Will it Float?

**Activity Overview**
This activity will show children how an object’s shape, size and material affect whether it will float or sink. In this activity, the elementary students will guess whether different objects will float or sink.

**Objectives**
The elementary students should learn:
- Some of the basic properties of water
- How the material and shape of objects affect their ability to float
- To determine which objects will float or sink
- How boats and ships float even though they are very heavy

**Materials**
- Large tank filled with water
- Rubber gloves (4)
- Towels for presenters
- Various objects to test buoyancy (solid ball, air filled ball, cork, feather, dice, rock, fork, orange, marbles, wood, apple, golf ball)
- Bucket (to fill the tank with)

**Setup**
- Fill the tank up with water
- Arrange various objects on the table for students to test if they float or sink in water

**Takedown**
- Be sure that all materials are in perfect working condition and that all of the materials are present.
- If there are any broken or missing materials, please notify the steward.

**Safety**
Ensure that the water in the tank is not consumed by anyone. When water gets dirty, replace with clean water.

**Vocabulary**
- **Mass** – a measure of how heavy an object is
- **Density** – the mass of an object per unit volume. For example, liquid is more dense than air so a litre of water weighs more than a litre of air. Density measures how tightly ‘stuff’ is packed together.
- **Buoyancy** – describes how well something floats

**What will I be doing? (Procedure)**

Before you start your presentation check with the teacher or chaperone that the entire group is present and ready to start.

Remember that doing an experiment and discovering the answer is more powerful than watching and listening to someone, so try to involve as many children as possible.

**PART 1:**
1. Welcome the students to the activity. Say: “Welcome to Will It Float? Today we will be learning how an object’s shape, size and material determines if it will float or sink”.

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2. Explain that the term buoyancy refers to the ability of an object to float in water. **Ask:** “Why do you think that some objects float and some sink?” Explain that an object floats when it is less dense than water. When an object has a greater density than water, such as a brick, it will sink.\(^1\)

3. Explain the term “density” (the amount of stuff or matter in a certain space). Show them two objects of the same size with different weights (e.g. rock and tangerine); this is because the rock has more matter/particles in the same space compared to the other object. Show them or let them see and feel the difference.

4. Choose some easier objects at first and let them guess which objects float or sink. Explain why they float or sink. (Refer to list of objects in “Materials” section.)

5. Next, choose more difficult objects and explain what affects whether they will float or sink.

6. Choose an item that is mostly water (maybe an apple or a balloon filled with water if you have one of these) and ask them what they think it will do. Then show them that it neither floats nor sinks. Explain that because they are mostly water, they are the same density as the water, so it will stay ‘neutral’ neither really floating nor sinking.

7. **Ask:** “How come when you’re in a pool and you stretch your body out flat you float. But, if you wrap your arms around your legs and curl up into a ball you sink?”
   **Answer:** “Well, it all has to do with how much water is pushing against you and a scientific principle called buoyancy or floatation. When you stretch out flat more water pushes against you. When you curl up into a ball, less water is pushing against you.”\(^2\)

(Older Students)
- How does a boat or ship carrying hundreds of pounds worth of stuff float while that same stuff would sink to the bottom of the ocean if dumped overboard?” Explain the science behind boats (see background info).

**PART 2: Review with the students what you have taught them in this activity**

**Specific Reminders for Students:**

- The ability of an object to float or sink depends on many things such as the object’s density relative to the surrounding water, whether or not the object is full of air, and how much water the object actually displaces (i.e. shape).

**Background Information:**

**DENSITY**

(All Students)
Different materials have different densities. Density is the amount of particles (mass) within a certain space (volume). Put simply, if mass is a measure of how much ‘stuff’ there is in an object; density is a measure of how tightly that ‘stuff’ is packed together. For example, the molecules in a rock are usually a lot closer together than in a piece of wood of the same size; the rock is a lot heavier than the piece of wood because it has a lot more matter/particles in the same amount of space.

Take a look at the two boxes below. Each box has the same volume. **If each ball has the same mass, which box would weigh more? Why?**

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\(^1\) Hands on Science, Level Five, p.130
\(^2\) http://www.spartechsoftware.com
The box that has more balls has more mass per unit of volume so it would weight more. This property of matter is called density.

(Older Students)
When two objects of the same volume (size) have different weights, the heavier one has the larger density, and the lighter one has the lower density. Let the students hold the rock and the orange and determine what has the higher density. Technically, density is the unit mass divided by its volume. (i.e. density = mass/volume). Mass is usually expressed in grams and volume in cubic centimetres, density is expressed in grams/cubic centimetre.

Buoyancy

(All Students)
Density of object determines if an object will float or sink in water. If an object is denser than water, it will sink, and if it is less dense than water, then it will float. This is why an anchor (very dense) sinks, but an inner tube (not very dense) float.

Buoyancy is the term used to describe how well something will float. If the weight of an object is less than the weight of the displaced fluid when fully submerged, then the object has an average density that is less than the fluid and has a buoyancy that is greater than its own weight.

If you were to experiment with your own buoyancy in a swimming pool you would find that when you stretch out flat more water pushes against you since your body is laid out over a larger area - hence you will float for longer. When you curl up into a ball, less water is pushing against you, which makes you sink quicker.

Some objects may look heavy but will float because they are filled with air (e.g. a hollow ball).²

(Older Students)
Why do ships float? Although a ship is very large and very heavy, the large surface area and hollow cavity within it allow it to float. When a Ship floats, it displaces some water aside. Ships float when the weight of the water that they push out of the way is the same as the weight of the ship. This explains why it is possible to make ships out of steel. As long as there are portions of the ship below the surface of the water that are hollow (i.e. contain air), the density of the ship is less than that of water even though the real density of the material (i.e. the steel the ship is made out of) is greater.³ Submarines can both float and sink. They sink by filling their hollow center with water (increasing their mass, thus increasing their density) and float by forcing water out (decreasing their mass, thus decreasing their density.)⁴

³ http://theory.uwinnipeg.ca
⁴ http://sciconn.mcb.arizona.edu/Sink_Float_lesson.html
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