Exploring Density
Lesson Plan

Name:

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Course Name: 7th Grade Science

Core Curriculum Standard(s) Fulfilled:

Standard I: Students will understand the structure of matter.

Core Curriculum Objective(s) Fulfilled:

Objective 2. Accurately measure the characteristics of matter in different states.

2a: Use appropriate instruments to determine mass and volume of solids and liquids and record data.
2b: Use observations to predict the relative density of various solids and liquids.
2c: Calculate the density of various solids and liquids.

Intended Learning Outcomes (ILOs) Fulfilled:

Intended Learning Outcome 1a: Use Science Process and Thinking Skills: Observe objects and events for patterns and record both qualitative and quantitative information.
Intended Learning Outcome 3a: Demonstrate Understanding of Science Concepts and Principles: Know and explain science information specified for their grade level.
Intended Learning Outcome 4a: Communicate Effectively Using Science Language and Reasoning: Provide relevant data to support their inference and conclusions.
Intended Learning Outcome 4b: Communicate Effectively Using Science Language and Reasoning: Use precise scientific language in oral and written communication.

Time Needed to Complete Inquiry:

One to two 45 minute class periods.

Approach: This is a constructivist approach to introducing the concept of density.

Prior Knowledge Needed: What background knowledge and skills do the students need to be prepared for this inquiry? How will they obtain it?

Since it is an introductory concept, no prior knowledge will be required.

Introduction: Tell how you will introduce the inquiry to your students to make it meaningful and relevant.

See procedure. Part 1.

Materials/Resources Needed for the Investigation:

- 40 mL of vegetable oil
- 40 mL of water dyed red
- 40 mL of corn syrup
- 250 mL glass beaker
- popsicle stick
- paperclip
- pasta
- piece of crayon
- four small cups
- 30 pennies (all should be post – 1982, 1982 and earlier pennies are heavier)
- piece of corner molding to be used as a fulcrum
- ruler
- piece of wood approximately 30 cm long, 3 cm wide and 2 – 3 mm thick

Procedure:

1. Teacher will supply (or have students get) about 40 mL of vegetable oil, colored water, and corn syrup in three separate containers. Have the students then pour these three liquids (in any way they desire – even all at once) into the 250 mL beaker. The liquids will separate with the corn syrup on the bottom, water in the middle, and vegetable oil on top. Have the students compare their results. Ask the students "how could it be that everyone got the same end result?" The most likely answer will be that the corn syrup is "heavier" than the others.

2. Hold up a small amount of corn syrup and a large amount of vegetable oil and ask "which is heavier?" Some guidance may be required to have the students come to the conclusion that equal "amounts" (volumes) of corn syrup would be "heavier" than vegetable oil. "How can we test your hypothesis?" The students should come to the conclusion that they could "weigh" (mass) equal volumes of each liquid. You may wish to break here for the following class period to finish the activity, but save the beakers for the conclusion of the next day's activities.

3. Give the students three paper cups. Using the ruler, have students mark up from the bottom of the cup 1 cm, stressing that this will be the equal volume that they will mass. Have them fill the cups to the appropriate level with each liquid.

4. Give the students the fulcrum, small board, and a cup with some pennies. Remind them of balancing a "teeter-totter," and how masses are balanced. They are to find the mass of their volume of liquid in pennies. Have them create a table to record their data. Have students present their data on the classroom whiteboard (chalkboard).

5. Now comes the FUN part. Have the students deduce that it is not the "heaviness" of the liquid that determines how the liquids layered out, but the "heaviness for the same amount." Introduce units for density (g/cm^3).

6. Have the students drop the piece of popsicle stick, the paperclip, the piece of pasta, and the piece of crayon into the 250 mL beaker that contains the corn syrup/water/vegetable oil combination.

Assessment:

Have the students predict (give a range) what the mass in pennies for a cup filled to the 1 cm line with melted down paperclips, finely grounded pasta, solid wood, and melted down crayons would be.

Have students write a working definition for *density* that includes the terms “mass” and “volume” in it. An example could be “Density is the amount of mass in a given amount of volume.”