



Air Quality Lesson

Warm-Up:

Air Phrases matching game. (See Attachment)

Pass out phrases and meanings (separately). Have students find their correct match.

Is air really there?

- **Paper walking:** Afterwards, explain that the force holding the paper in place when the student ran was air. *Make the point that even though air is invisible, it exerts pressure.* When you run, the air pushes against you, working to hold the piece of paper against your body. While walking, the paper did not stay in place because the air was not pushing very hard against your body. (5)
- **Paper bag (is there air in the bag?):** Hold up a paper bag and ask the students if there is anything in it. Have the students open the lunch bag and look inside. Next, blow into the bag and hold the top tight with your hand.
- **Balloon in Bottle:** Try to blow up the balloon! After the experiment, discuss why the balloon did nothing. (Answer: Because air takes up space, the bottle was full of air. When you try to blow up the balloon, the air trapped inside the bottle prevents the balloon from inflating.) (5)
- *Make the point that even though air is invisible, it still takes up space.* Also, discuss how engineers need to know how much space air takes up so they can design filtration systems that are large enough to treat the polluted air created by cars, power plants and factories.

Outdoor Air Pollution

Writing #10:

- Quick-Write Prompt: "Today's lesson topic is Air Pollution. What is air? What components make up air? What is air pollution?"
- Pair & Share with partner.
- Share with class.

Air Composition (pie chart): M&M©s

Overview: Make pie chart that reflects clean air using multicolored candy, M&M©s work great. Then make pie chart that reflects air outside of a power plant.

- Explain that air is made up of many different things, and that each different colored M&M© represents a different "ingredient."
- Have students sort their M&M©s by color (7 brown, 2 red and 1 yellow and 3 blue)
- Arrange **7 brown, 2 red, and 1 yellow** M&M©s in a circle on a blank sheet of paper, with like colors together and the sides of the M&M©s touching. The extra blue M&M©s will be used later.
- Trace around the circle. Estimate the center of the circle and mark it with your pencil.



- Draw a line from the center of the circle to the points at which the colors change on the circle of M&M©s
- Label each section with the color and number of M&Ms
- Write the fraction that represents each "pie piece" (the number of each color of M&M©s divided by the total number of M&M©s).
- List the fractions from largest to smallest. (Answer: 7/10, 2/10, 1/10)
- Tell the students that the **brown represent nitrogen (N₂) at 78%**, the **red ones represent oxygen (O₂) at 21%**, and the **yellow ones represent argon (Ar) at 0.9%**. Some other elements also exist in the air that are too small for the pie chart. They include neon (Ne), helium (He), methane (CH₄), krypton (Kr), hydrogen (H₂), nitrous oxide (N₂O), xenon (Xe) and carbon dioxide (CO₂). These gases make up the remaining 0.1%.
- Next, tell students they are going to make a new graph representing the air outside of a power plant. Ask them if they think this air is safe to breathe.
- Arrange **5 brown, 1 red and 1 yellow, 3 blue** M&M©s in a circle on a blank sheet of paper, with like colors together and the sides of the M&M©s touching.
- Trace around the circle. Estimate the center of the circle and mark it with your pencil.
- Draw a line from the center of the circle to the points at which the colors change on the circle of M&Ms (you should draw three lines).
- Label each section with the color and number of M&M©s.
- Write the fraction that represents each "pie piece" (the number of each color of M&M©s divided by the total number of M&M©s).

Speaking and Listening #1 and Speaking and Listening #2:

Class open discussion prompt: "What do you notice about the differences in the two representations?"

(Side note: This air has been polluted; it has more blue M&M©s [carbon dioxide, methane, etc.] and fewer red M&M©s [oxygen]. People need oxygen to breathe and because less oxygen is in the air around this power plant, more effort should be made to reduce the amount of pollutants the plant releases into the air.)

Writing #5:

Revise Quick-Write Prompt: "Looking back at what you wrote before the M&M© activity, what more do you know about the components that make up our air?"

Causes of Air pollution (Make a list with partner)

Writing #10:

Quick-Write Prompt: "What are the causes of air pollution?"

Reading #1, Reading #2 and Speaking and Listening #1:



Types of Air Pollution, Reading activity (See Attached). In groups, students read about the 5 types of air pollution. Highlight key points and then share with the class.

- ✓ Methane
- ✓ Ozone
- ✓ Particulate Matter
- ✓ Carbon Monoxide
- ✓ Sulfur Dioxide

Exploratory Activity. What is going on in Southwestern PA Air: Air Quality Index/Breathe Cam/Breathe Meter (breatheproject.org)

- Compare your city's air quality with other cities in the US on the Breathe Meter.

Writing #5 or Writing #2

- Revise Quick-Write Prompt.

Indoor Air pollution

Writing #10:

- Quick-Write Prompt: "What is indoor air pollution? Who does it affect?"
- Pair & Share.

PowerPoint slides

Sources of indoor air pollution PowerPoint activity (hand out strips of paper from EPA website) Match pollutant with room in house.

<http://www.epa.gov/iaq/iaqhouse.html>

Speaking and Listening #1:

- Review quick-write prompt and compare to new knowledge on subject as a class discussion.

Activities:

Make your own air freshener.

Store-bought air fresheners are not always healthy. They can contain phthalates (which can disrupt our hormones) and synthetic fragrances (and companies do not have to tell us what makes up a "fragrance"). Many of these air fresheners significantly lower our indoor air quality. If you really still need your house



or classroom to smell good, make your own air fresheners with healthy ingredients! Measure ½ cup baking soda and 25 drops essential oil of your choice and put into cup or open jar. Mix well and enjoy!

Explore the Air with Speck Monitors.

Speck monitors measure particulate matter 2.5 in the air. Place Speck monitors at “stations” containing different materials that may or may not show up on the monitor. Stations can contain, air fresheners, flour, baby power, sand, dry soil, hairspray, etc. The students may also want to come up with materials to test. To make sure the monitor stays safe, teachers can make a 2 foot radius around the Speck using tape. Speck monitors can be used indoors or outdoors. Students can log their readings on a data sheet (included) and compare/analyze as a class.

Additional Resources:

Pollution: Unwanted chemicals or contaminants found in the environment. Pollutants can harm human health, the environment, and property. Air pollutants occur as gases, liquid droplets, and solids. Once released into the environment, many pollutants can persist, travel long distances, and move from one environmental medium (e.g., air, water, land) to another.

Healthy Schools PA Map- Air Emission Sources: <http://www.healthyschoolspa.org/places>

“Legal Responses to Indoor Air Pollution” –Frank B. Cross (book)

“Air Pollution” –Rhonda Lucas Donald (book)

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