

Bird House Documentation

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Problem Statement:

- Design and fabricate a functional, durable, and educational birdhouse that can be transformed into a STEM kit for elementary and middle school children. The birdhouse must incorporate engineering principles, environmental considerations, and precise fabrication techniques while meeting criteria for bird safety, weather resistance, ease of maintenance, and proper installation.

Criteria & Constraints:

- Must be waterproof and non toxic to birds
- Must be able to be installed or mounted in some way
- Must be sized to consider local bird species and sizes
- Feed _____ birds
- Must be a way to add food to the feeder and clean the feeder as needed
- Must be able to maintain a dry interior
- Sloped roof for drainage

Brainstorming / Research

What is a bird house?

- A birdhouse is a man-made structure, also called a nest box, designed to provide a sheltered space for birds to build their nests, lay eggs, and raise their young

How big does the hole need to be?

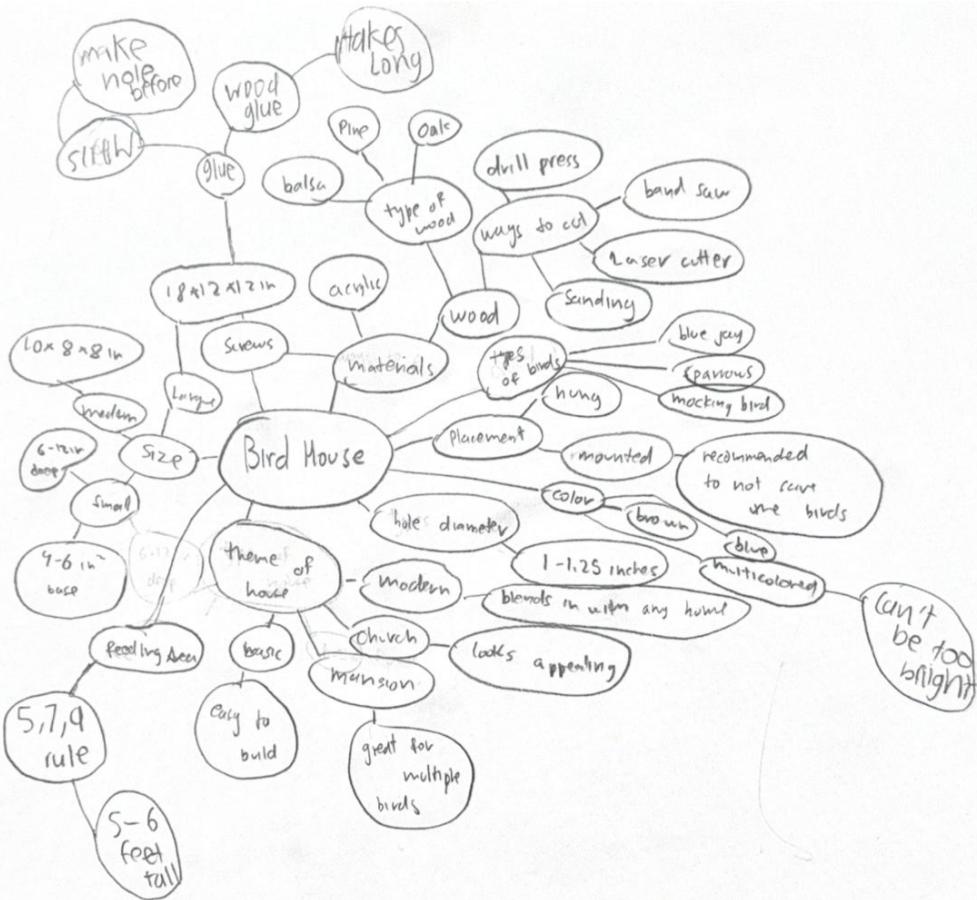
- The entrance hole of a birdhouse should be between 1 and 1.25 inches in diameter.

Should the bird house be hung or mounted?

- Should be Mounted
 - Birds prefer houses that are securely mounted on a sturdy pole, tree trunk, or wall,
 - Hung houses can sway in the wind and make them feel insecure

Types of bird that live in New Jersey

- Blue jays, Sparrows, and Mockingbird



Bird House Design

Plenty of space for multiple birds

Looks really appealing but it will be hard to mass produce



Looks really appealing



Looks really appealing
It will be hard to mass produce(Texture)



