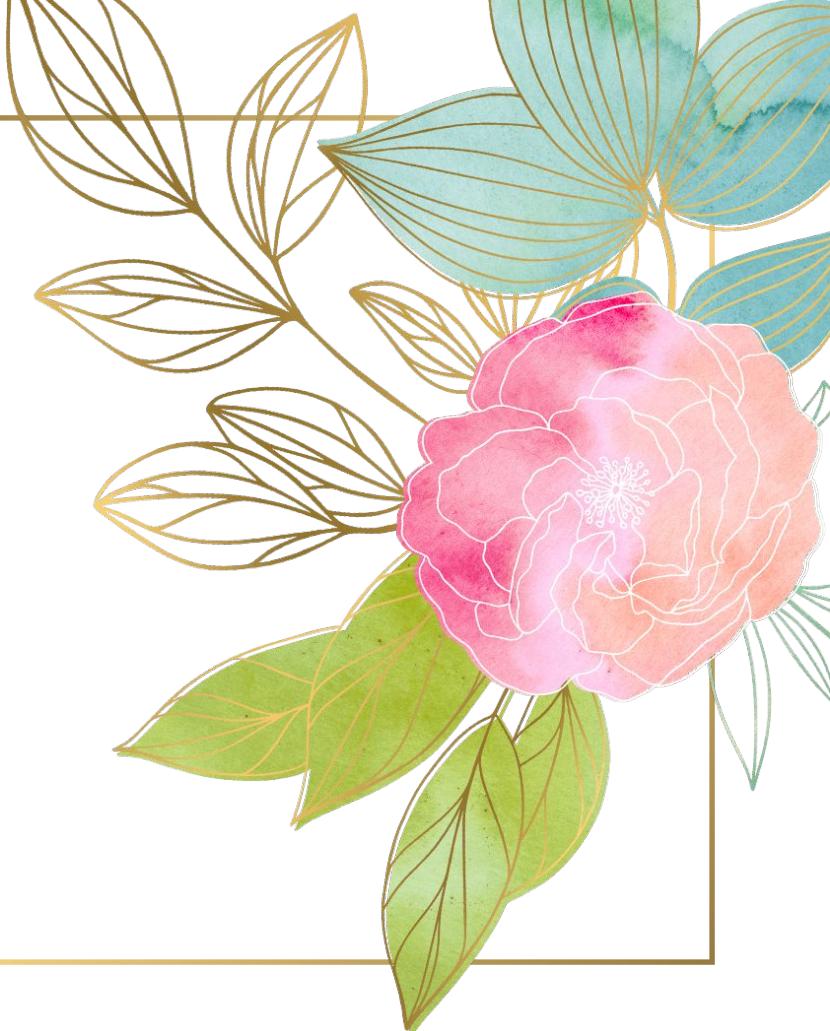


Small Planter Box

Engineering R&D S21
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Define & Explore

Problem Definition: Small Planter Box

Goal: Create a small planter box to grow plants in

Primary Functions:

- The right size to fit multiple plants.
- Doesn't take up too much space.
- Doesn't get too messy

Secondary Functions:

- Looks good.
- Holds multiple plants.
- Can be easily moved around.

Constraints:

- Figuring out right size and design I want.
- What materials I want to use.
- What plants I want to grow.

Raised Garden Bed (\$95)

Overview:

- 48x24x30 in. raised garden bed.
- Has a hole in the bottom for drainage.
- Includes a liner to protect the wood from water damage.

Pros:

- Has a lot of room for plants.
- Protects wood from water damage.
- Good size

Cons:

- Expensive
- Doesn't look good
- Difficult to move around

Takeaways:

- Although this doesn't look good I think I could paint it or stain it to improve the aesthetics and I like the idea of having it stand rather than just sitting on the ground.
- It might be difficult to move but I really like this design.



Raised Garden Bed on Wheels (\$170)

Overview:

- 47.5x23.5x33 in. raised garden bed.
- Has shelf on bottom and it is on wheels
- Includes a liner to protect the wood from water damage.

