

Design Challenge: Making a Boat

In this activity, your child will be tasked to create a boat that can successfully float 25 pennies. They can be creative with how they make their boat and can use any household items. We have given instructions which you can use to guide your child through the design thinking process. We have also given step-by-step instructions for making a boat in case your child is stuck and needs some inspiration.



What You Need:

- Plastic straws
- Duct tape
- Plastic wrap
- Plastic container/Tupperware
- Mini paper cup
- 25 pennies set aside in a plastic bag
- Pen and paper for taking notes

What You Do:

1. Before your child gets to work, make sure that they fully understand the prompt of this challenge. Explain to them that they're supposed to use the materials you're providing in order to create a boat that will hold 25 pennies and stay afloat.
2. Ask your child some of the following questions so that they start thinking about why certain things float and why others sink:
 - a. Besides a boat, what are some things you know that float in water?
 - b. What are some things that sink in water?
 - c. Why do you think a boat is able to float? (Answer: the concept of buoyancy.)
3. Explain to your child that buoyancy is a force underneath an object that pushes it upward. When an object (like a boat) has more buoyancy, it can float higher on the water because it is being pushed upward with more force.
4. After your child fully understands the prompt of this challenge and has considered the properties of objects that float, they can begin **brainstorming** different ways to build a boat of their own.
 - Feel free to show your child all the materials you will provide, but don't let them start building just yet. Instead, have them draw or write down their ideas on a piece of paper so that they can refer back to them later. (You can also write them down if you'd like.)
5. Once your child is done brainstorming, ask them to choose the idea they think will work best. Be sure to ask them why they are choosing this design, emphasizing the purpose of the boat (to float 25 pennies).
 - This is an important step of the design thinking process because it teaches your child to prioritize the functionality of their design over personal preferences. This also prevents your child from getting emotionally attached to one design.
6. Next, allow your child to begin **building**. Be sure to supervise for safety purposes, but allow them to work independently through challenges as much as possible.
7. After your child is done building, it's time to **test** the design. Have your child place the 25 pennies on their boat, counting them aloud one by one. Then, fill a container with water to serve as a "pool" for the boat to float on. Next, have your child place their boat on the water and observe whether it successfully floats the pennies.
 - a. If your child's boat successfully floats with 25 pennies in it, congratulate them for their success!
 - b. If your child's boat sinks, make sure they aren't discouraged. Ask your child what they think went wrong and why. Then, encourage them to go back and repeat this process in order to make a boat that works next time.

Below, we have written instructions for building a boat in case your child is struggling to come up with ideas. Feel free to have your child build something entirely on their own, or use the procedure below:

1. First, take a piece of duct tape and stick some plastic straws to the adhesive side of the tape.
 - Ask your child why plastic straws are a useful item to make a boat out of. (Answer: plastic straws are buoyant, meaning they're able to float in water.)
2. Next, wrap your straws and duct tape in plastic wrap.
 - Ask your child why they think using plastic wrap is useful. (Answer: plastic wrap makes the boat "waterproof.")
3. Tape down the plastic wrap using duct tape to secure it in place.
 - At this point, you have finished building the boat's structure.
4. After your child has finished building their boat, have them tape down a small paper cup to serve as a weight holder for their pennies.
 - Ask your child why they think it's important to have a weight holder. (Answer: a weight holder balances out the weight of the boat, so it won't tip over when you place the pennies on top.)
5. Next, have your child add the pennies inside the cup one at a time, counting how many there are.
6. Finally, test out your child's boat!