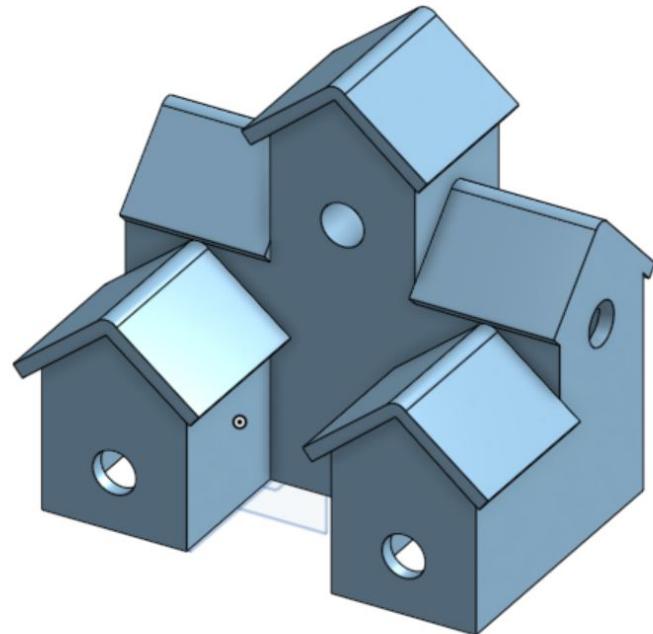
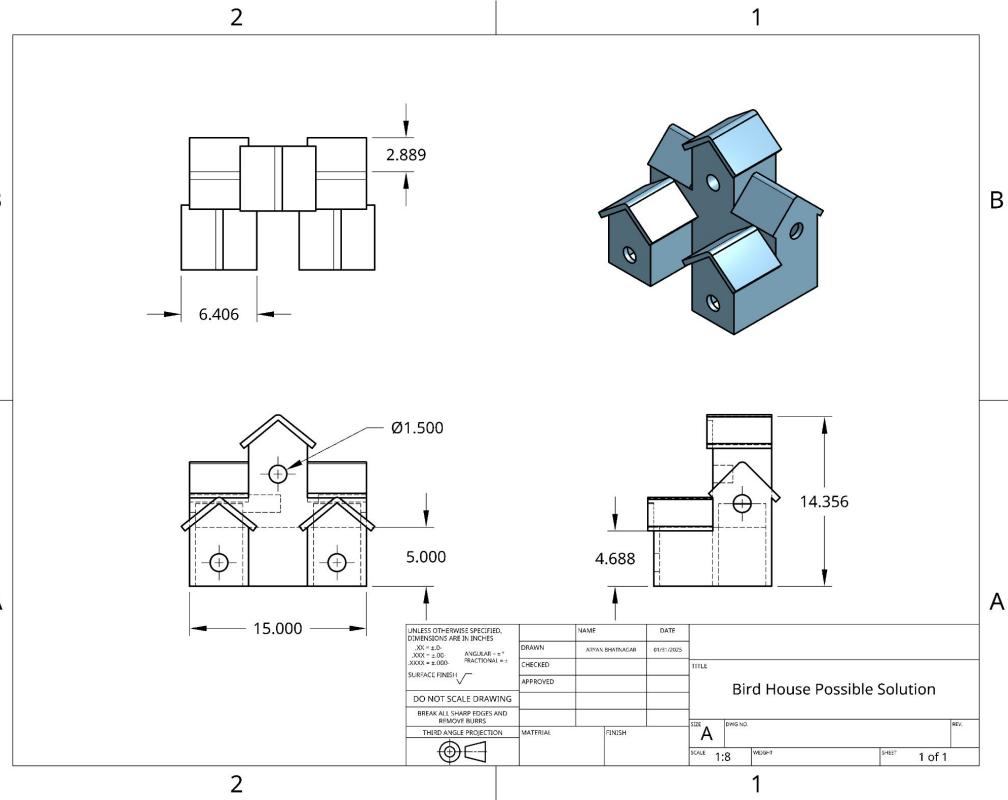
Easy to build