Pros:

- Has a lot of room for plants.
- Good size
- Has a shelf on bottom
- Has wheels

Cons:

- Expensive
- Doesn't look good

Takeaways:

- Similar to the last one this design doesn't look great but that can be fixed with paint or wood stain.
- I really like the raised design and I like that this design has a shelf on the bottom and wheels on the legs



2 Tier Raised Garden Bed (\$130)

Overview:

- 48x43x29 in. 2 tier raised garden bed.
- Has two different boxes at different levels
- Includes a liner to protect the wood from water damage.

Pros:

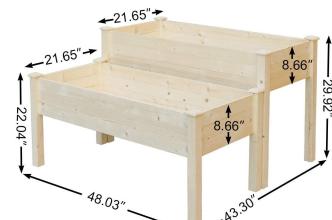
- Has a lot of room for plants.
- Good design
- The tiers can be moved around (aren't stuck together)

Cons:

- Expensive
- Doesn't look good
- Too big

Takeaways:

- Similar to the last two designs this design doesn't look great but that can be fixed with paint or wood stain.
- I really like the raised design and I like that this design has two different boxes at different levels but it takes up a lot of space



Takeaway Summary

Takeaway Summary

- I want to do an elevated design not just letting it sit on the ground.
- I need to get a liner to protect the wood from water damage.
- I need to figure out where I want to put it and how big I want it to be.
- I also need to figure out what plants I want to grow.
- Do more research about the plants and soil.

Ideate & Design

Key Features

→ Box Depth

- ◆ It needs to be deep enough to allow room for the roots of the plants to grow.

→ Entire Box Size

- ◆ I want it to be big enough to hold a few plants but I don't want it to take up a lot of space.

Moveability

- ◆ I want it to easily movable so that if I ever need or want to move it I can do so easily.

Storage

- I want it to have some storage for tools and other supplies I use for my plants.

Key Feature Approach

Entire Box Size

- ▷ Plan out where I want to put box and figure out the maximum size box I can possibly make.
- ▷ Then figure out what size I want to make it.

Notes/Takeaways

- ▷ In order to figure out this feature I need to do some planning and figure out some things.

Moveability

- ▷ I want to make this box very easily moveable.
- ▷ My ideas to make it easily moveable is to maybe put wheels on the legs.

Notes/Takeaways

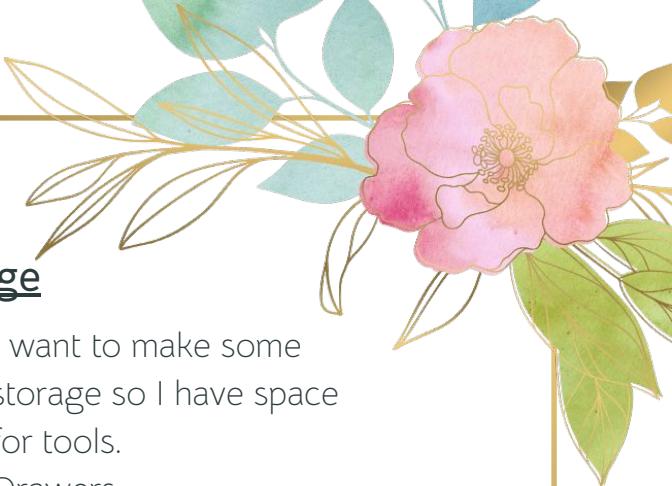
- ▷ I am trying to brainstorm some other ways of making it easily moveable.

Storage

- ▷ I want to make some storage so I have space for tools.
- ▷ Drawers
- ▷ Shelves
- ▷ Basket

Notes/Takeaways

- ▷ I am going to put storage underneath the box but I want to figure out the best option for storage.



What is being planted?

→ Herbs

- ◆ Cilantro
- ◆ Parsley
- ◆ Mint

→ Flowers

- ◆ Carrots
- ◆ Cucumbers
- ◆ Lettuce

Prototype Design

Prototype Goal

- ▷ Figure out a final design and size for the box.
- ▷ Plan out where I want each plant and how much of each plant I can grow.

