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There's Something in the Air

The Science of Air: Activity 10

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There's Something in the Air

This activity's objectives are aligned with the National Science Education Standards, specifically those related to Science as Inquiry and Physical Science. There's Something in the Air uses guided inquiry to illustrate that most air pollutants are invisible particles that travel through and are dispersed in the air.

In this activity, students will compare the dispersal of odors indoors and outdoors as a model for the movement of pollutants in indoor and outdoor air. Students will discover that although odors often disperse in the air outside, they can become concentrated in indoor environments. Students will make predictions and observations, record and compare data, and draw conclusions based on their investigation. Science concepts addressed in this activity include the following.

Concepts

- Ⓢ Many kinds of gases and particles travel through, and become dispersed in air.
- Substances in air become and remain concentrated in enclosed spaces.

Reference

Moreno N., B. Tharp, and J. Dresden. (2011). *The Science of Air Teacher's Guide*. Third edition. Baylor College of Medicine. ISBN: 978-1-888997-74-3. Development of this student activity was supported, in part, by grant numbers R25 ES06932 and R2510698 from the National Institute of Environmental Health Sciences of the National Institutes of Health to Baylor College of Medicine.

Image Reference

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Key Words

lesson, teaching slides, air, indoor air, air particle, ppm, odor, odors, dispersion, smoke, cigarette smoke, smoking, secondhand smoke, ETS, tobacco, fumes, chemicals, cleaners, pesticides, paints, asbestos, lead, dust, asthma,

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Materials



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Materials

Teacher Materials

- 48 meters of string or heavy yarn
- 6 metric tape measures or meter sticks
- $\frac{3}{4}$ -in. roll of masking tape
- Stopwatch with a second hand, watch, or classroom clock
- Orange, vinegar, air freshener

Setup

Before conducting this activity, measure and cut string or yarn into six-meter pieces. Arrange the eight pieces on the floor like spokes of a wheel around a central point.

With a marker or pieces of tape, make lines at the two-meter, four-meter, and six-meter points on each piece of string/yarn. Adjust these distances from the center depending on the size of your classroom.

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Science Safety Considerations

- Follow all instructions.
- Begin investigation only when instructed.
- Do not eat or drink anything during the experiment.
- Take caution when walking near the strings on the floor.
- Report accidents.



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Science Safety Considerations

Safety first! Students always must think about safety when conducting science investigations. This slide may be used to review safety with your class prior to beginning the activity. Also, keep the following points in mind.

- Always follow your district school safety guidelines.
- Have a clear understanding of the investigation in advance. Practice any investigation with which you are not familiar before conducting it with the class.
- Make sure the appropriate safety equipment, such as safety goggles, is available.
- Continually monitor the area where the investigation is being conducted.

References

1. Dean, R., M. Dean, and L. Motz. (2003). *Safety in the Elementary Science Classroom*. Arlington, VA: National Science Teachers Association.
2. Moreno N., B. Tharp, and J. Dresden. (2011). *The Science of Air Teacher's Guide*. Third edition. Baylor College of Medicine. ISBN: 978-1-888997-74-3. Development of this student activity was supported, in part, by grant numbers R25 ES06932 and R2510698 from the National Institute of Environmental Health Sciences of the National Institutes of Health to Baylor College of Medicine.

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What Is in the Air?

- Have you ever noticed a funny smell in the air?
- Have you ever seen smog?
- What is pollution made of?
- Is it bad for us to breathe polluted air?



What Is in the Air?

To focus students' attention, ask the class, *Have you ever smelled a funny or bad smell in the air?* Prompt them to give examples of unusual smells they have encountered, and to mention where they noticed these odors.

Follow by asking if students ever have noticed a cloud of smog on the horizon of a city. Ask, *What is smog?* Explain that smog is outdoor air pollution. Ask, *What is pollution made of?* Remind students of the dust particles they observed in the activity, "*Dust Catchers.*" *Mention that dust particles also are a form of pollution.* Ask students, *Is it bad for us to breathe polluted air? If so, why?*

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Image Reference

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http://upload.wikimedia.org/wikipedia/commons/7/7c/Los_Angeles_Pollution.jpg

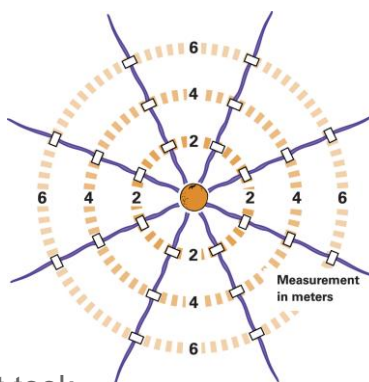
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Let's Get Started

1. Divide into three groups.
2. Your group will be assigned to sit at a position on the "String Wheel."
3. Raise your hand when you smell the odor of an object, such as an orange, vinegar, or air freshener.
4. Record the amount of time it took for each group to smell the odor.
5. Repeat the activity outdoors.



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Let's Get Started

In this activity, students compare the dispersal of odors indoors and outdoors as a model for the movement of pollutants in the air. They should discover that many small particles travel through and are dispersed in the air we breathe. Students also make predictions and observations, record and compare data, and draw conclusions based on their investigation.

Divide the class into three groups. Tell the members of one group to sit on the two-meter marks of different pieces of yarn. Similarly, arrange the second group on the four-meter marks and the third group on the six-meter marks.

