PSI: PHYSICAL SCIENCE INVESTIGATION

wviz ideastream℠

GREAT LAKES Science Center

Teacher's Lesson Description

Title	**Balancing Act**
Brief Description of the Videos	In these videos, students will watch as Danté demonstrates the use of a simple balance to determine that air has mass.
Time Needed	1 or 2 class periods
Ohio Science Benchmarks and Indicators Addressed in This Activity	Physical Science, 6-8 Benchmark A Science and Technology, 6-8 Benchmark A and B Scientific Inquiry, 6-8 Benchmark A and B Scientific Ways of Knowing, 6-8 Benchmark C
Ohio Grade Level Indicators Addressed in This Activity	Physical Science Benchmark A • Grade 6th Grade Nature of Matter Indicators 1 Science and Technology Benchmark A • 6th Grade Understanding Technology Indicators 3 and 4 • 7th Grade Understanding Technology Indicator 1 Science and Technology Benchmark B • 6th Grade Abilities to do Technological Design Indicator 5 • 7th Grade Abilities to do Technological Design Indicator 5 • 8th Grade Abilities to do Technological Design Indicator 5 Scientific Inquiry Benchmark A • 6th Grade Doing Scientific Inquiry Indicators 1 and 2 • 8th Grade Doing Scientific Inquiry Indicator 1 Scientific Inquiry Benchmark B

	• 7th Grade 7 Doing Scientific Inquiry Indicator 4 and 5 Scientific Ways of Knowing Benchmark C • 6th Grade Science and Society Indicator 3 • 7th Grade Science and Society Indicator 3 •
Concepts Developed	Students will be able to explain that: • Air has mass. • A balance is used to measure mass. • Size alone does not determine mass.
Lesson Rationale	To demonstrate that air has mass, occupies space, and that an objects size is not the sole determiner of mass.
Background Knowledge for Teachers	Review the "teacher video" segments and "student video" segments. • Weight and mass are different. • Weight is a measurement of the effect of gravitational force on a mass. • Mass is the amount of material in a sample. • When people say, "I want to lose weight", what they really mean is that they want to lose mass.
Classroom Procedures	Before viewing the video segments, tell students that they will be watching a DVD segment titled, Balancing Act. 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. After viewing and discussing the classroom video segments students will be making a simple balance and conducting experiments to investigate mass. Provide pan balances from your school's supply. If you do not have pan balances, students can construct a simple paper balance as shown at http://www.topscience.org/book_samples/balancing31.html

	The video allows several points where it is paused and questions are asked that the students are 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: Two balloons with no air are attached to opposite ends of the balance and they weigh the same. After the balloon is blown up and placed on the balance. What will happen to the balance next? Remember at this time you are asking students to make a hypothesis – list thoughts and start the video again. Make sure that you record all student response. Balloon weighs more. Can you explain? Now inflate the empty one at the other end. We measure using the ring. I put it on the other end and release the balance and see what happens. What do you think will happen next? Why do you think that happened? Now take one balloon and put into something really cold. Measure with the ring. Then measure again after cooling. Can you guess what if anything will happen next? Why? Notice that the size is different. Why did the temperature change cause a change in the balloon size? Put on the balance? Will they weigh the same or different? Now that the balloon got smaller will the balloon weight be heavier, lighter or the same? Can they explain why? Let's find out. Now they are the same weight. Can you explain why? As an extension, have objects of different masses sitting on a table and ask students to sort them from the least to the most mass. Of the objects in front of you, which has the most mass? Which has the least mass? Can you order the objects from greatest mass to least mass, using the balance?

Materials Needed	Sheets of 8.5” X 11” paper cut into 4 equal pieces. Other objects that could be measured and compared: paper clips, mini-marshmallows, pennies, M & Ms or other small candy pieces of similar size and weight, cereal pieces like Trix or Cheerios.
Science Connections	Because air has mass, it can exert force. The effects of air are connected to such things as Charles’ Law, weather in the hydrosphere, atmosphere and lithosphere, pneumatics, and energy being transferred.
Additional Web Resources	USA Today Explains Atmosphere and Density http://www.usatoday.com/weather/wdensity.htm NASA Glenn Research Center Learning About Air Density http://www.grc.nasa.gov/WWW/K-12/BGA/Michele_Kotick/DensityandLift_act.htm Search for more Web pages related to this topic at the Ohio Resource Center http://www.ohiorc.org/for/science/Default.aspx Classroom Safety: http://membership.acs.org/c/ccs/pubs/chemical_safety_manual.pdf Search the National Science Digital Library: http://nsdl.org/ Find more science teaching lessons at Teacher’s Domain: http://www.teachersdomain.org/

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