Approach

- ▷ Build a small prototype of the box using cardboard and finalize some of the plans for the box.

Materials

- ▷ Cardboard
- ▷ Duct tape or glue
- ▷ Pen or pencil

Build, Test, Evaluate Prototype

Prototype Build

Approach

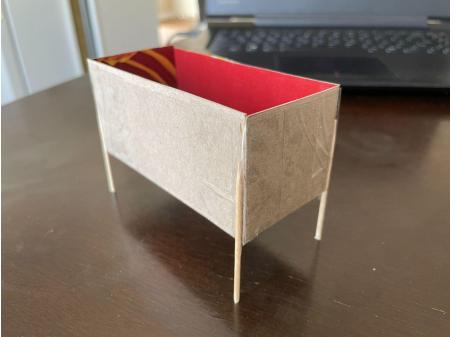
- I made a 3D model of what I want my planter to look like.
- I used cardboard for the box and toothpicks for the legs.

Something I Liked

- I liked how I drew out a flat design then cut and folded it to get the box shape.

Something I Didn't Like

Although the toothpicks were very easy to make the legs with I don't think they represent what I actually want the legs to look like very well.

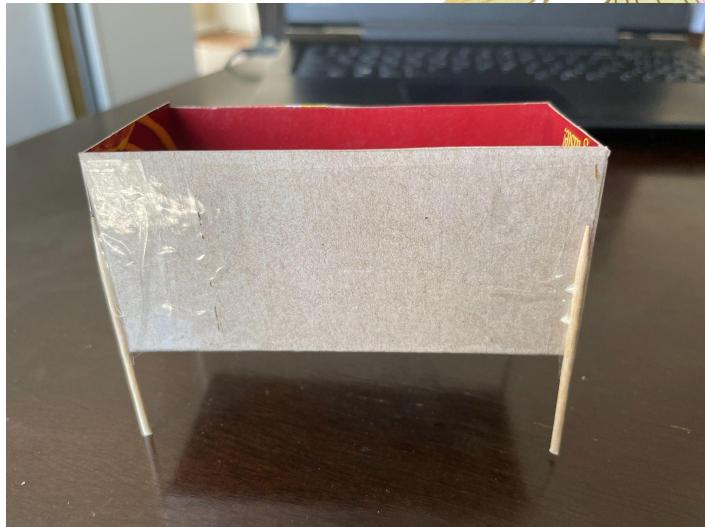


Quick Note: Because of the project I am doing there weren't any tests I needed to do for my prototype. I used my prototype to look at the design and possible storage options and how I might need to change or adjust my design for these storage options.

Prototype Test #1

Shelves

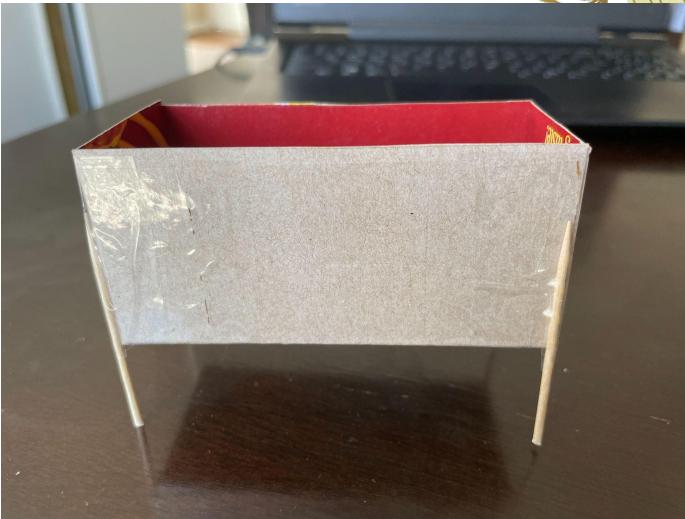
- I really like the idea of having a shelf underneath the box.
- After making my prototype I realized that if I want to put a shelf underneath the planter box I need to make the legs longer because in the prototype the box goes so far down the legs that there is very little room for a shelf underneath.



