

Define and Explore Slide Summary

Damar Lemelle

Problem: Optimizing Bookshelf

Primary Function:

- Can hold books
- Increases space used
- Can support a significant amount of weight
- Level shelving

Secondary Function:

- Can hold other object (Heavier/lighter)
- Easy to Organize
- Accessible shelf height (ease of access)
- Lightweight (Not necessary)
- Collapsible (Not necessary)
- Safe Varnish (Not necessary)

Thoughts:

- Material used is the main and driving factor
- Useful and needed
- The simplistic primary function leaves room for interesting improvisation
- Should try and have the bookshelf look nice

Existing Solutions



Bamboo Shelving Unit

Functionality

- Can be easily altered
- Holds both Items and Books

Pros

- Can be made of simple materials
- Can tailor every aspect

Cons

- Hard to stabilize/prone to falling over
- Must construct entire thing

Takeaway

- Probably too frail to consider, but opens a lot of customizability.



Wall Mounted Bookshelf

Functionality

- Can hold amounts equivalent to room length

Pros

- Simple to construct
- No height limit
- Does not use floor space

Cons

- Have to disassemble my bookshelf
- Have to drill into the wall

Takeaway

- Solid idea, worth prototyping, need a blueprint first



Etagere Geometric Bookcase

Functionality

- Can hold items and books
- Could be (roughly) organized

Pros

- Can be added to my current bookcase
- No standard design
- Can be used to hold items

Cons

- No standard design

Takeaway

- A quick fix, but the unorganized appearance is less than ideal.



Takeaway Summary

- Wall Mounted shelving is most likely my best bet
- I could disassemble my current bookshelf to use in the construction of a new one
 - It is comprised of more wood than is just used for shelves.
- Most likely want a symmetrical design
- Stability is the most important thing

Prototype Summary

- **Objective:** Support weight
- **Approach:** Constructing a stable structure using lesser materials.
- **Materials:** Cardboard

Constraints & Key features

Damar Lencelle

Primary Function:

- 1 Can hold books
- 2 Optimizes space used
- 3 Can support weight
- 4 Has level shelving
 - Not necessary, but nice to have.

Constraints:

- Size Limited room height, should not use more ground space.
- Weight Must be able to hold books in large quantities.
- Stability Must be balanced and strong.
- Materials Starting w/ improvised materials to create a blueprint. Ending product made of wood.

Key Features:

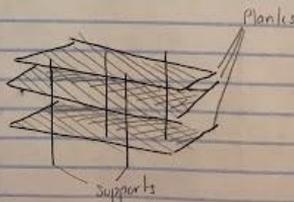
#2: Geometric bookcase

- Pros Uses as much space as possible
Can hold both books & items
Simple design
- Cons I dislike their asymmetrical appearance



#3 Bamboo shelving unit

- Pros Very simple construction
Can be customizable
- Cons Can't support much weight
Not very stable

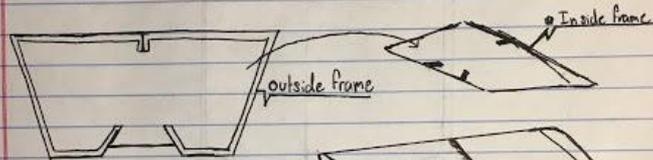


Prototye 1

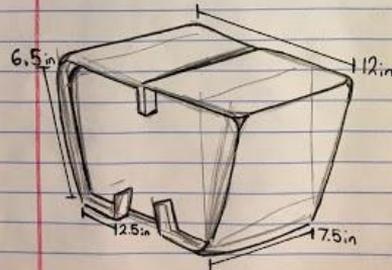
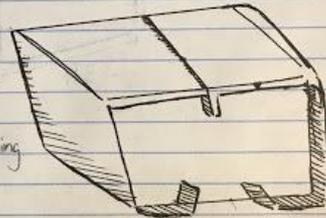
Objective: Can Carry books - Doesn't break

