



Scientist demo: Density

Time: 45 Minutes

Skill Level: Elementary (age 6–11)

Background

What is Science Inquiry?

Children are natural scientists. From a very early age they explore the world, ask questions and seek answers. This journey of exploration and discovery is Science Inquiry. Science Inquiry helps young people understand their environment, solve problems and gain knowledge about scientific ideas and processes.

Next Generation Science Standards (NGSS)

Science and Engineering Practices

1. Asking questions
6. Constructing explanations
7. Engaging in argument from evidence

Disciplinary Core Ideas

PS1: Matter and its interactions

Crosscutting Concepts

1. Patterns
2. Cause and effect: Mechanism and explanation
3. Scale, proportion, and quantity

Objective

In this demonstration, students will develop important scientific skills (observation, prediction, and analysis) as they watch a density column of liquids be constructed.

Intro to Scientists

Scientists perform research to better understand nature from physical, mathematical, and social perspectives. The word scientist comes from the Latin word, *scientia*, meaning *knowledge*.

Scientists may be motivated in different ways—by curiosity about the world around us, the desire to improve people's health or benefit the greater good, or even to develop new materials and processes.

Scientists utilize a variety of skills in their everyday work, including the science and engineering practices described above. While curiosity often comes naturally, aspiring scientists will want to develop excellent *observation* skills, so that they can accurately record their findings. Observations commonly use vision and hearing. However, with proper safety precautions, observations may utilize other senses such as touch, smell, and taste. It's also important for scientists to develop strong *communication* skills, so they can share their results with others.

Materials List:

Graduated cylinder
Plastic cups
Honey
Light Karo syrup
Dish soap
Water
Vegetable oil
Rubbing alcohol
Lamp oil
Food coloring
Scale

Prep ...For each liquid, measure the same amount (e.g., 4 oz) into two plastic cups (i.e., create two sets of the seven liquids, using a total of 14 plastic cups). Optionally, you can add food coloring to the clear liquids, however, the addition of food coloring may affect the density of the liquid and thus how it layers.

Discuss ...What do students know about the different liquids? Are some thick? Sticky? Greasy? Thin? What's going to happen if we pour the liquids into the cylinder?

Predict ...Generate Ideas. Select a Solution

Experience “What to Do”- What is the plan for the investigation? Demonstrate making a seven layer column as follows: Pour each liquid slowly into the center of the cylinder, making sure it doesn't touch the sides of the cylinder. It is okay if the liquids mix when you are pouring—the layers will settle out eventually because of the varying densities. Pour the liquids in the following order:

1. Honey
2. Karo syrup
3. Dish soap
4. Water
5. Vegetable oil
6. Rubbing alcohol
7. Lamp oil

Share ...Encourage students to discuss their observations. What causes the layers?

Reflect ...**Analyze and interpret the data and results. Discuss among the group.** Why did some liquids settle at the bottom whereas others settled at the top? Remind students that we used the same *amount* of each liquid—but does each have the same weight? To test, have the students use a scale to measure the mass of each liquid (using the second set of seven cups). Why are some liquids heavier than others? We can think of those liquids as having more molecules packed into the same amount of space. In other words, they have a greater *density* (i.e., mass per unit volume).

Generalize ...**to real world examples. Construct explanations.** Where else do we talk about density? (Examples include: population density, air density, etc.)

Apply ...**outside the classroom or club meeting.** Ask for examples of other objects that look similar but have different densities (a small bouncy ball and a marble; a lump of flubber and a lump of clay, etc.)

Additional resources:

- This experiment is based on an activity designed by Steven Spangler, available on his website, <http://www.stevespanglerscience.com/lab/experiments/seven-layer-density-column>

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Agriculture Sciences & Natural Resources, Family & Community Health, 4-H Youth, Forestry & Natural Resources, and Extension Sea Grant programs. Oregon State University Extension Service offers its programs and materials equally to all people.