Prototype Test #2

Baskets or Drawers

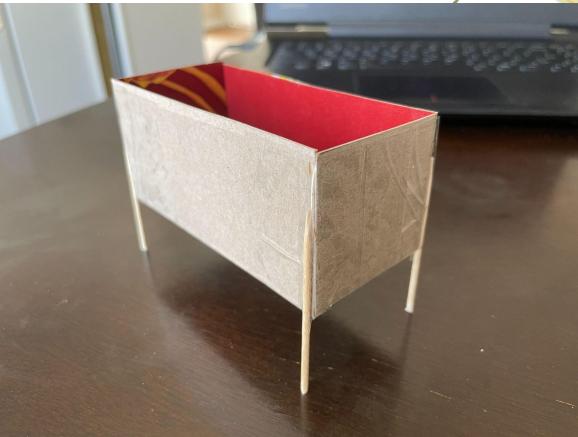
- I also really like the idea of adding hanging baskets or drawers under the box but this storage option would be the most difficult one to add.
- Also the same as the shelf I would have to make the legs longer so there is enough room for the drawers or the baskets.



Prototype Test #3

Hooks

- These are the easiest storage options but not my favorite because I can't use them for everything I need to store and they don't look great.
- For this option I would just need to attach hooks onto the side of the box.
- I would also need to account for the hooks and what might be hung on them when putting the planter box where it goes so there is enough space.



Prototype 1 Evaluation

Aspects of my prototype that I like

- I really like the size and depth of the box because I feel like it gives me way more than enough room for the plants I want to plant.

Aspects of my prototype that I don't like

- I don't like how short the legs are because it makes the box a lot closer to the ground and doesn't leave a lot of room for storage underneath the box.

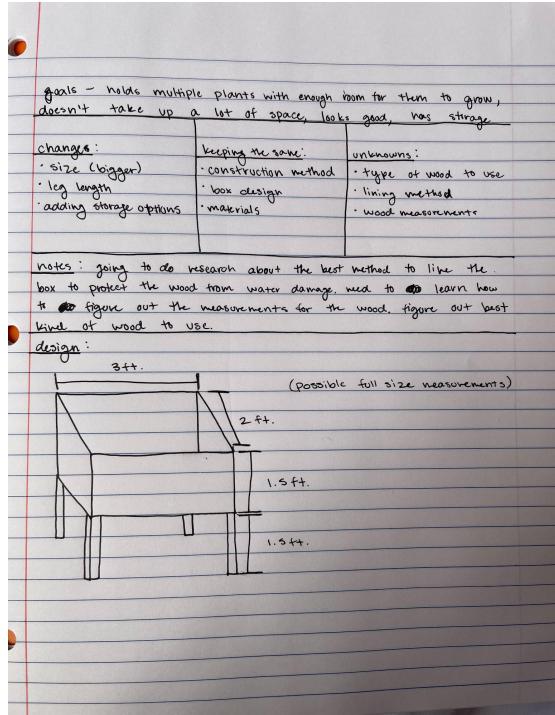
Improvements for the next iteration

→ Make the legs longer.

→ Make prototypes that show each of the storage options to make a final decision.

Rough Draft

Rough Draft Design



Rough Draft Build



Approach:

- I wanted to use the same approach that I used for my prototype where it was all one piece that I folded and taped together but the cardboard I had wasn't big enough to do that because my design is a lot bigger this time. I just cut out each shape and taped it together. I also changed the measurements as I built because sometimes I felt like things were too big or too small.

Something I Liked:

- I really like the size of my rough draft, at first I wanted to make my rough draft about half scale but now that I've built it I kind of like the size and I might only change the size a little bit for the final size.

Something I Will Not Do Again:

- I think for my final design I am going to do the shelf underneath the box as my final storage option because it is the easiest to build and I can always put baskets on the shelf to keep it organized.

