

PSI:

PHYSICAL SCIENCE INVESTIGATION



Teacher's Lesson Description

Title	What's the Deal?
Brief Description of the Video	In this video segment, students will watch as Danté demonstrates that air can generate pressure in all directions on everything in the atmosphere.
Time Needed	1 or 2 class periods
Ohio Science Benchmarks Addressed	Earth and Space, 6-8 Benchmark C Physical Science, 6-8 Benchmark B Scientific Inquiry, 6-8 Benchmark B Scientific Ways of Knowing, 6-8 Benchmark C
Ohio Grade Level Indicators Addressed	Earth and Space Benchmark C <ul style="list-style-type: none">• 7th Grade Earth Systems Indicators 5, 6, and 7 Physical Science Benchmark <ul style="list-style-type: none">• 8th Grade Forces and Motion Indicator 3 Scientific Inquiry Benchmark B <ul style="list-style-type: none">• 7th Grade Doing Scientific Inquiry Indicator 5• 8th Grade Doing Scientific Inquiry Indicator 3 Scientific Ways of Knowing Benchmark C <ul style="list-style-type: none">• 6th Grade Science and Society Indicator 3• 7th Grade Science and Society Indicator 3•
Concepts Developed	Students will be able to explain that: <ul style="list-style-type: none">• Air has mass.

	<ul style="list-style-type: none"> • Air exerts pressure in all directions. <p>Students will develop scientific inquiry habits of mind.</p>
Lesson Rationale	Students should understand and be able to describe that air exerts pressure in all directions in the atmosphere. Air pressure can be used to create unbalanced forces. Air pressure can be mathematically calculated.
Background Knowledge for Teachers	<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.
Classroom Procedures	<p>As the video begins, students are asked to make their prediction about what will happen. Students should write their predictions in their laboratory journal. Title it prediction.</p> <p>This is a good opportunity for the class to record predictions and vote on the one they think is most likely. They should discuss and reach agreement as a class on one prediction. Will the water stay in the jar or will it fall out?</p> <p>During the video, where Dante’ says: “Explain why or how one playing card can hold up a jar of water?”</p> <p>Now have the students title the next section of their report as <i>Student Explanation</i>. While the video is paused, have students observe the jar and water. They need to think about what is in the jar, what is touching the jar, and what is outside the jar. Have them draw a diagram that they think explains what will happen.</p> <p>Ask students to review their prediction. If they were correct, how can they explain what happened? If they were incorrect, what do they think caused the water to stay in the jar? Allow time for students to respond. As they are responding to this question, circulate around the room and look at the students’ drawings. Prompt students to develop their explanations and incorporate all of the parts that they included on their drawing. They should consider what’s happening inside the jar, outside the jar, and with the card. What is in the jar? What is outside the jar? What is touching the jar? What happened to the card that made it stay there? (A teacher tip that helps</p>

students focus ideas is for them to highlight, circle or underline every time they discuss the words air, water, or the card.)

Continue the video. Once Dante' asks them to explain, stop the video and allow students to review what they wrote and make any changes they might have at that time.

Continue the video. Have the students label the next section as *Scientific Explanation*. This is done on the board as a total class discussion. The points that must be emphasized are:

Air has mass.

Air exerts pressure in all directions in the atmosphere.

Air on the outside of the jar exerted more pressure on the card than the 2 pounds of water on the inside of the jar.

This is what allowed the card to hold the water in the jar.

Now the teacher should tell students that high air pressure moves to low air pressure. (You could use a weather map to show how H's and L's are used to demonstrate areas of high pressure and low pressure.) Based on this concept place an H and an L on the appropriate places in the diagram. (H on the outside of the jar and an L on the inside of the jar.)

Several links for weather maps and related information are:

www.weather.com

<http://www.edheads.org/activities/weather/index.htm>

AT THIS TIME, YOU MAY WANT TO USE THIS VIDEO AS AN INTEGRATED ACTIVITY WITH YOUR MATH TEACHER or TEACH THESE CONCEPTS YOURSELF.

Dante' has told the students that the jar held a little over 900 grams of water or 2 pounds of water.

The opening to the jar measured 2.5 inches in diameter or 1.25 inches radius.

Using the formula for the area of a circle, the area of this jar's opening is 4.9 square inches or almost 5 square inches.

The pressure downward is 0.4 pounds/square inch (2 pounds divided by 4.9 square inches) times 4.9 square inches or 1.96-pounds/square inch.

The pressure upward is 14.7 pounds/square inch times 4.9 square inches or 72.0-pounds/square inch.

Materials Needed	Paper/laboratory notebook
Science Connections	This gives teachers a great opportunity to connect weather data and weather map reading to the concept of air pressure. Students are asked to read, construct, and interpret data in a variety of forms.
Additional Web Resources	<p>EdHeads Weather Investigations: http://www.edheads.org/activities/weather/index.htm</p> <p>Air Pressure and Weather: http://www.weather.com</p> <p>Teacher's Domain: Lifting with Air http://www.teachersdomain.org/resources/phy03/sci/phys/matter/zlift/index.html</p> <p>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