

Buoyancy Business: Aluminum Foil Vessels

Learning Objectives

- Students will learn about buoyancy and how it relates to boats and other marine vessels.
- Students will explore different shapes and sizes to influence how buoyant an object is.

Activity Overview

- Students will create their own aluminum foil boat that safely floats on the surface of water.
- Students will use marbles to test the strength of their boat.

Standards Addressed

- **SC.3.N.1.1**– Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- **SC.3.N.3.2**- Recognize that scientists use models to help understand and explain how things work.
- **SC.5.P.13.4**- Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.

Materials

Item	Quantity Needed	Notes
Aluminum Foil	1-2 rolls	
Marbles	20	
Sensory Bin	1	<i>Special projects closet</i>

Preparation

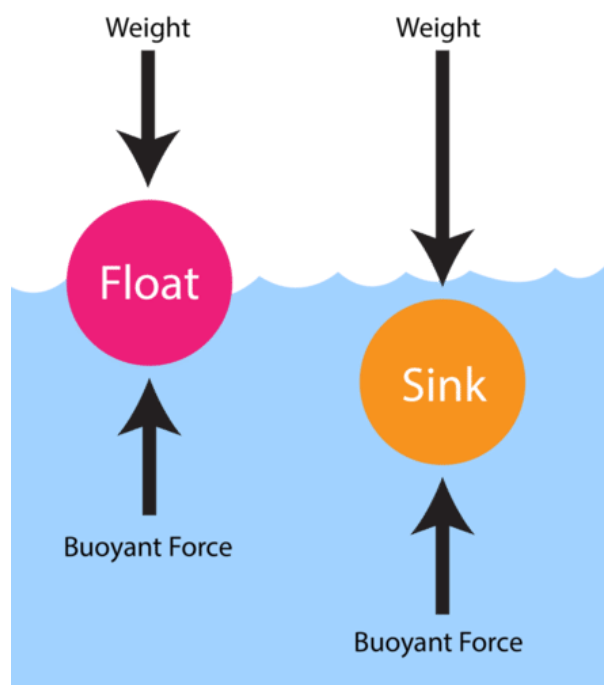
- Fill sensory bin with water and place it at the teacher table or another central area.
- Display PowerPoint on the screen.
- Tear aluminum foil so each group gets 5 pieces of foil.

Science Content

Buoyant force is the upward force that fluids (such as water or air) apply to any object placed in them. The ability of fluids to exert this force is called **buoyancy**. What explains buoyant force? Fluids can exert pressure in all directions. However, the pressure increases as we move deeper

into the fluid. Therefore, the fluid below an object exerts greater pressure than the fluid above it. This pressure difference creates an upward force on the object called buoyant force. In other words, the object experiences an upward force equal to the weight of the fluid it displaces. This is why objects less dense than the fluid they are in will float, while denser objects will sink.

Weight is a measure of the force of gravity pulling down on an object, whereas buoyant force pushes up on an object. Which force is greater determines whether an object sinks or floats. Look at the figure below. On the left, the object's weight is the same as the buoyant force acting on it, so the object floats. On the right, the object's weight is greater than the buoyant force acting on it, so the object sinks. Because of buoyant force, objects seem lighter in water. You may have noticed this when you went swimming and could easily pick up a friend or sibling under the water. Some of the person's weight was countered by the buoyant force of the water.



Source: www.flexbooks.ck12.org

Facilitation Guide

Engage (10 minutes)

1. Ask the class if they can think of any types of transportation technologies that travel across the water to get from place to place. Boats, submarines, etc.
2. Explain that Boats are vessels on water that are able to be pushed forward by a number of different things.
3. Ask the class why they think boats are important (Pause for responses) because the earth is nearly 70% water, most of the world is across some body of water. Since that's the case, engineers have designed boats to safely carry humans and goods across it all!
4. For boats to work they first must float, and for them to float they need to create something called buoyancy.
5. Briefly reiterate the main point that as long as a boat weighs less than the water it pushes forward it creates buoyancy. And that buoyancy is an object's ability to float on a liquid surface.
6. Inform the students that for the next activity, we will be working in pairs to create a buoyant boat out of aluminum foil.
7. Tell the class that we will use the testing tub to see not only if our boats can float, but how many passengers (marbles) our boats can hold as well, up to 20.
8. Before you pass out the materials, make sure you once again go over their goal to create a floating boat out of aluminum foil that can hold as many passengers as possible.

Activity (30 minutes)

1. Begin ripping out 5 sheets of foil per table pair. (Roughly the size of notebook paper)
2. Once all the groups have their materials, they may start working. Allow them around 10-15 min at least to create giving time warnings as it progresses.
3. As the groups work, encourage them to think of the ways boats look and remind them of their goals every couple of minutes.
4. For testing, groups can come up and place their boat in the sensory bin. Start adding marbles one by one until their boat either sinks or has gone through all 20 marbles.
5. After testing, students can improve their boat and test again.

Reflect (10 minutes)

- How do boats float?
- Was your boat able to float? Why or why not?
- Why are boats important for transportation?

Ideas for Extension or Adaptation

- Add more marbles.
- Add one more sheet aluminum foil or allow for tape.