Rough Draft



Rough Draft



Rough Draft Testing & Evaluation

Note: The final draft will not be made out of the same material as my rough draft.

Rough Draft Weight Test



Test Objective:

- See how much weight the box can hold and see where there might be weak spots or see where I might need to reinforce the box.

Test Method:

- I used exercise weights and I gently placed them in the box to see how it would hold up. I started light and tried adding more.

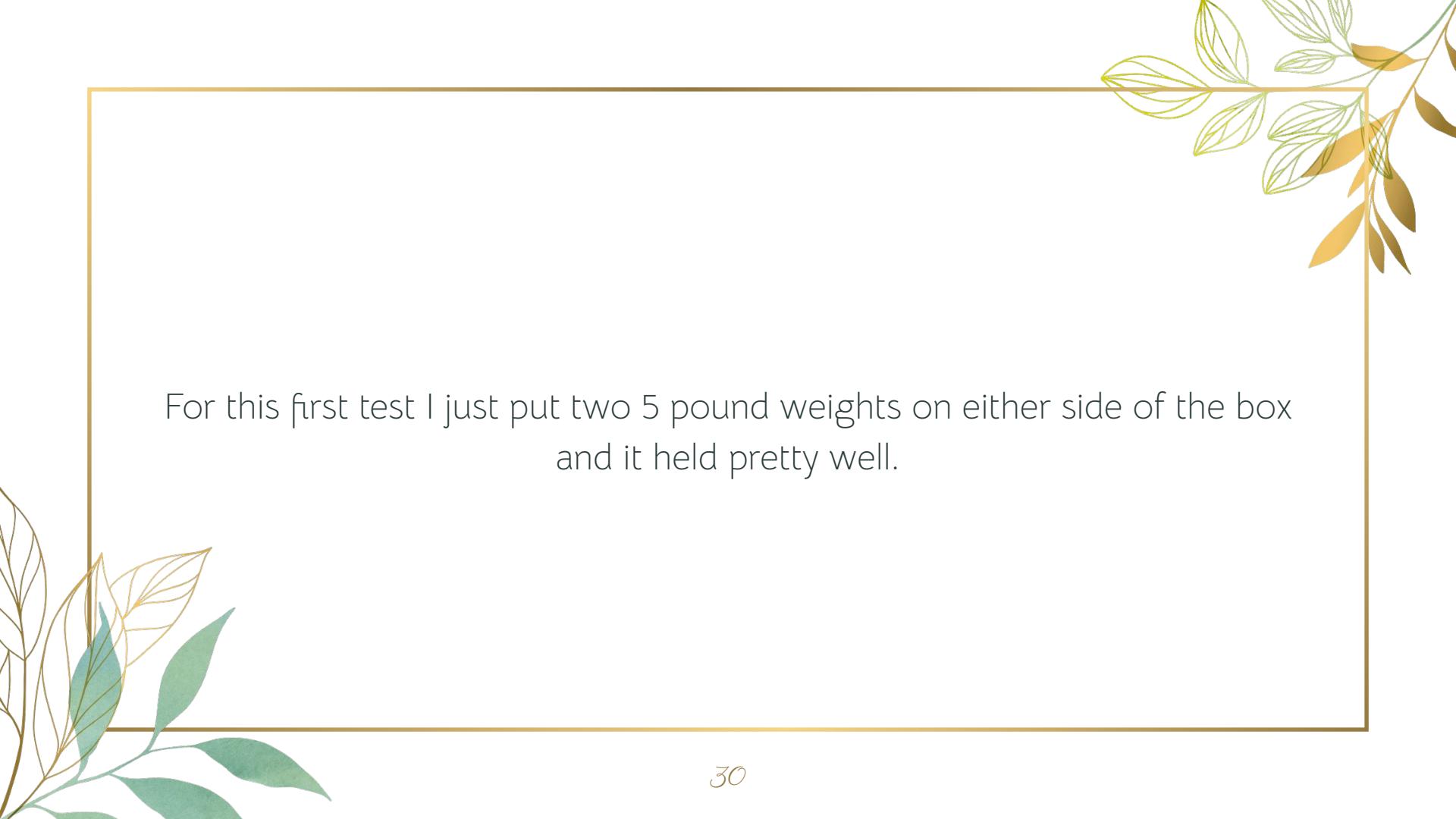
Test Criteria for Success:

- There wasn't really any criteria for a successful test, it was more to see how long it would hold or how much it could hold.

