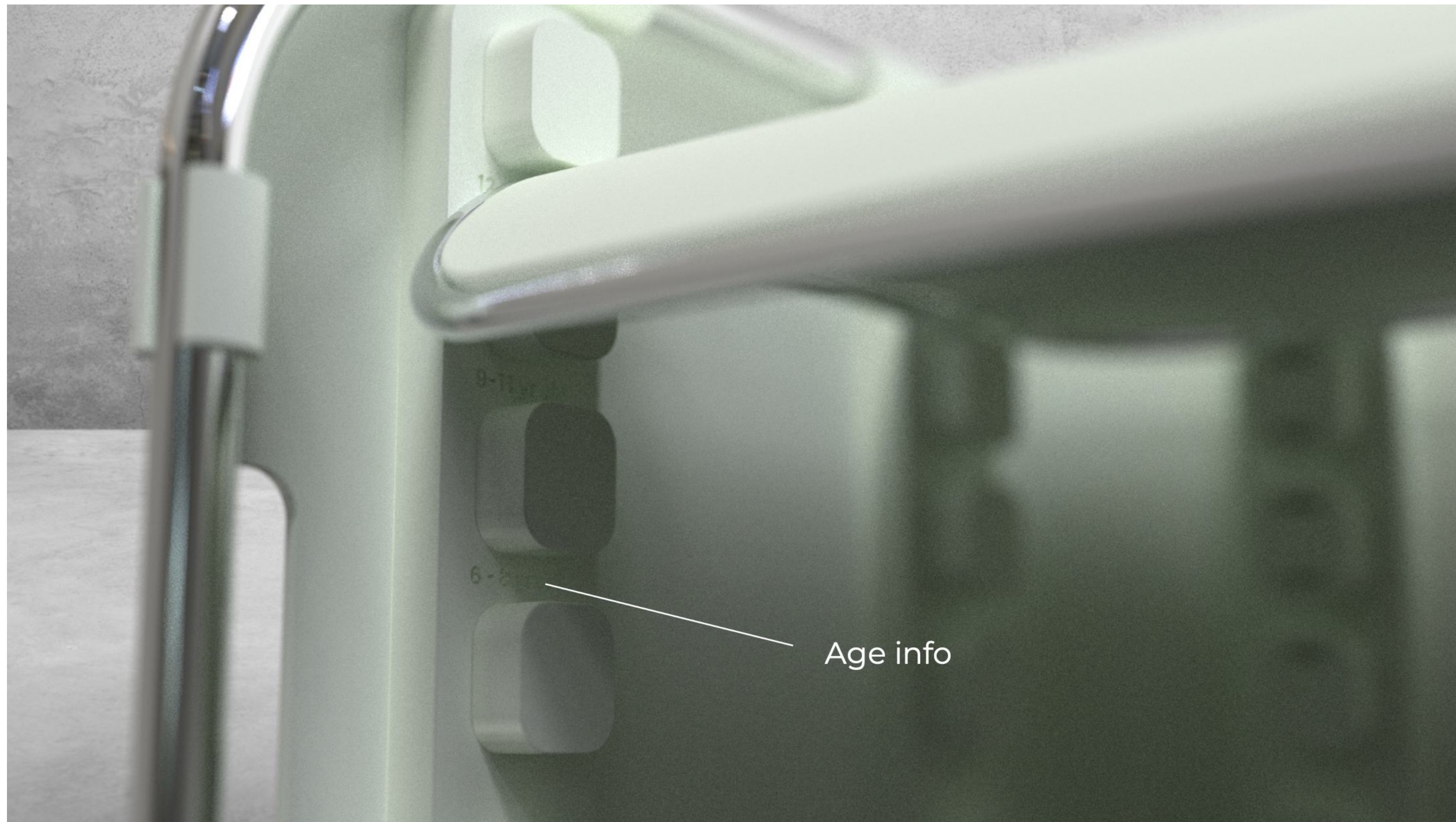
Prototyping & Testing



Prototyping & Testing

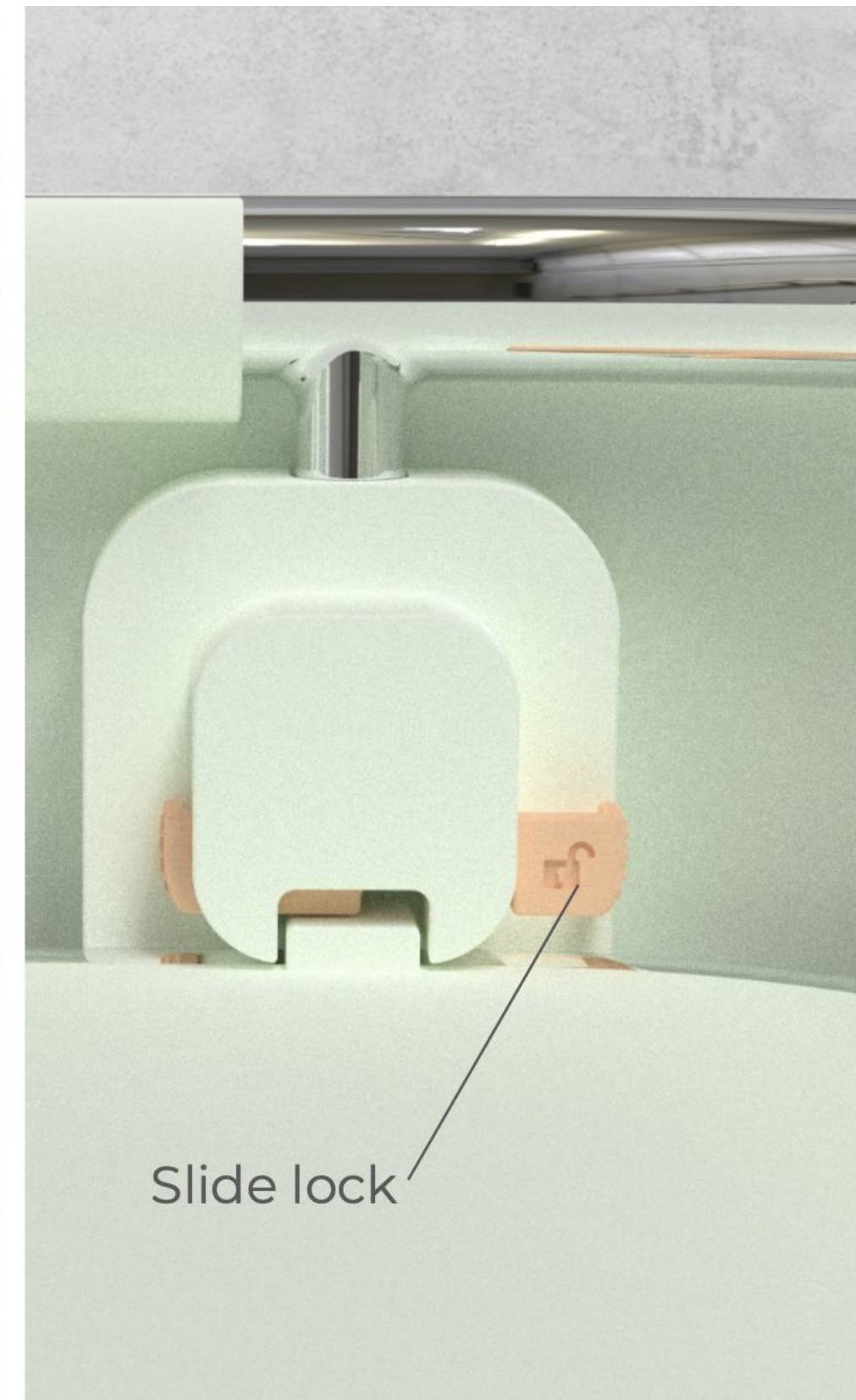


Final Design



Signifier that user understand easily

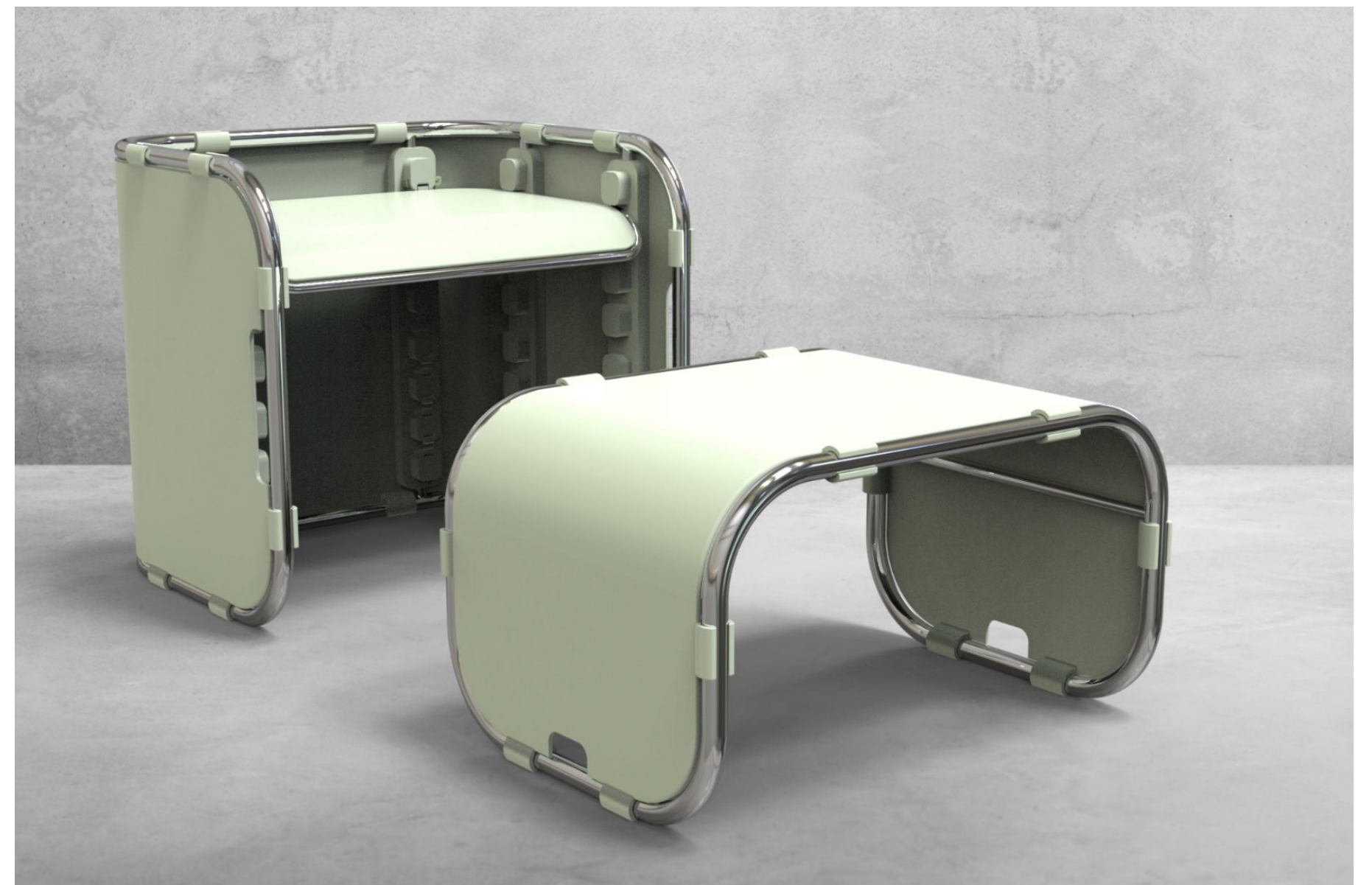
Final Design



Why no backrest ?

- Design trade-off
- Versatility
- Children tend to lean on the desk more often
- Upright sitting posture
- Chair can be reused as shelf

What is the first module for purchase ?



Material

- PP (Polypropylene) Copolymer
 - PP-B (Block Copolymer)
- Impact Resistance
- Toughness
- Weather Resistance
- Colorability
- SS (Stainless Steel)
 - 304 Stainless Steel
- Corrosion Resistance
- Strength and Durability
- Impact Resistance
- Formability and Weldability

Cost



Packaging



Packaging













References

The "Sustainable Modular Adaptable Furniture for Children" project successfully addresses the evolving needs of children and their furniture requirements, particularly in urban environments. By designing adaptable furniture that grows with children from early childhood through adolescence, the project offers a flexible, affordable, and sustainable solution. Emphasizing functionality and space optimization, this furniture contributes positively to the well-being and independence of children and their families, marking a significant advancement in child-focused furniture design.