Stand in the center of the "String Wheel," holding an orange. Tell the students that they should raise their hands as soon as they smell the scent of the orange. Begin to peel the orange, and slowly turn around. Record the time it takes for approximately three-fourths of the students at each distance to raise their hands.

On the board, create a class graph showing the time it took for students sitting at each distance to smell the orange. Leave the graph on the board. You may wish to repeat the experiment using things such as vinegar and air freshener.

Repeat the entire experiment in an outdoor location. After returning to the classroom, make a second graph, using the same scale as on the first, to show the time required

for odors to travel outdoors.

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Let's Talk About It

- Based on the data from your graph, who smelled the odor first: students at two or six meters?
- Did you smell the odor more quickly indoors or outdoors?
- Was the odor stronger indoors or outdoors?
- Did everyone smell the odor when indoors?
- Did everyone smell the odor when outdoors?



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Let's Talk About It

This activity allows students to understand how odors disperse in indoor and outdoor air. Students may find that many odors become more concentrated indoors than outdoors.

As a class, compare the two graphs (information gathered indoors and outdoors) and identify the differences between them. Ask, *Did you smell the odor more quickly indoors or outdoors? In which location was the odor stronger? and Could everyone smell the scent in both locations?* (In most cases, the scent will be noticed more quickly indoors. However, air currents indoors and breezes outdoors may affect the results. Discuss these variations with the class.)

Prompt a class discussion about how pollutants travel in the air. Relate this experiment and student observations to the way particles travel through air, and how pollutants can become concentrated in indoor environments.

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The Science of Air Pollution

- Indoor pollutants come from tobacco smoke, pollen, dust mites, and other sources.
- Pollutants often are at higher concentrations indoors than outdoors because the air in modern buildings is re-circulated.
- Pollutants travel through, and are dispersed in the air we breathe.



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The Science of Air Pollution

During this activity, students observed the following properties of air.

- **Many kinds of gases and particles travel through, and become dispersed in air.** In homes with a fireplace or a family member who smokes, indoor pollutants can include gases such as carbon monoxide, as well as particles like those that make up soot and tobacco smoke. Other indoor pollutants, such as pollen, spores, insect parts and droppings, and dust mites come from biological sources.
- **Substances in the air remain more concentrated in enclosed spaces.** Because many modern homes and buildings are designed to save energy by preventing air leaks or the introduction of outside air into heating or cooling systems, the concentration of many of these compounds is much higher indoors than outdoors. This often causes airborne chemicals and other substances to build up indoors.

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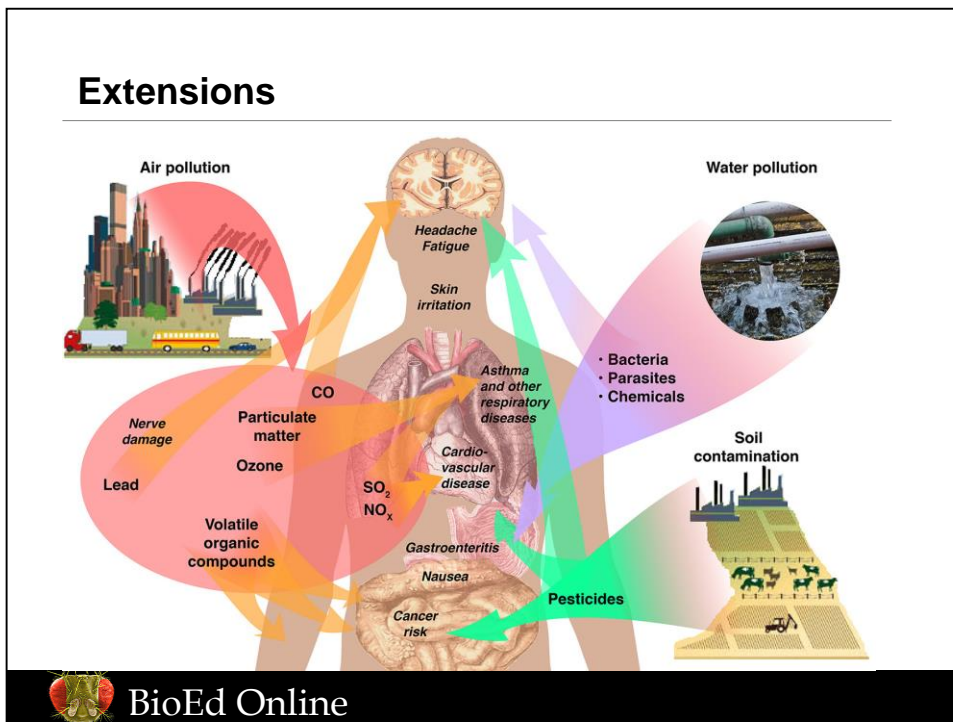
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Extensions

Encourage students to suggest variations of the investigation they just completed. For example, stand in front of a fan or other source of moving air while peeling the orange. Have students predict whether this variable (more rapid movement of air) will affect the distribution of orange scent throughout the room.

Mention that many kinds of gases and particles float in the air continually. Ask, What happens when things floating in the air get trapped inside a room? What if one of these pollutants is a harmful gas? How can pollutants in air enter our bodies? How can pollutants harm our bodies? and *What can we do to reduce pollution?*

Lead a class discussion about things we can do to prevent harmful substances (like dust, chemicals, or pollen) from building up inside our classrooms or homes.

Image Reference

Haggstrom, M. (2009). Pollution health effects. Retrieved 07-28-2010, from http://en.wikipedia.org/wiki/File:Health_effects_of_pollution.png.

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