Evidence:

- Pictures on the next slide





For this first test I just put two 5 pound weights on either side of the box
and it held pretty well.





For this second test I tried to place two more 5 pound weights on both sides of the box and the legs on the left folded and broke. The box didn't stand at all with all of this weight.

Rough Draft Evaluation



Aspects of my Rough Draft that I liked:

- I liked the size of my rough draft I might change it a little bit but overall I liked the size.

Aspects of my Rough Draft that I don't like:

- I didn't like the material I used for my rough draft because it just didn't hold well and I wouldn't even consider using it for the final draft. Also my rough draft just looked kind of messy and not good.

Improvements for next draft:

- I am going to make sure that my final draft looks very clean and well made.
- I am going to make sure the bottom of the box and the legs are strong enough to hold all the weight.
- I might change the size a little bit.



Final Draft Documentation

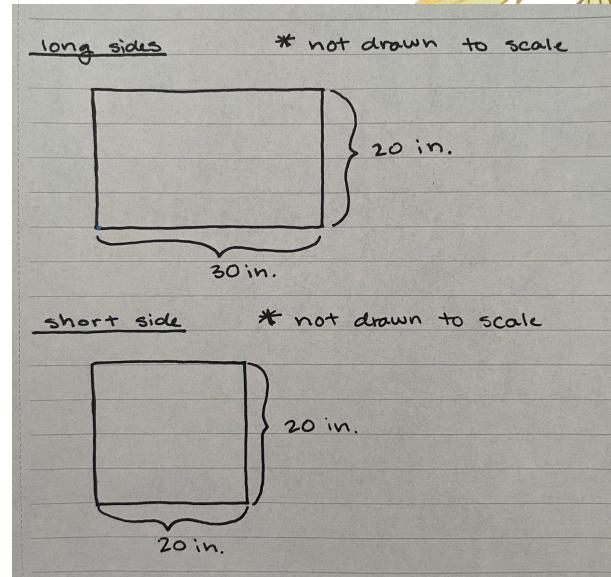
Final Design

How has my final design changed?

- When I was first designing my planter box I wanted it to have storage but while designing it I realized that I didn't like the storage options so I took them out of my final design.
- I also changed my dimensions throughout my design process and I am very happy with my final dimension sizes.

What are the key features of my design?

- One of the key features of my design are the drain holes in the bottom of the box.
- Another key feature of my design is the plastic liner inside the box that protects the wood.



Final Draft Build

What went well during my build?

- During my build I learned a lot about building things and how to use different power tools.
- By the end of my build I felt a lot more confident and comfortable building in the workshop.

Steps I took:

- After I drew out my final dimensions I cut out each of the sides and used screws to connect them.
- Then, I measured how big I needed to cut the bottom and then cut it out.
- Next, I figured out how tall and I wanted the box and how tall the legs would need to be. Then, I screwed them on.
- Finally, I drilled in drain holes into the bottom and stapled liner around the inside of the box.



Final Draft Testing

Why I didn't do testing?

- For my final draft there isn't really any testing I need or can do right away.

What I would want to test?

- I would want to test how many plants I can fit in the box.
- How well the box and liner hold up for.
- How well do the drain holes work.
- How well does the liner protect the wood from water damage.



Final Draft Evaluation

Project Summary

- For my project I wanted to create a good sized planter box to place in this unused space on my patio.

What do I like about my final project?

- I really love how my final draft of my project came out.
- I love the size and height of the box.
- I love how much I learned from doing this project and I am very proud of my final product.

