



Whatever Floats Your Boat [ME]

Adapted from Teach Engineering

Grades: 9-12

Time: 45 minutes to 1 hour

Goals: To demonstrate the density property in relation to fresh and salt water and to understand how buoyancy in objects is changed because of the density property of water.

Objectives:

Students will be able to: determine the best boat design to float in certain densities of water; understand the principle of object buoyancy; and understand the density property of water and how it relates to fresh and salt water.

Materials:

- Plastic toy boats
- One clear pan per group
- Pennies
- Room temperature water
- Salt
- Measuring cups
- Plastic stirring spoon
- Paper towels

Procedures:

1. Pre-Activity (introduction): Divide the students into groups of four. Hand out the materials for each group. Explain the concepts of water density and demonstrate them by pouring water into two plastic cups and dropping one paper clip into each. The paper clip will sink. Add salt to one of the cups until the paper clip does not sink. Explain that salt water is denser than fresh water, so something that is normally heavy in fresh water will float better in salt water.
2. Activity: Have the groups designate who will pour the salt, who will add the pennies, and who will record the results of the experiment. Instruct the students to carefully pour water into their pan and float their toy boat on top. This becomes trial zero in the experiment. Add one penny at a time, keeping count, until the toy boat sinks under the water completely. Record the number, as this will be used to compare to salt saturated water. For the next few trials, have the students add one cup of salt each time and mix well. Repeat the experiment by floating the toy boat and adding pennies until it sinks. Record the results each time.



3. Post-Activity (review): Discuss with the class where freshwater and saltwater is located around the planet and how much of the planet contains this water. Discuss the concept of ice floating on top of saltwater at the poles, how freshwater melts and can change the properties of water, and the increase in temperature around the planet. Ask the students to describe the changes that will occur in specific ecosystems such as estuaries as more fresh water is added from rivers during a heavy rain storm or as more salt water is added with hurricanes or tropical storms.

Key Words:

Density
Salinity

Freshwater
Buoyancy

Saltwater

Background Information:

Adapted from COSEE West

If you have ever had the opportunity to float, without the aid of a floatation device (boogie board, raft, noodle, or floaties), in a pool or in the ocean, you will notice that your ability to float is different. It might appear easier to float in the ocean rather than in the pool and you don't have to try so hard to stay floating. The reason for this phenomenon is simple: saltwater has a higher density than freshwater. And when you are lighter than the water you are displacing, you are considered buoyant. It is also the reason large ocean-going vessels are able to stay afloat while carrying heavy cargo. Once they empty their cargo though, they must take on "ballast water" in order to stay buoyant in the water during their return voyage.

Because of their density differences, if you placed salt water and fresh water in a container, the salt water would sink and the fresh water would appear to float on top of it. This is true in an estuarine environment. Salt water from the ocean will come in with the tides and sink as it comes in contact with fresh water being drawn down from rivers and streams. If you were to take a salinity reading, you will be able to measure the amount of salts that are dissolved in the water. In the estuary, this reading will be higher towards the bottom and lower towards the surface. Also, the amount of salts in the water will increase as you move closer to the ocean and decrease as you travel further upstream.