



# DENSITY

## Teacher Notes

---



### **FOURTH GRADE BACKGROUND**

- Fourth graders can perform multiplication, but they are just learning division
- The students probably haven't talked about density
- Their only experience with density was a third grade exercise called "Float or Sink"

### **PREVIOUS LESSON REVIEW**

- What did you learn last month about volume?
- How do we measure the volume of a cube? How do we measure the volume of a liquid?
- Review "displaced volume" to calculate the volume of an object.

### **INTRODUCTION**

An important property of matter is density. Density can be thought of as the amount of matter that is stuffed into a fixed space or, more technically, as the mass of matter divided by its volume. For example, an empty desk is less dense than the same desk filled with books and pencils. The desks occupy the same amount of space (volume), but the full desk has more material (mass). When discussing density with the students, the following ideas need to be made apparent.

- If you pack more mass into the same volume, it's denser
- If you pack the same mass into a smaller volume, it's denser
- If an object has more mass, that doesn't necessarily mean it's denser

One way to introduce the topic of density is to revisit states of matter with a demonstration. We have three containers of equal volume: each filled with a solid, liquid, or gas. A solid has the greatest number of particles in the container, a liquid has an intermediate number of particles, and a gas has the fewest number of particles in the same container. Other demonstrations to clarify the concept of density are to compare a table tennis ball and a golf ball. The tennis ball and golf ball are the same shape; however, the table tennis ball is less dense because it is hollow and the core of a golf ball is solid. To explore the topic of relative density, the students can compare objects' densities by placing them in a cup of water. Objects that are denser than water will sink to the bottom of the cup, while those less dense will float at the top.

### **DISCUSSION THOUGHTS**

Why do things sometimes float on water? Why does a balloon float when filled with helium but not with air?

### **VOCABULARY**

- **Density:** The amount of matter "stuffed into a fixed space"
- **States of Matter:** The three states of matter are solids (fixed shape and volume), liquids (fixed volume and shaped by the container), and gases (filling the container)

### **ACTIVITIES**

- **Liquid Density Demonstration**
  - Pour some corn syrup into a graduated cylinder. Next, pour the dyed water gently into the cylinder by flowing it down the side (the water can mix with the syrup if poured too vigorously). Finally, pour some vegetable oil into the graduated cylinder. The liquids will separate into red, blue, and clear layers based upon their densities. The oil is least dense and floats on the top and the corn syrup is most dense and sinks to the bottom.
  - Objective: Show that liquids with different densities will separate based upon their densities
  - Materials:
    - Corn syrup dyed with red food coloring
    - Vegetable oil
    - Water dyed with blue food coloring