PSI:
PHYSICAL SCIENCE INVESTIGATION

wviz ideastream℠

GREAT LAKES Science Center

Teacher's Lesson Description

Title	**What's The Difference?**
Brief Description of the Videos	Dante demonstrates that air moves because of differences in air pressure. Air movement is difficult to see because air is usually non-visible. Air moves in predictable ways because of differences in air pressure.
Time Needed	2 class periods
Ohio Science Benchmarks Addressed	Grades 6-8 Earth and Space Science Benchmark C Grades 6-8 Scientific Ways of Knowing Benchmarks A,C
Ohio Grade Level Indicators Addressed	Grade 7 Earth and Space Science Indicators 5, 6, 7
Concepts Developed	Air is around us, moving and exerting pressure. The movement and pressure of air is a factor in determining our weather. *Teacher Note: The main factor contributing to Earth's weather is* ***energy from the sun*** *and heat convection on the Earth's surface that contributes to global wind patterns.*
Lesson Rationale	The video demonstrations are designed to provide students with content knowledge about differences in air pressure and the movement of air. This lesson is designed for students to make connections between the weather associated with high and low air pressure. Students will participate in an inquiry experiment activity and then apply learned content knowledge by interpreting weather using a map depicting high and low pressure.

Background Knowledge for Teachers	Review the teacher segment *What's the Difference* at the PSI web site. In the segment, Dante explains how the student segments can be used and models effective techniques that promote inquiry in the classroom.
Classroom Procedures	1. After viewing the student segments and conducting classroom discussions, tell the students that they are going to learn how to make basic weather predictions using air pressure. 2. Project the current weather map from The Weather Channel web site (http://www.weather.com). Ask students what letters they see on the map (H for high pressure and L for low pressure). Next, hold up a cup of water and a laminated paper. Tell the students that they are going to conduct an experiment with the cup, water, and laminated paper that connects to the H's and L's found on the weather map. 3. Provide each group of students with a container, cup, laminated paper, and access to water. Have them follow the student directions and you should circulate the room assessing inquiry skills and lab responses. _____ Student Directions: 1. Fill the cup ¾ full with water and place the card over the entire top of the cup. 2. Hold the card against the cup with one hand. Hold on to the cup with your other hand. 3. Holding the card in place, turn the cup upside down over the container. Let go of the card. It should stay put, held up by nothing but air pressure! **READ WITH LAB PARTNERS**------Air pressure pushes in all directions, including up. It is easily strong enough to hold up the weight of the water in a cup. The card acts as a seal, keeping air out of the cup as you turn it upside down. Air pressure determines weather too. **High air pressure** usually means fair skies with perhaps a few clouds. **Low air pressure** often brings clouds and precipitation.

High pressure (H) moves towards Low pressure (L). Draw a picture of this experiment and label where the H and L are. Clue: Think about what kept the card in place and there is a different air pressure inside the cup versus outside the cup!

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4. Engage the class in a discussion about what happened in their experiment. Lead students to the conclusion that low pressure is in the cup and high pressure is outside the cup. That same concept applies to weather and is the reason why the letters H and L are found on weather maps.

5. Display the Predicting Weather web site http://www.ussartf.org/predicting_weather.htm and read the High and Low Pressure section.

6. Lead the class in making conceptual connections between the cup experiment and air pressure in weather.

7. Project the current weather map from The Weather Channel web site and look closely at cloud cover at low pressure versus high pressure fronts.

8. Use the map to predict cities and states that may be in the path of high or low pressure fronts. Will these cities/states experience clear/fair skies or cloud cover and precipitation?

9. Congratulate your students on a good job of handling pressure!

As another activity, you can have students conduct their own experiment with pressure differences. As in the teacher explanation video, have students make the following device:

Cut a single drinking straw in half and tape part of it inside a plastic cup. Fill the cup with water so that the bottom of the straw is below the water's surface. If students blow across the top of the straw in the cup by using the other half of the drinking straw, they can create enough pressure difference to make the water come out of the cup thorough the inserted straw. You can present this as an inquiry activity, or as an assessment activity to see if your

	students can explain that the air pressure pushing down on the water allows it to rise in the column of the straw if the pressure above the straw is reduced. This is actually the physics principle behind drinking with a straw. We decrease the pressure inside our mouth when we sip on a straw, and the outside air pressure forces the liquid up and out. This is also a principle that was considered as the barometer was invented. Most spray bottles and squirt guns, or soakers, use a similar principle: increasing the air pressure inside (or decreasing the pressure outside) will force liquids to move from areas of high pressure toward the lower pressure. Water/air pressured toy rockets (available at many dollar or discount stores) provide another example of using air pressure to move things in predictable ways.
Materials Needed Per Group	Cup, Water, laminated paper just large enough to cover cup, container. Plastic cups, drinking straws (straight straws work better than flex straws), and water.
Science Connections	Differences in air pressure connect to several everyday situations such as drinking from a straw, suction cups, and vacuum cleaners. These everyday examples of air pressure can be integrated into a science process inquiry investigation.
Additional Web Resources	USA Today Ask The Experts: Air Pressure http://www.usatoday.com/weather/resources/askjack/wfaqpres.htm BBC Air Pressure http://www.bbc.co.uk/weather/features/understanding/airpressure.shtml How Stuff Works: Under Pressure http://science.howstuffworks.com/weather2.htm NASA World Book of Weather: http://www.nasa.gov/worldbook/weather_worldbook.html

Ohio Science Standards Abbreviations:

ES – Earth/Space Science	LS – Life Sciences	PS – Physical Sciences
SI – Scientific Inquiry	ST – Science and Technology	SW – Scientific Ways of Knowing