Modern and will fit into any home

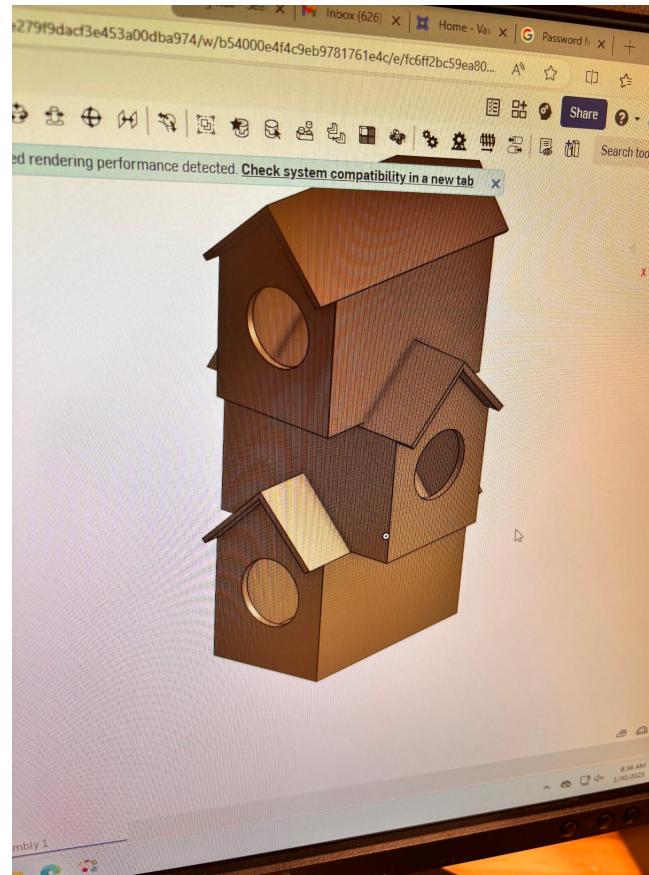
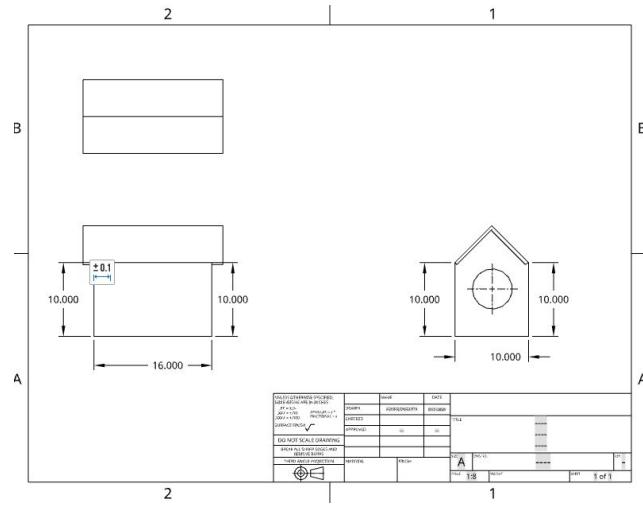


Possible Solution 1 [Onshape Link](#)



Possible Solution 2

Possible Solution 2



Possible Solutions	Pros	Cons
Possible Solution 1	<ul style="list-style-type: none"> • It is a very complex design so it gives us a challenge • Has a slot for a birdfeeder • Looks nicer than possible solution 2 	<ul style="list-style-type: none"> • Cutting a variety of different shapes so we could mess up • Uses a lot more material
Possible Solution 2	<ul style="list-style-type: none"> • The concept is pretty cool • It will be easy to assemble/mass produce for the second part of the project • Less cutting required 	<ul style="list-style-type: none"> • No room for a bird feeder

Decision

We chose Possible solution 1 because we like how the design looks and it has room for a bird feeder and since material for this project is nigh unlimited we could pursue this design

Cut List

Component	Thickness	Length (in)	Width (in)	Multiplier (in)	Total Area (in)
Base	0.41	5	5	5	125
Roof	0.41	3.2	5	10	160
Front (Arrow Shaped)	0.41	7	5	2	70
Back of the front house	0.41	10	5	4	200
Front (Arrow Shaped)	0.41	15	5	1	75
Side (Arrow Shaped)	0.41	10	10	2	200
Side (Top House)	0.41	5	5	2	50
					880

Types of Tenants

American Robin



Northern Cardinal



Prototype Process

- We cut out all pieces for the small and large birdhouses based on the cut list.
- We used a scroll saw to cut out pilot holes in the smaller birdhouse.
- Nailed the side panels of the small birdhouse together and nailed the front of the birdhouse to the the already nailed side panels



Prototype Process

- We then glued left and right side panels of the other small birdhouse.
- Once again we used a scroll saw to make a pilot hole (which is 1.25 inches in diameter) for the faces of the new birdhouse and the larger middle one
- Glued the sides of the larger birdhouse to the base and the 5x5 panels that belong on the edges that aren't occupied by smaller birdhouses



