

Air, Air—It's Everywhere!

Purpose

- Understand what air is and where it is.
- Understand why it's important for our air to remain clean and healthy.

Time Requirements

- One or two 30-45 minute sessions

Subject Areas

- Mathematics
- Science
- Health Education

The air we breathe is all around us. Good, clean air gives us the oxygen we need to breathe. Even though we usually can't see or feel the air, it is there. Ask the class when they can see the air and when they can feel it. Having this discussion outside can be effective if it's a clear day with some breeze blowing. The following science experiment activities illustrate that air is made of matter, does take up space, and is very important to our health.

Activity 1: Mystery of the Upside Down Glass of Water

Grades K-5

Objective:

Students or teacher will demonstrate the forces of air pressure.

Background:

Air pressure is the force exerted on you and everything around you by the weight of tiny particles of air (mostly oxygen and nitrogen molecules). Although air molecules are invisible, they still have weight and take up space.

TEKS:

Mathematics

- Grade K: 6A, 10A, 14A
- Grade 1: 7A, 11B, 12A, 13
- Grade 2: 7A, 12B, 13A, 14
- Grade 3: 11C, 14C, 15B, 16A, 17B
- Grade 4: 11B, 14B, 15A, 16B
- Grade 5: 10A-B, 12B, 14B, 15A, 16B

Science

- Grade K: 1A, 2D, 4B
- Grade 1: 1A, 2D, 4A
- Grade 2: 1A, 2C, 2E
- Grade 3: 1A, 2A, 3D, 4B
- Grade 4: 1A, 2A, 2C-D, 3A, 4B
- Grade 5: 1A, 2A, 2C, 3A, 4B, 12D

Health Education

- Grade K: 7A
- Grade 1: 6A, 7B, 8B
- Grade 2: 5A-B, 6B

- Grade 3: 6A-D, 7A
- Grade 4: 6A-B, 7A
- Grade 5: 7A, 8D

Time:

5-10 minutes

Materials:

- 12-ounce plastic cup
- Water
- Sink, bathtub, or large container to catch any water spill
- 5 x 8 index card or plastic lid (cottage cheese lid)

Directions:

1. Fill the cup almost to the top with water.
2. Place the lid over the mouth of the cup.
3. Gently hold the cup in one hand and hold the lid in place with the other hand.
4. Over the sink, turn the glass upside down with one hand while still holding the lid in place with the other hand.
5. Once the cup is completely upside down, slowly remove the hand that is holding the lid in place.
6. Ask, "Can you figure out why the lid stayed stuck underneath the cup? What force holds the lid in place?" It's air pressure.

Extension:

Try this experiment with larger size plastic cups or containers and larger lids, and see if there is any difference between the sizes used.

Activity 2: Air Blaster

Grades 1-3

Objective:

Demonstrate the forces of air pressure and velocity.

Background:

Air is made of matter (mostly nitrogen and oxygen molecules). Even though air is invisible, it takes up space. When you hit the bottom of the milk jug or squeeze the plastic container, you are reducing the size of the container, and this increases the pressure within it. This increased pressure pushes some of the air out of the container, and you feel a blast of air. Air velocity!

TEKS:

Mathematics

- Grade 1: 7A, 11B, 12A, 13
- Grade 2: 9B, 12B, 13A, 14
- Grade 3: 15B, 16A, 17A-B

Science

- Grade 1: 1A, 2B, 2D-E, 4A-B, 7A
- Grade 2: 1A, 2B, 2D-F, 4A, 7A
- Grade 3: 1A, 2B-D, 6A, 8C

Health Education

- Grade 1: 6A, 7B, 8B
- Grade 2: 5A-B, 6B, 7A
- Grade 3: 6A-C, 7A

Time:

5-10 minutes

Materials:

- Empty clean plastic 1 gallon milk jug or plastic mustard/ketchup bottle
- Napkins or paper towels
- Masking tape

Directions:

1. Cut the napkin into five strips that are about 2 inches wide.
2. Find a suitable place indoors or outdoors where there is little or no air movement.
3. Tape the top of each napkin to the edge of an object (bookshelf, table, fence, etc.). Make sure each strip is about 2 inches apart.
4. Stand at least 3 feet away from the napkin strips.
5. Hold the bottle in one hand and aim its mouth at the napkin strips.
6. Quickly pat the bottom of the bottle or quickly squeeze it with your other hand to hit one or several napkin strip "targets" with a blast of air. It will take a little practice to hit each one individually.
7. Try the experiment again. This time tape the opening to make the hole smaller. How does it affect the blast of air? Try blasting your friends from a distance. How far can your blast go?

Activity 3: Breathing and Exercise

Grades 4-5

Objective:

Students will observe and record how breathing changes with physical activity.

Background:

Air is essential to life. Humans and other animals use the oxygen they breathe along with the food they eat to produce energy. Increased physical activity raises the body's energy demand, increasing consumption of oxygen and nutrients. When we exert ourselves, we notice an increase in breath rate. This is our respiratory system's response to increased energy demand.

More air flowing in and out of our lungs increases our exposure to air pollution. As a result, active children, adults, and athletes are more vulnerable to the unhealthy impacts of air pollution. During episodes of unhealthy levels of air pollution, public health officials advise reducing vigorous outdoor activities (e.g., soccer, running).

TEKS:

Mathematics

- Grade 4: 12, 15A, 16A-B
- Grade 5: 11A, 12B, 16A-B

Science

- Grade 4: 1A, 2A-E, 3A, 4A-B
- Grade 5: 1A, 2A-E, 3A, 4A-B

Health Education
- Grade 4: 2A, 6A-B, 7A
- Grade 5: 8B, 8D

Time:

15-30 minutes

Materials:

- Stopwatch, watch, clock, or timer
- "Breathing and Exercise - Activity Worksheet" to record and chart data

Directions:

1. Have students form research teams of two or three persons. In the two-person groups, one student will time and record data, while the other student will be the research subject. In the three-person groups, one student will time, one will record data, and the last will be the research subject. Each team member takes a turn as the research subject. The teacher or a student can be the timer for the whole class if there are not enough watches for each group.
2. Hand out a stopwatch and worksheet to each team. Each team will write its prediction on the worksheet, answering the question, "Does a person breathe more or less during exercise?"
3. **Breathing at Rest.** The subject is sitting down. The timer/recorder will give the subject the following instructions: "When I say start, begin counting your breaths. Breathe normally." The timer tells the subject to start. After one minute, the timer asks the subject how many breaths he or she has taken. The timer records the number on the worksheet under the subject's name.
4. **Breathing during Exercise.** The timer/recorder tells the subject, "When I say start, begin jumping up and down. After 15 seconds, I will say stop. Stop jumping and immediately start counting your breaths." The timer tells the subject to start. After 15 seconds, the timer tells the subject to stop jumping. After an additional 15 seconds, the timer asks the subject for a breath count. The recorder writes the number of breaths on the worksheet and multiplies it by four. The timer asks the subject, "Were your breaths deeper while you exercised?" The recorder writes down the answer.
5. Repeat Steps 3 and 4 until each team member has been the subject.
6. Compare results. Have each team make a chart or graph showing the results of their research (e.g., number of breaths counted after exercise compared to number of breaths counted at rest). One member of the team presents the team's prediction and results to the class. Discuss the variety of results. What other variables could cause widely varying results (e.g., physical condition, respiratory illness such as asthma)? How could the results for the whole class be shown?

Resources:

Classroom Materials [PDF]

- [Breathing and Exercise - Activity Worksheet](#)
- [Breathing and Exercise - Activity Worksheet Example](#)