

PSI:

PHYSICAL SCIENCE INVESTIGATION



Teacher's Lesson Description

Title	How Egg-Sighting
Brief Description of the Videos	In these videos, students will watch as Danté demonstrates the relationship between unbalanced forces as he uses air pressure to pop an egg into a bottle.
Time Needed	1 class period
Ohio Science Benchmarks Addressed	Physical Science, 6-8 Benchmark B Scientific Ways of Knowing, 6-8 Benchmark A Science Inquiry, 6-8 Benchmark A and B
Ohio Grade Level Indicators Addressed	Physical Science Benchmark B <ul style="list-style-type: none">• 8th Grade Forces and Motion Indicator 3 Scientific Ways of Knowing <ul style="list-style-type: none">• 8th Grade 8 Nature of Science Indicator 1 Scientific Inquiry Benchmark A <ul style="list-style-type: none">• 6th Grade Doing Scientific Inquiry Indicator 1• 7th Grade Doing Scientific Inquiry Indicator 1, 2, and 3 Scientific Inquiry Benchmark B <ul style="list-style-type: none">• 6th Grade Doing Scientific Inquiry Indicator 3• 7th Grade Doing Scientific Inquiry Indicator 5 and 6•
Concepts Developed	Students will be able to explain that: <ul style="list-style-type: none">• The weight of air exerts a force called pressure.• Forces can be presented as balanced and unbalanced.

	<ul style="list-style-type: none"> • Unbalanced forces can move objects. • In order to measure these forces we use a Newton scale.
Lesson Rationale	Air pressure can be used to move objects. Air pressure can be changed and used to do work. Air pressure is connected to daily events in the natural world and in the human-made world.
Background Knowledge for Teachers	<p>Review the “teacher video” and student video segments.</p> <p>This segment allows students to see that many uncontrolled variables in one experiment make it difficult to determine exactly what happened. Here are several science facts that you will need to complete the classroom activities.</p> <ul style="list-style-type: none"> • Air pressure is approximately 14.7 pounds per square inch (depending on altitude and temperature). Based on the skills of your students it would be acceptable to use 15 pounds per square inch. • In this segment the air pressure outside the bottle remains constant at 14.7 pounds per square inch. • The air pressure inside the bottle decreases rapidly. • Balanced forces occur when there is no motion (egg at rest on top of the bottle, and at rest inside the bottle.) Unbalanced forces occur to move the egg through the neck of the bottle. • The difference between the inside air pressure and the outside air pressure pushes the egg into the bottle. (IMPORTANT TO NOTE HERE: The egg is not sucked into the bottle.) <p>There are several opportunities to distinguish between observation and inference.</p> <ul style="list-style-type: none"> • An observation is anything that is experienced any of your senses (hear, see, taste, touch or smell.) • An inference is a prediction based on your observations.

	<ul style="list-style-type: none"> • An inference requires more investigation and evidence and to be considered accurate. <p>There are too many important principles happening in this demonstration to determine exactly what happened and why, or to want to bring the lesson to a closure at this point. Students need time to think more deeply about their observations and inferences and return to this segment later.</p>
Classroom Procedures	<p>Before viewing the video segments have students create a T-chart. Explain to students that they will be using the T-chart to record observations and inferences. On one side of the T-chart write the heading OBSERVATION, and on the other side write INFERENCE. During the video, encourage students to list everything they see and hear. Those should be written on the observation side of the chart. After students record observations, they will write down inferences on the other side of the T-chart. These observations and inferences will lead students to develop questions that they may have about what happened. Teachers can expect that the students will believe that the egg was sucked into the bottle. This opens the door to a great set of inquiry questions that develop scientists in the classroom. Here are some anticipated student statements: (Be sure to accept and validate all responses.)</p> <ul style="list-style-type: none"> • I think that the egg got hot and fell into the bottle. • The egg got hot and melted. • Gravity • The bottle sucked the egg in • The bottle got hot and the opening got bigger. <p>Students should select one of their inferences and develop a plan of action to investigate and prove, or disprove, their inference.</p> <p>As part of the closure to this activity, students should be able to describe why the pressure inside the bottle decreases, and eventually becomes significantly less than the atmospheric pressure to allow the egg to enter. Students should draw diagrams to show the egg on the bottle, the egg passing through the bottle's neck, and the egg at rest inside the bottle. On each diagram, student can show where balanced or unbalanced forces occur.</p>
Materials Needed	Glass bottle with an opening slightly smaller than a hard-boiled egg. (Milk bottle or Erlenmeyer flask)

	<p>Hard-boiled egg Stick matches Safety goggles</p>
Science Connections	<p>Connection to Earth and Space Benchmark C weather standards in the 7th grade. Changes in air pressure cause the formation of wind patterns.</p> <p>Students' inferences are used to develop inquiry questions that can be used to explore students' ideas. Inquiry allows students to develop scientific habits of mind, ask valid questions, gather and analyze information, develop hypotheses and reflect on scientific practices as they plan their investigations.</p> <p>Activities like this can branch off to develop concepts of balanced and unbalanced forces.</p>
Additional Web Resources	<p>Steve Spangler Balloons and Bottles: http://www.stevespanglerscience.com/experiment/00000166</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

LS – Life Sciences

PS – Physical Sciences

SI – Scientific Inquiry

ST – Science and Technology

SW – Scientific Ways of Knowing