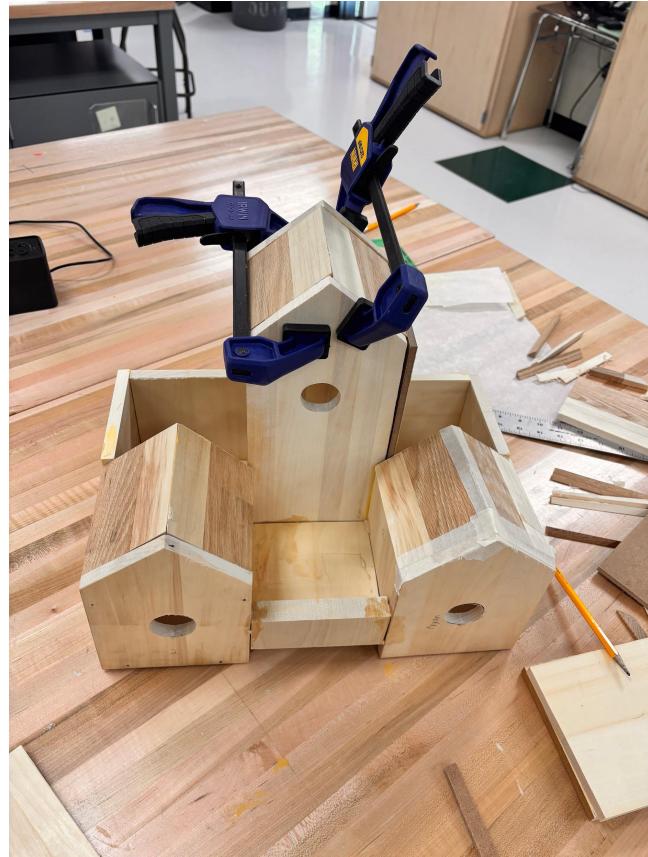
Prototype Process

- We then glued the 5x5 panels meant for the second smaller birdhouse together
- We then glued the face of this birdhouse on the existing smaller structure
- We then glued the other smaller birdhouse which is already complete aside from the roof on to the base



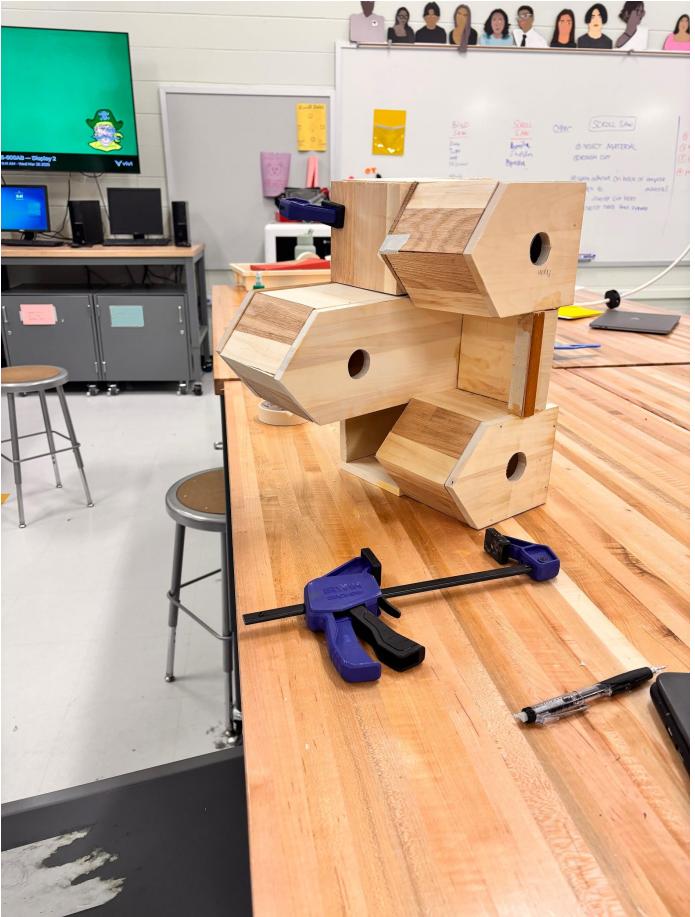
Prototype Process

- Glued the second miniature birdhouse to the main design
- We adjusted the roofs and their dimension using the bandsaw
- Used the feature of the bandsaw that allows you to angle the table to create bevel joints
- Glued the roofs to each to each other attached via bevel joint and to the design itself we used tape to hold it in place

