



Children's Museum of Houston

Pre/Post Classroom Activities

Boat Building

Rationale

FlowWorks gives visitors a chance to experiment with the power and properties of water. Water's natural physical and chemical properties come to life as the exhibit simulates a variety of natural phenomena, such as vortices and rapids, as well as human-created devices such as sprays and pumps. Visitors harness water's power through lock systems, boat building, and dams and, through various inquiry-based explorations, visitors have the opportunity to examine transformations of energy (ex. potential to kinetic or even kinetic to electrical) using water as a medium.

TEKS Objectives (Science)

- 5.2: The student uses scientific methods during field and laboratory investigations.
- 5.3: The student uses critical thinking and scientific problem solving to make informed decisions.
- 5.4A: Collect and analyze information using tools including calculators, microscopes, cameras, sound recorders, computers, hand lenses, rulers, thermometers, compasses, balances, hot plates, meter sticks, timing devices, magnets, collecting nets, and safety goggles.
- 5.7D: Observe and measure characteristic properties of substances that remain constant such as boiling points and melting points

Background

In this lesson plan, children become familiar with the concept of Archimedes' Principle (buoyancy) and how this concept relates to building a boat that will float. Archimedes' Principle states that the buoyant force on a submerged object is equal to the weight of the fluid that is displaced by the object. In order for an object to float, it must displace enough water to equal its weight, before it is fully submerged. An object will float if it weighs less than the amount of water it displaces. It will sink if it weighs more than the water it displaces. Differently shaped objects displace water differently, even if they are of the same material and have equal weight. This explains why huge steel ships float even though a ball of steel sinks. While in the exhibit, visitors will be able to test out their new found knowledge about buoyancy at the Currents' Boat Race Course by building boats and racing them. Back in the classroom they can use all of this knowledge to build and test out their own boats made out of recycled materials.

Vocabulary

Buoyancy – the ability to float.

Density – the measurement of how much matter is in a given amount of space.

Mass- the amount of matter an object has

Volume- the amount of space an object takes up

Archimedes Principal- the weight of an object is equal to the weight of the liquid that the object displaces

Bow- front of a boat

Stern- back of a boat

Hull- body of a boat not including the motor or sails

Keel- the “backbone” of a boat

Materials

- Tape
- Glue
- Thumb tacks
- Craft sticks
- Aluminum foil
- Yarn or string
- Variety of recycled materials that students can bring from home such as plastic bottles, margarine and other plastic containers, milk jugs, egg cartons, juice cartons, ice cream containers, etc. Be sure to remind students that they are not to bring glass, sharp metal, or any other possibly dangerous or hazardous material.

Procedure

Set Up: Review the Archimedes’ Principle with your students.

1. Challenge your students to design a boat out of recycled materials (either individually or as a partner/team challenge).
2. Once their design is complete, have them create their own boats out of the recycled materials.
3. Next, test them out to see which ones float.
4. Let your students have time to build and modify their creations, then have a class-wide contest.

Questions to ask

- What did you notice about the shape of the boats that floated?
- What did you notice about the shape of the boat that sunk?

Extensions

Test the boats to see which can hold the most weight by adding one washer (weight) at a time. Record how many washers each boat can hold on a class chart. Allow time for students to make modifications and retest.

Resources

<http://www.instructables.com/id/Pop-pop-or-put-put-steamboat-made-easy-for-children/> - this is a site with instructions on how to build a very simple steam-powered boat

<http://pbskids.org/zoom/activities/sci/sodabottleboat.html> - this website has a chemically powered (very safe) water bottle boat

<http://pbskids.org/zoom/activities/sci/survivalraft.html> - this challenge is a fun way to take this activity up yet another step

<http://en.wikipedia.org/wiki/Buoyancy> - more in-depth understanding of buoyancy and Archimedes' principle