References

https://www.researchgate.net/publication/363934499_The_Integrated_Development_of_Furniture_Design_and_Children's_Characteristics_Based_on_Artificial_Intelligence
<https://www.autonomous.ai/ourblog/correct-children-table-height-size-chart>
http://rei.pef.um.si/images/Izdaje_revije/2017/1/REI_10_1_cl_8.pdf
<https://in.pinterest.com/>

Inferences

- Adjustments Needed for Size
- Risk of Toppling if Seated on the Edge
- Lacks a Backrest
- First Purchase Module cost
- Light weight
- Admired the color
- Interesting form
- Play value

Final Design

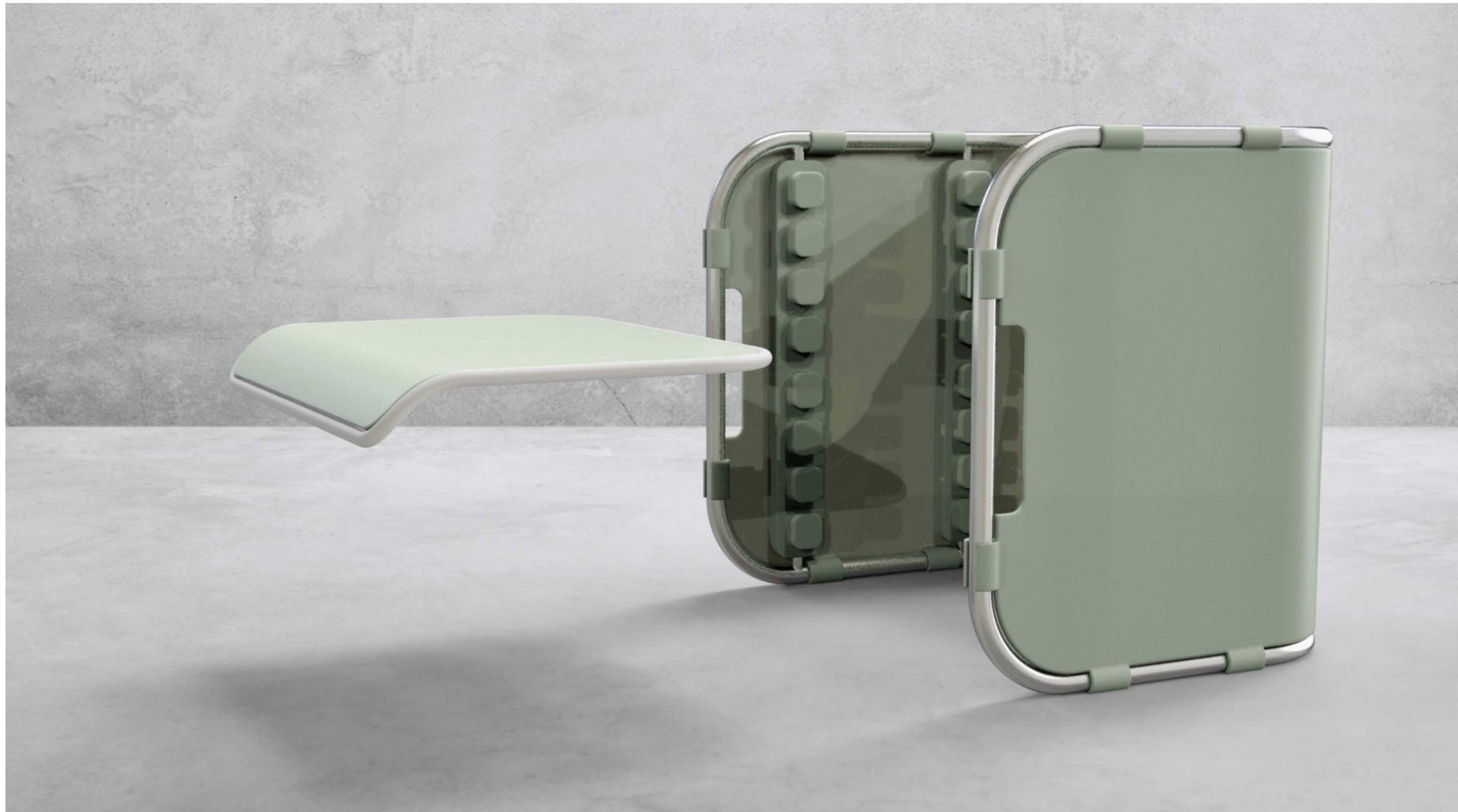


Final Design



Height Adjustable

Final Design



The seat can be removed and positioned at desirable location.

Final Design



Assembly of the product is minimal.

Final Design



A shelf can be made with same modules. The user can purchase these module as a shelf or change the chair to a shelf when the chair in no longer use.

Final Design



Table and chair set up that can be customised with the height of the child.

Final Design



The table can be used for drawing as well.

Final Design



Final Design



The product boasts a distinctive aesthetic, easily recognizable by its unique form and prominent use of steel. The design highlights the steel structure, making it a focal point rather than concealing it.

Final Design