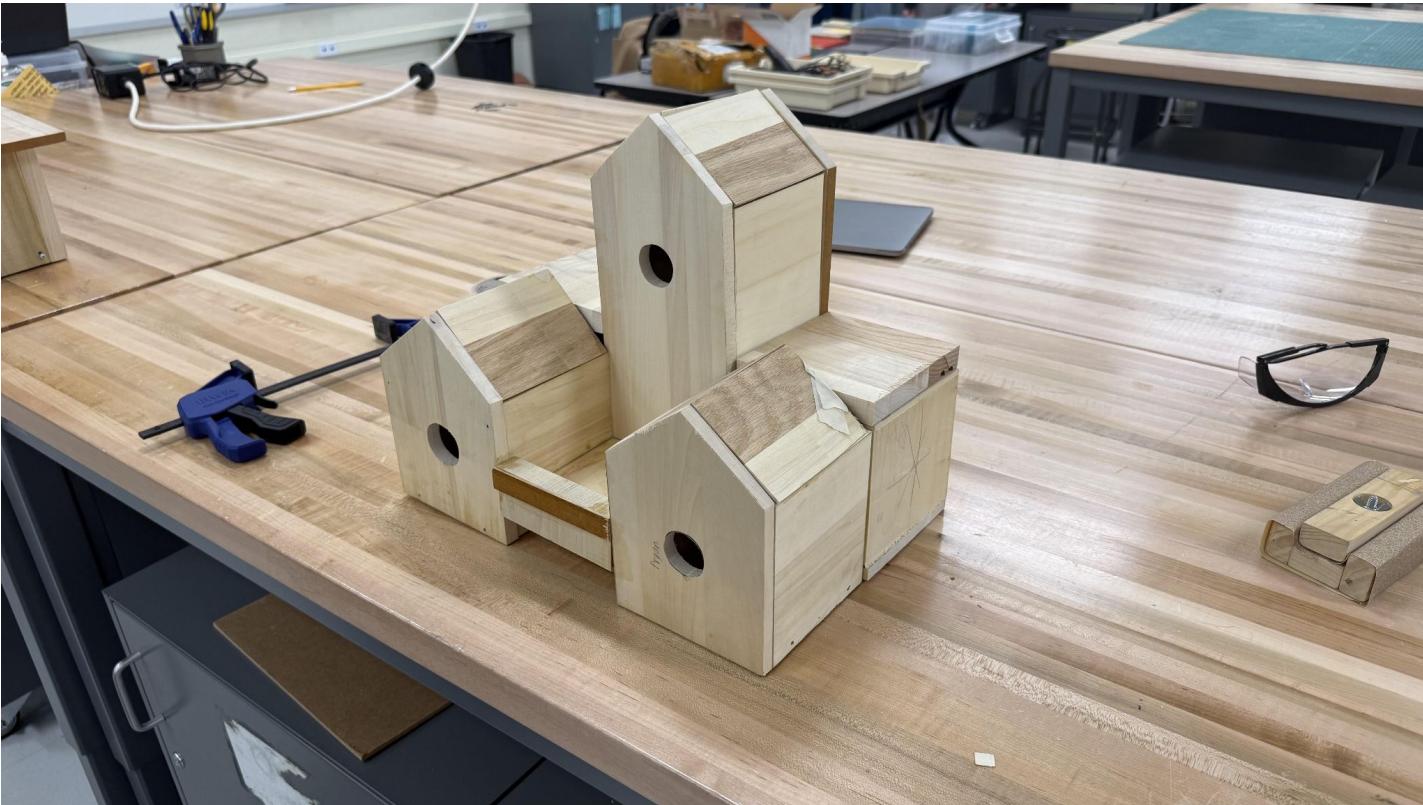


Prototype Process

- We used 2 5x5s the first pair were placed as the walls for the taller bird house they were attached via wood glue and clamps
- Glued the last pair of 5x5s via wood glue on to the cube without a roof which is adjacent to one miniature birdhouse and the large one
- Created the bird feeder out of scrap wood in our locker we designed to fit between the gap of the two miniature birdhouse it was attached via wood glue made of a 5x5 and 5x1. It was also attached to the main design with wood glue however it was so well cut glue wasn't really necessary



Final Product



Conclusion

We worked efficiently by dividing tasks based on our strengths. One of us would handle the cleanup while the other focused on the journal entry, or we would each focus on different types of cuts, which allowed us to work smoothly. However, there are several areas for improvement. First, while wood glue is strong, it isn't as secure as it could be. Using a nail gun to reinforce the joints would make them much stronger. Additionally, some of our bevel joints could be redone, as they aren't perfect.

Conclusion Again

Moving forward, we need to adjust and account for the depth of the wood when including measurements in our cut list. This would help ensure more precise cuts and prevent any wasted time or uneven pieces. If we were to do a similar project again, our first step would be to ensure our cut list is properly adjusted. Secondly, we would set more realistic time goals. Initially, we planned to build four miniature birdhouses, but due to time constraints, we couldn't complete them and ended up rushing. This led to a lot of rework, so next time, we'll aim for a more manageable target. With more realistic goals, we would have more time to focus on precision and accuracy with our cuts.