Approach: Book bench

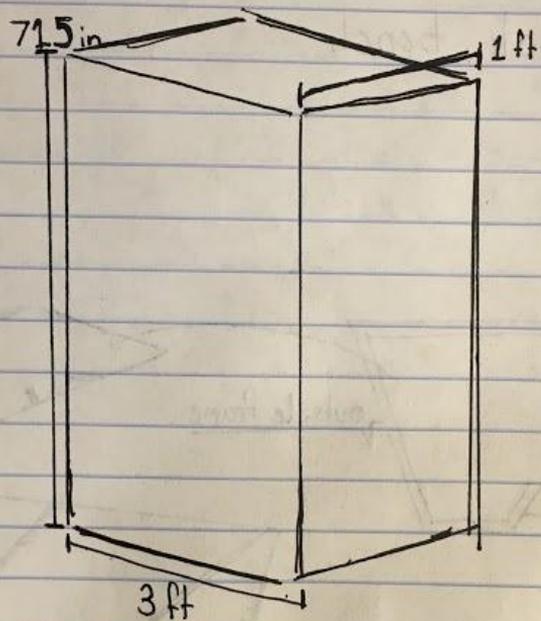
> Prototype is cardboard & the final result will be wood. I want a feasible backup plan and design first



This design uses 100% cardboard and is sturdy enough to be used as shelving



Bookshelf Dimensions

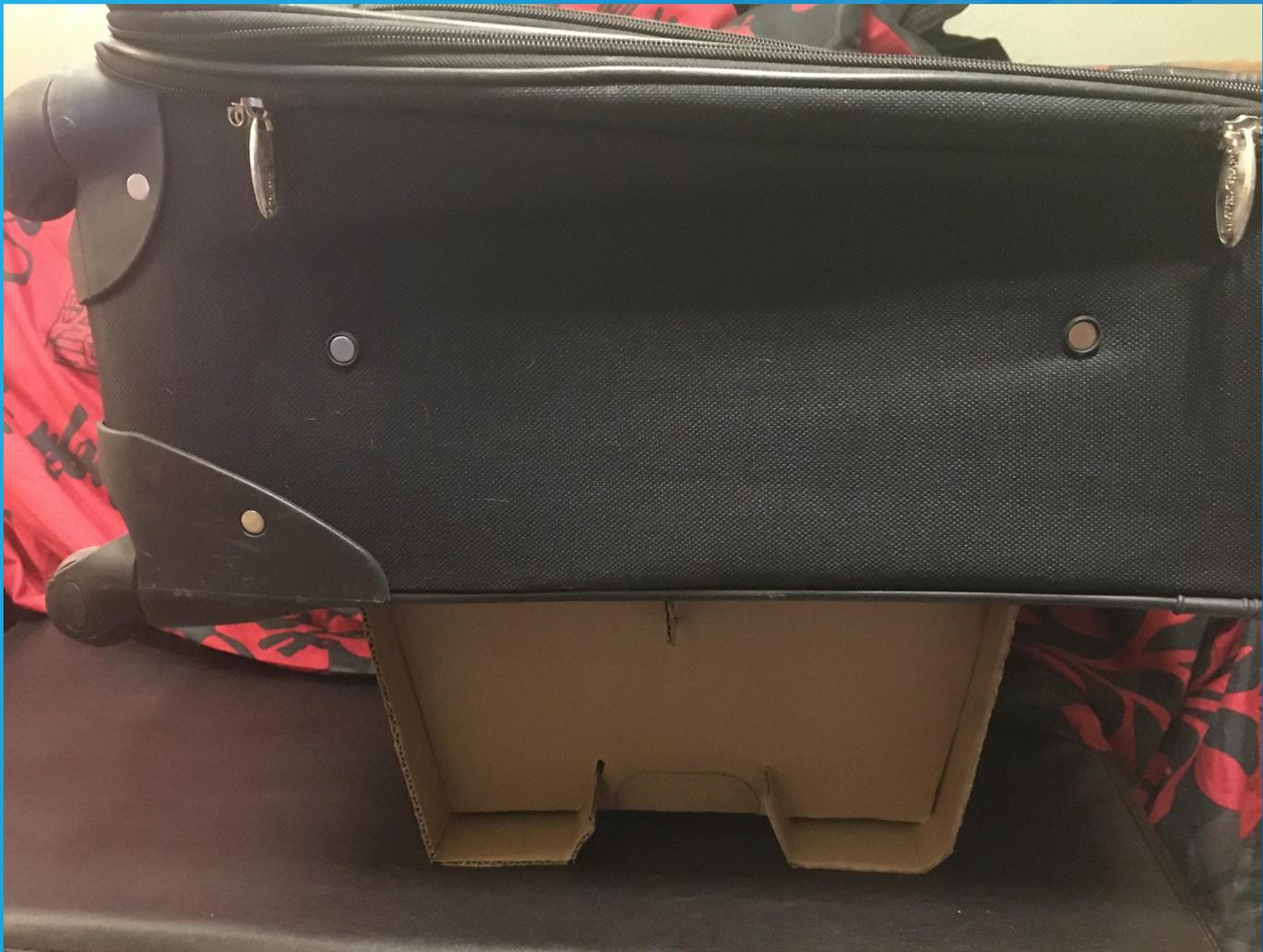


Prototype Summary

Testing:

- **Purpose:** Support large amounts of weight reliably
- **Approach:**
 - Simulated testing: Using weight to scale how strong, flexible, and/or space used
- **Result:** The prototype fills a noticeable amount of space, but in return it can lift a disproportionate amount of weight. A cardboard ensemble was able to withstand me placing my full weight upon it, 129 pounds.





Prototype Summary

End of Testing:

I have assembled a more-than-stable structure out of weaker materials that can support a significant amount of weight. I was able to use only cardboard for this experiment, not even requiring adhesives of any kind. Utilizing scoring and cardboard's flexibility, I was able to construct a close knit structure.



Prototype Summary

Review:

My next prototypes will definitely be assembled out of wood, this example being a test of my engineering skills.

While considerable strong, wood is a better base material without having to compensate with ridiculous girth as my cardboard one did.

Build

Something I learned...

- Appearances are deceiving
- A screwdriver is a great improvised multifunctional tool.

Something I liked...

- Customization presented and possible.

Something I will not do again...

- If any other parts of the bookshelf are unyielding, I will most likely leave it undisturbed. It will be much easier to work around the issue than to move through it.





Testing

Key Features:

- Stability
- Carry Capacity

Testing Entailments:

- Testing stability involved shaking/rocking the bookshelf itself, while an object was on the top shelf.
- Testing Carrying Capacity involved filling the shelving with many or heavy objects.



Weight

Stability

Results

Both tests ran quite well, despite the initial damage sustained. The object's stability was the most affected parameter, due to the backdrop being largely disconnected

Evaluation

Things I liked...

- Removing the fixed shelving, even if it caused multiple issues.
- Pegs and their inlets are customizable

Things I disliked...

- Damage sustained from the removal of one fixed shelf.
- Inevitable collage of colors

Plans to improve...

- Include removable pegs.
- Construct additional shelving (vertical and horizontal).
- Repair damage caused in deconstruction.



