

PSI:

PHYSICAL SCIENCE INVESTIGATION



Teacher's Lesson Description

Title	Can It Be?
Brief Description of Videos	In these videos, students will watch as Danté crushes a can by using changes in air pressure. This experiment demonstrates the relationship between air pressure and air temperature.
Time Needed	1 or 2 class periods depending on the extensions chosen
Ohio Science Benchmarks Addressed	Physical Science, 6-8 Benchmark A Earth and Space, 6-8 Benchmark C Scientific Inquiry, 6-8 Benchmark A and B Scientific Ways of Knowing, 6-8 Benchmark A and C
Ohio Grade Level Indicators Addressed	Physical Science Benchmark A <ul style="list-style-type: none">• 7th Grade Nature of Matter Indicator 1 Earth and Space Sciences Benchmark C <ul style="list-style-type: none">• 7th Grade Earth Systems Indicators 3 and 6 Scientific Inquiry Benchmark A <ul style="list-style-type: none">• 6th Grade Doing Scientific Inquiry Indicators 1 and 2• 7th Grade Doing Scientific Inquiry Indicators 3 and 4• 8th Grade Doing Scientific Inquiry Indicator 1 Scientific Inquiry Benchmark B <ul style="list-style-type: none">• 8th Grade Indicator 3 Scientific Ways of Knowing Benchmark A <ul style="list-style-type: none">• 6th Grade Nature of Science Indicator 2 Scientific Ways of Knowing Benchmark C <ul style="list-style-type: none">• 6th Grade Science and Society Indicators 3 and 4

<p>Concepts Developed</p>	<p>Students will be able to explain that:</p> <ul style="list-style-type: none"> • Air exerts pressure. • Temperature affects the amount of pressure exerted. • There are sets of procedures that guide scientific investigations. • Safety considerations and appropriate tools are always required. <p>The extensions give students experience with several indicators within Scientific Inquiry and Scientific Ways of Knowing standards.</p>
<p>Lesson Rationale</p>	<p>Demonstrates that air exerts pressure and that pressure is affected by temperature. This lesson will guide students through Scientific Ways of Knowing and the inquiry process.</p>
<p>Background Knowledge for Teachers</p>	<p>Review the “teacher video” segment and student video segments.</p> <ul style="list-style-type: none"> • Air has mass and exerts a force called pressure. • Air pressure exerts force in all directions. • Air pressure can increase or decrease as a consequence of temperature changes.
<p>Classroom Procedures</p>	<p>Before viewing the video remind students they will be watching a segment titled “Can It Be?” They will be asked to participate in classroom activities, ask questions and draw conclusions about science phenomena, and complete a reflective activity that prepares them for the short answer or extended response items on the Ohio Achievement Tests in Science.</p> <p>After viewing and discussing the classroom video segments students will be completing the simple lab; “A Candle Barometer.” This lab sets up conceptual learning that relates to the 7th grade Earth and Space indicator #6, which expects students to identify weather instruments used to collect data (barometer). (See the Charles Law Internet activity at.</p> <p>http://www.pz.harvard.edu/ucp/curriculum/pressure/s3_reinforcement_charles.pdf It will help teachers their understanding of what students will be observing.)</p> <p>Note: Teachers must review laboratory safety procedures as they pertain to the use of fire with their students and have them wear goggles.</p>

If you choose to have students establish their own laboratory procedures, use the PSI Investigation Sheet found in the resource section.

Problem:

“Does the amount of air pressure affect the height that water will rise in a closed system?”

Background Knowledge:

Have students collect information from the video and place it in this section.

Procedure:

1. Take a small piece of clay and place a birthday candle into the center.
2. Place the candle and clay in the center of a 9” plastic plate securing it to the plate.
3. Place 2 washers on either side of the candle.
4. Fill the plastic dish so that it covers the mouth of an overturned 250 beaker.
5. Note the water level in the beaker.
6. Remove the beaker.
7. Light the candle.
8. Cover the candle with the beaker.
9. Observe the level of water in the beaker.
10. Record all observations.
11. Repeat this investigation with 2 candles, 3 candles, etc.

Data Collection:

These will be observations about the movement of water in the beaker and the dish.

Conclusion:

Students should state that the change in pressure on the inside of the beaker and the outside are different and therefore, the water rises and falls. They should be able to identify the high- and low- pressure areas and draw a diagram to illustrate this concept.

Extend the learning by explaining that this is the way that a barometer helps us record the air pressure for place to place.

The video allows several points where it is paused and questions are asked that the students are

	<p>expected to respond to in their laboratory journals. Below you will find the questions as they appear in the video. Have the students respond to the following questions as they watch the video:</p>
Materials Needed	<p>Birthday candle, clay, small dish (Petri or plastic), washers, 250 mL beaker (tall clear glass), matches, and goggles.</p>
Science Connections	<p>This allows the opportunity to teach phase change of matter. The fundamental design of barometers as a measurement tool for relative changes in air pressure is clearly demonstrated by the candle activity.</p>
Additional Web Resources	<p>Little Shop of Physics Marshmallow Mash http://littleshop.physics.colostate.edu/Videos/Pressure/marshmallows/marshmallows.html</p> <p>Science Net Links: Properties of Air http://www.sciencenetlinks.com/lessons.cfm?Grade=3-5&BenchmarkID=4&DocID=156</p> <p>Harvard University Physics Project Zero: Barometer Experiments http://www.pz.harvard.edu/ucp/curriculum/pressure/s3_reinforcement_charles.pdf</p> <p>PALS Project: Build a Barometer http://pals.sri.com/tasks/5-8/Barometer/directs.html</p> <p>NASA Kids Resources on Air Pressure http://kids.earth.nasa.gov/archive/air_pressure/# Search for more Web pages related to this topic at the Ohio Resource Center http://www.ohiorc.org/for/science/Default.aspx</p> <p>Classroom Safety: http://membership.acs.org/c/ccs/pubs/chemical_safety_manual.pdf</p> <p>Search the National Science Digital Library: http://nsdl.org/</p> <p>Find more science teaching lessons at Teacher's Domain: http://www.teachersdomain.org/</p>

Ohio Science Standards Abbreviations:

ES – Earth/Space Science

SI – Scientific Inquiry

LS – Life Sciences

ST – Science and Technology

PS – Physical Sciences

SW – Scientific Ways of Knowing

