

Density Rainbow Experiment

Florida State Standard: SC.8.P.8.3 – Explore and describe densities of various materials through measurement of their masses and volumes.

Florida State Benchmark: SC.8.P.8.4 – Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured.

A. TEACHER: Mr. Barbado

B. GRADE LEVEL: 6-8

C. SUBJECT: STEM/Science

D. DATE: 11/6/2024

E. DURATION: 45-60 minutes

F. LESSON FOCUS: Understanding the concept of density and how differences in density cause liquids to layer without mixing.

G. MATERIALS:

- Clear plastic or glass container (e.g., tall glass or beaker)
- Honey or syrup
- Dish soap
- Water
- Vegetable oil
- Rubbing alcohol
- Food coloring (optional for visibility)
- Dropper or spoon (for careful pouring)
- Small objects (optional, for testing density of solids)

H. LESSON OBJECTIVES:

1. Students will define density and describe how it affects the layering of liquids.
2. Students will conduct a hands-on experiment to observe density in action.
3. Students will record and interpret observations about the layering of liquids with different densities.
4. Students will apply the concept of density to explain why some objects float and others sink.

I. PROCEDURES:

1. INTRODUCTION (10 minutes):

Begin by discussing density as a property of matter that determines how “heavy” a substance is for its size. Explain that in today’s experiment, students will see how liquids with different densities create layers. Ask students if they have ever seen oil float on water and use this example to introduce the concept of density differences.

2. EXPERIMENT (20 minutes):

- **Step 1:** Pour honey or syrup into the clear container to form the bottom layer. Explain that it has the highest density.

- **Step 2:** Carefully add dish soap on top, observing that it forms a separate layer.
- **Step 3:** Add water, optionally colored with food dye, slowly to create the next layer.
- **Step 4:** Pour vegetable oil carefully above the water.
- **Step 5:** Top off the layers with rubbing alcohol (use a different color if desired).

Explain to students that each liquid sits on top of the one with a higher density, creating a “density rainbow.”

3. **OBSERVATION (10 minutes):**

- Instruct students to record their observations of each layer, noting any changes and differences between each liquid.
- Ask them to predict what would happen if small objects (like beads or grapes) were dropped into the container. Allow students to test their hypotheses and observe how objects settle at different layers based on density.

4. **GENERALIZATION (10 minutes):**

Discuss as a class why the liquids did not mix and how the experiment demonstrates density in real life. Review how density affects layering and why substances with lower density rise above those with higher density. Ask students to think of other real-world examples, like oil spills or the separation of oil and vinegar in salad dressings.

5. **ASSESSMENT:**

- **Formative:** Ask students to define density in their own words and explain why some liquids layer above others.
- **Summative:** Have students complete a short worksheet where they:
 - List the liquids used and rank them by density.
 - Draw the layers and label them.
 - Write a brief explanation of why density causes liquids to layer.

Note 1: Safety

Students should handle all liquids carefully, especially rubbing alcohol, which is flammable. Ensure that students do not ingest any materials used in this experiment. Encourage careful pouring to avoid spills and reinforce the importance of keeping their workspace clean to prevent contamination and slipping hazards.

Note 2: Accommodations for ELL and ESE Students

For English Language Learners (ELL), visual aids and pre-teaching vocabulary (such as “density,” “layer,” and “float”) can support understanding. ESE students benefit from hands-on assistance and step-by-step instructions. Pairing students to work collaboratively allows peer support, and providing written and visual instructions on a worksheet helps reinforce learning. For both ELL and ESE students, offering sentence starters and visuals can improve engagement and comprehension.