Final Iteration

1. Alter connections between shelving and frame

Focus:

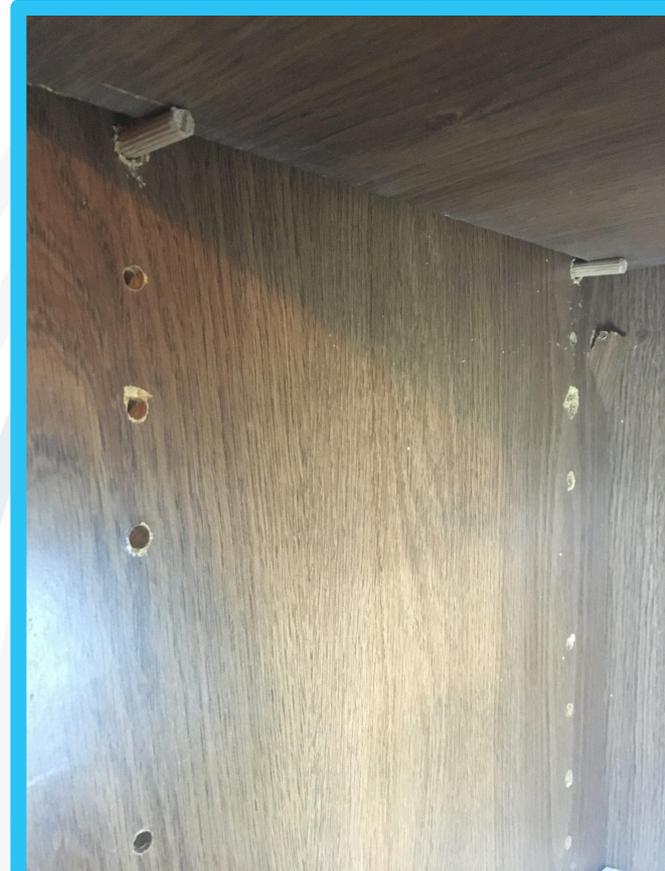
- Interchangeability is one of the main objectives of this design
- The spacing between shelves (due to the divider's height) would require me to drill new holes.

Approach:

- Drilling wooden pegs into the shelving as opposed to underneath it

Results:

- Shelves and frame slot together like puzzle pieces



2. Make Substitution Easier

Focus:

- With freedom of movement being an important aspect of the design, making it as simple as possible is beneficial

Approach:

- Changing inlet sizes to make disassembly and swapping much easier

Results:

- The entire structure can now be disassembled within minutes



3. Damage Control

Focus:

- Limiting and Fixing damage caused during and after this project is vital to keeping it around. Damage control refers to fixing and preventing damage.

Approach & Results:

- Giving Pegs a more interlocking design that runs deeper between shelf and frame
- I did not repair the bookshelves backboard which in this instance, prevented further damage.
- The foundational shelf has been delegated to function over form



Project Functionalities

The background features a light blue gradient on the left side, transitioning into a series of concentric, semi-circular arcs on the right. These arcs are composed of thin, parallel lines in varying shades of blue. Small, solid blue dots are scattered across the arcs, creating a pattern reminiscent of a fingerprint or a stylized orbital system.

Primary

Can hold books

- The topmost shelf was made specifically with books in mind, while the other shelves can be used to carry them, as well as other objects

Optimizes space used

- The usage of space has been greatly improved, as i've tailored my bookshelf to roughly what I own. The least optimized space is the final shelf, but it is left like that

Can support significant amount of weight

- The final design is made up of wood that joins to the frame with the finesse of puzzle pieces. It has supported significant weight during the building process.



Secondary

Easily interchangeable/can rearrange

- The shelving and dividers can be easily arranged to my will within a few minutes.

Level Shelving

- Working towards level shelving was not a hard goal, but it is very helpful.

Concluding Thoughts

The background features a light blue gradient on the left side, transitioning into a series of concentric, semi-circular arcs on the right. These arcs are composed of thin, parallel lines in varying shades of blue. Small, solid blue dots are scattered across the arcs, creating a pattern reminiscent of a fingerprint or a stylized wave.

Project Reflection

Aspects of my project that I like

- Useful and can be used immediately

Aspects of my project that were difficult

- The bookshelf is made with a hardwood, making it susceptible to cracking when I was drilling
- The bookcase's foundation repeatedly gave me problems

What I would do differently next time

- Prevent bowing of the wood.
- Include foundation in redesign

