

# Air Has Pressure

## Summary

Using a bottle and a hard boiled egg, students will see that air exerts pressure. They will analyze evidence about particles of matter and demonstrate the role of motion in the particulate description of matter.

## Main Core Tie

SEEd - Grade 6

[Strand 6.3: EARTH'S WEATHER PATTERNS AND CLIMATE Standard 6.3.2](#)

## Time Frame

2 class periods of 45 minutes each

## Group Size

Small Groups

## Life Skills

Thinking & Reasoning

## Materials

For the teacher:

Hard boiled eggs

Matches

Paper towel

Small jar (with an opening large enough to let the egg almost pass through)

## Background for Teachers

The mixture we know as air is made of tiny particles of matter. The movement of these particles in the air causes air pressure. We are at the bottom of the atmosphere and have about 400 miles of air pushing down on us. The atmosphere exerts about 14.7 pounds of pressure on each square inch of our bodies. High and low pressure systems have an important effect on our weather. This activity will help students understand air pressure as it relates to the particulate nature of matter.

## Intended Learning Outcomes

Make observations.

Make predictions.

Identify variables and identify relationships.

Plan investigations.

Understand science concepts.

Prepare written reports.

## Instructional Procedures

1. Ask the students: What is pressure? (the application of force per unit area). Discuss things that exert pressure. What causes pressure? Does air exert pressure? How do we know?

2. Tell students that today they will see a demonstration of air pressure.

*Note: The following instructions are for a teacher demonstration. For safety reasons it is best that the*

*teacher perform the demonstration. Be sure that the demonstration is performed in an area visible to all students. Also, use a bottle with a mouth just smaller than the diameter of the egg. It is very wise to practice the demonstration before performing it in front of students.*

3. Peel the egg. Set a small piece of paper on fire and drop it into the bottle. Place the hard boiled egg gently on the opening of the bottle, small end first. The egg may "dance" and wobble on top of the opening. Then, when the flame has been extinguished, the egg will appear to be pulled into the bottle.

4. In small groups, discuss why the egg went into the bottle. Then discuss results as a class. *(As flame heated the air, the air particles began to move more rapidly. Some of the air particles escaped causing the egg to wobble. When the fire was extinguished, the air particles began to cool and slow down. The egg sealed the bottle and trapped a reduced amount of air in the bottle. This caused the air pressure inside the bottle to be less than the air pressure outside the bottle. The greater air pressure on the outside pushed the egg into the bottle.)*

5. Define air pressure: air particles push on all surfaces that they touches. This push is called air pressure. Allow students to discuss in their groups how they could use air pressure to get the egg out of the bottle without cutting the egg. Keep in mind the first demonstration. As a class, discuss the students' ideas. Have the students decide which ideas will work and which ideas probably will not.

6. Once students have decided on a way to use air pressure to remove the egg from the bottle and have explained why they think their idea will work, implement their plan.

7. Discuss the results. Was the egg removed from the bottle? Why or why not? Discuss the method as a class and relate what they tried to air pressure. If the first attempt did not work, implement another plan. Even if the first attempt did work, try other student ideas. Discuss the result of each attempt to remove the egg.

IMPORTANT: Do not show the students how to remove the egg using air pressure until you have tried several of their plans. After attempting their plans, you may show them one way to remove the egg using air pressure.

8. Hold the bottle upside down with the small end of the egg in the bottle neck. Remove any pieces of the burned paper towel. Tilt the bottle down until there is a small opening between the neck of the bottle and the egg and blow hard into the bottle making a closed seal with your mouth. Before you remove your mouth, tilt the bottle upside down until the egg settles in the mouth of the bottle. Move your mouth and the egg should come out. (The air pressure is greater inside the bottle so it pushes the egg back out.)

9. Have the students as a group or as individuals write the explanation of this activity in their own words. Why did the egg go into the bottle? Why did the egg go out of the bottle? What evidence does the demonstration give that air is made of tiny particles? What evidence does the demonstration give that particles move? What is the effect of heat on the motion of particles? What is air pressure? Where was the air pressure the greatest each time? Why was the air pressure different? Ask the students to design an experiment that demonstrates the motion of particles.

### Extensions

Talk about things that would cause differences in air pressure. For example, deserts are very hot. Air over a desert would be heated and would rise. You could also discuss what type of weather accompanies a rise or fall in air pressure. For example, high pressure usually means good weather.

### Assessment Plan

1. Assess the students' proposed methods of removing the egg for scientific accuracy. Are their proposals based on an understanding of how science works?
2. Assess the students' written explanations of what happened for scientific accuracy. Do they understand the principles involved?

3. Assess the students' plans for an experiment that illustrates the motion of molecules. Do they understand how science works? Do they understand the science concepts involved?

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