

Design & Build a Paddle Boat

Overview:

Participants will learn the parts of a pirate ship and the build and test a rubber-band-powered paddle boat.

Goals:

- Learn about ship anatomy
- Explore propulsion and energy by designing and building a rubber band powered paddle boat

Time Required: 60 minutes

Materials:

- Cardboard
- Duct Tape
- Rubber band
- Pencil
- Ruler
- Scissors
- Tub or pool to test boats

Vocab: propulsion, potential energy, kinetic energy, drag,

Procedure:

1. Begin the activity by exploring “Pirate Ship Anatomy” (see slides presentation).
2. Ask students to define “propulsion” (act or process of moving something forward)
3. Ask, “What do pirate ships use for propulsion?” (sails, wind)
4. Tell students, “Today, we will be using a rubber band to provide propulsion for our boats.”
5. Show students the video example of the duct tape paddle boat from science buddies – only show the first 5 seconds! (see slides presentation)
6. Briefly discuss and demonstrate how the rubber band / paddle provides the propulsion for our boat:
 - a. When you “wind up” the rubber band it stores energy called potential energy. When the paddle is released, that potential energy is transformed to kinetic energy which spins the paddle.
 - b. The paddle wheel on the boat works by transferring the rotational motion of the paddle to propulsive motion that pushes the boat forward.
 - c. The larger the paddle wheel blades the faster the boat will go. The bigger blade displaces more water pushing the boat faster.
 - d. Something else to consider: a pointed bow (front) minimizes drag from water resistance and helps the boat move through the water.



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7. Have students brainstorm and sketch out ideas for their paddle boat. Encourage them to draw a picture of their selected design that includes the measurements they will use.
8. Instruct students to use their design and measurements to cut out their boat from cardboard.
9. Cover the cardboard pieces with duct tape to make it waterproof.
10. To test your boat:
 - a. Stretch the rubber band across the gap on your boat.
 - b. Slide the paddle through the rubber band, twist it about 20 times.
 - c. Be sure to hold the paddle in place so it does not unwind!
 - d. Put your boat in the water and watch what happens.
11. Experiment:
 - a. What happens if you twist the rubberband 10 times? 30 times?
 - b. What other changes could you make to your design? Change the shape of the boat? Change the thickness of the boat? Change the design of the paddle?

Reflection:

1. How far did your boat travel?
2. What happens if you wind the paddle 30 times?
3. Were you successful? Why or why not?
4. What changes would you make to your design? Why?
5. Draw and label a picture of your final design.

Extension / Adaptations:

1. Give students a chance to redesign and improve their boats.
2. With younger groups, you may choose to provide a basic design for them to start with, and then let them make modifications.

Adapted from the following lesson:

Finio, Ben. "Build a Rubber Band Paddle Boat: Stem Activity." *Science Buddies*, 2023, www.sciencebuddies.org/stem-activities/rubber-band-paddle-boat.

Huff, Joseph. "Popsicle Paddle Boat." *Clover by 4-H*, National 4-H Council, 21 Sept. 2023, 4-h.org/clover/activities/popsicle-paddle-boat/.

