Adapted to STEMAZing ECE Format by
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Density: Will It Sink or Will It Float?

NOTE: Children should always be given ample time to experiment, notice, and wonder before they are provided an explanation.

Always engage children with our two favorite questions:

What do you notice? What do you wonder?

Resist the urge to answer any questions children have while exploring. Instead, respond back with questions to children and let them make sense of the world. Sample questions you might use: What do you think? Do you notice any patterns? What could we change? Can we test something else? What can we try next? If children ask a testable question, which they could answer by doing an experiment, talk through with them how they might design a test to help answer their question. As much as possible and within reason, let them actually test their questions by trying the experiments they propose.

Vocabulary (See **What the heck? Explanation of Science** at the end for definitions.)

Density	Gas	Buoyancy
Mass	Liquid	Weight
Volume	Sink	Gravity
Fluid	Float	Force

Learning Objectives

Children will…

- discover that the density of an object determines whether it will sink or float in another substance.
- learn the rule for how density determines if an object will sink or float.
- learn that weight alone, which is an indicator of how much mass an object has, does not determine whether it will sink or float.

Materials

Two tea light candles with metal containers (look for candles in which the wax completely fills the metal container)

Clay (a small amount is needed – a ball about the size of a marble)

Water	Pencil or Pen
Ruler, paint stir stick, or similar	Clear plastic container or large cup

Key Question

How can you predict whether an object will sink or float before you put it in the water?

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Notice and Wonder Developmentally Appropriate Practice

1. Balance the ruler on a pencil or pen to create a simple balance.
2. Ask children which object is heavier and therefore has more mass?
3. After they make a prediction, put the candle on end of the balancing ruler and the clay on the other side. (NOTE: The clay should be lighter than the candle. If not, adjust the size of the clay until it is less weight than the candle.)
4. Pour water into a clear plastic container (or large cup) until it is about ½ full.
5. Ask the children to make predictions about whether the candle will sink or float. Also ask them to make a prediction about whether the ball of clay will sink or float. Give children ample time to either draw or write down their predictions.
6. Discuss why a heavier candle floats and a lighter piece of clay sinks.
7. Refer to the rule and make the connection that the candle must be less dense than the water because it floats. You might ask if they think a big boat is heavy or light. It is heavy and yet still floats. So, the weight of an object cannot be used to predict if it will sink or float.
8. Refer to the rule and make the connection that the ball of clay must be more dense than the water because it sinks. You might show them a small pebble, even smaller than the ball of clay, and show that it is really light but still sinks because it is more dense than water. Again, the weight of an object does not predict if it will sink or float. You need to know something about its density.

Extensions for Additional Learning

Collect other objects and let children predict if they will sink or float and then test them out. Be sure to use the rule to explain why things sink or float. An object floats because it is less dense than water. An object sinks because it is more dense than water. You might also look up video clips from David Letterman when he did his “Will It Float?” bits.

Take the ball of clay and form it into a boat. Ask children why they think it now floats. What changed about the boat? What must this have done to its density? The clay shaped like a ball is more dense than water and therefore sinks. The clay formed into the shape of a boat is less dense than water and therefore floats.

AZ Early Learning Standards

Science Standard - Strand 1: Inquiry & Application - Concept 1: Exploration, Observation & Hypotheses
The child observes, explore, and interacts with materials, others, and the environment.

Science Standard - Strand 1: Inquiry & Application - Concept 2: Investigation
The child researches their own predictions and the ideas of others through active exploration and experimentation.

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What the heck? Explanation of the Science (Vocabulary in bold.)

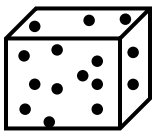
These phenomena can all be explained using density. What is density? Technically, **density** is the ratio of an object's **mass** to its **volume**. **Mass** is the amount of matter in an object. **Volume** is the size of the object.

IMPORTANT NOTE: Mass is not the same thing as the weight of an object. **Weight** is the **force** (pull) due to **gravity** on an object. For example, your mass (the amount of matter you are made up of) would not change if you were standing on the Moon's surface. However, your weight would change (it would be less) because the strength of gravity on the Moon is less than the strength of gravity on Earth. It should also be noted that the weight of an object does not determine whether it sinks or floats in a fluid. **Fluid** is a term used to describe either a gas or a liquid. So, air (a **gas**) is a fluid and water (a **liquid**) is a fluid. The density of an object compared to the density of the fluid it is in determines whether it will sink or float. More on this below.

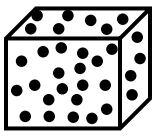
In equation form: $$density\ (\rho) = \frac{mass\ (m)}{volume\ (V)}$$

Density is a measure of how much matter is packed into an object. You cannot easily compare the density of two **solid** objects unless they are both the same mass or both the same volume (size).

Two solid objects with the same volume but different masses.



Less Dense



More Dense

If two solid objects are the same size, as shown above, then the one with less mass is less dense. The object with more mass packed into the same volume is more dense. The more matter packed into a certain volume or object, the greater its density. If it has less matter packed into a certain volume, then it is less dense.

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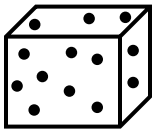
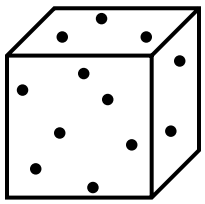
Two solid objects with the same mass but different volumes.



More Dense



Less Dense

If two solid objects have the same mass, as shown above, then the one with a smaller volume is more dense. The object with the same amount of matter spread throughout a larger volume is less dense. If an amount of mass is packed into a smaller volume, the density is greater than the same mass packed into a larger volume.

So, what determines if a solid object will **sink** (fall to the bottom) or **float** (rise to the top) of a fluid?

Here is the rule:

A solid object will **SINK** if it is MORE DENSE than the fluid it is in.

A solid object will **FLOAT** if it is LESS DENSE than the fluid it is in.

Video Lesson: https://bit.ly/SciShowKidsSinkFloat

NOTE: An object DOES NOT sink or float because it is lighter or heavier. The weight of an object DOES NOT determine if it will sink or float. The object's density compared to the fluid it is in, as noted in the rule above, is what determines if it will sink or float. Just because an object is heavy, or weighs a lot, does not mean it will sink. Think about a big ship, which weighs a lot, and still floats. It floats because it is less dense than the water it is in. Just because an object is light, or weighs a small amount, does not mean it will float. Think about a small pebble, which weighs just a little, but will sink when placed in water. The small pebble sinks because it is more dense than the water. **PLEASE be careful to reference density and not weight when describing why something sinks or floats.**