

2nd Grade - Lesson 4.1

Float and Sink

Teacher Background

One of the properties of an object is whether it sinks or floats in water. In this lesson, students predict and test a variety of objects to see which ones sink or float. Students notice that objects made from metal and rubber sink, but objects made from wood and wax float. Students are guided to the conclusion that wood and wax have the characteristic property of floating in water, and that metal and rubber have the characteristic property of sinking in water. Through an animation, students see that this is true even if the wood is very heavy and the metal is very light.

Note: Metal and rubber can be made to float if they are shaped and molded in a special way. To investigate sinking and floating in this lesson, wood, metal, wax, and rubber, are considered as solid blocks, spheres, or other solids without special shapes.

“Density” Not Directly Addressed

The questions of *why* wood and wax float and *why* metal and rubber sink are not addressed in the lesson. Explanations based on density and related concepts are difficult even for students in higher grades. It might be tempting to explain that if something has its weight packed into a small space, it is dense and sinks. And if something has its weight spread out over a bigger space, it is less dense and floats. This could lead to the misconception that only small objects sink and larger objects float and would also be contradicted by students’ observations in the lesson. At the second grade level, it is very difficult for students to grasp the idea of a ratio of an amount of mass per unit of volume, so using the concept of “density” as an explanation is unlikely to work.

Density Refresher for You

If it’s been a while since you’ve thought about floating and sinking, here is the basic idea: An object floats in water if its density is less than the density of water. An object sinks in water if its density is greater than the density of water.

Density is determined by the mass and volume of an object, and is expressed by the equation:

$$\text{Density} = \text{mass/volume or } D=m/v$$

Mass is a measurement how much matter is in an object, and is typically measured in grams (g) or kilograms (kg). **Volume** is a measurement of the amount of space an object takes up, and is typically measured in centimeters cubed (cm³) for solids, and milliliters (mL) for liquids.

The mass of water is known to be 1 g/mL or 1 g/cm³. If an object has a density greater than 1 g/cm³, it is more dense than water and will sink. If it has a density less than 1 g/cm³, it will float. For example, a penny is made out of zinc (7.14 g/cm³) and copper (8.96 g/cm³) so it sinks in water. The density of a popsicle stick is around 0.75 g/cm³ so it floats in water.

There are other explanations of sinking and floating that are related to density but stated differently: An object floats if the mass of water displaced by the object is equal to the mass of the object. This explanation is useful in explaining why a boat made of a dense material like iron or steel can float. If the material is molded and shaped in such a way that the boat displaces a mass of water equal to the mass of the boat, it will float.



There are other explanations that use a more physics-based approach and rely on the concept of the “buoyant force” to explain why an object floats or sinks. But for second graders, it is enough that they realize that certain types of materials float and that others sink and that this is true no matter how heavy or light they are.