

PSI:

PHYSICAL SCIENCE INVESTIGATION



Teacher's Lesson Description

Title	Sink or Swim?
Brief Description of the Videos	Dante demonstrates whether objects (marble, bowling balls) sink or float in a tank of water. This demonstration introduces the concept of density. Students will use scientific inquiry to ask questions, test hypotheses, analyze data, communicate results and identify questions for further investigations as they experience the relationship between density, mass, and volume.
Time Needed	One or two class periods.
Ohio Science Benchmarks Addressed in This Activity	<ul style="list-style-type: none">• Grade 6-8 SI Benchmark A & B• Grade 6-8 SW Benchmark A & C• Grade 6-8 PS Benchmark A
Ohio Grade Level Indicators Addressed in This Activity	<ul style="list-style-type: none">• Grade 6 SI Indicator 1, 2, 3• Grade 7 SI Indicator 3, 4, 7• Grade 8 SI Indicator 3• Grade 6 SW Indicators 3, 4• Grade 7 SW Indicator 3• Grade 8 SW Indicator 1• Grade 7 PS Indicator 1
Concepts Developed	Scientific inquiry is the development of a questioning system that allows students to make sense of the world around them. Inquiry includes the processes of observation, inference and prediction. When conducting experiments and investigations, the observations made may lead to new

	questions.
Lesson Rationale	<p>Scientific explanations for some concepts (density) may seem difficult but beginning explorations in similar concepts can give students the skills needed to connect density at a relationship between mass, volume, and shape.</p> <p>In physics terms, density is defined as the mass per unit volume. Meaning the amount of mass in 1 unit volume of the substance. The equation of density is $Density = Mass / Volume$. Students will explore the concept of density and the relationship between mass and volume by making observations and predicting if an object will sink or float when placed in water.</p>
Background Knowledge for Teachers	<p>Scientific inquiry describes how scientists go about finding answers to questions about the natural world. It begins when a question is asked and continues as you look for the answers. The goal of scientific inquiry is to understand and explain the natural world. Scientific observations are a large part of inquiry. They involve using your senses to describe the world. Observations are often made during experiments. Sometimes measurements are taken and added to your observations. These eventually lead to a prediction about what has been observed and measured.</p> <p>Density is defined as the mass per unit volume. Density can also be determined mathematically, $Density = Mass / Volume$.</p> <p>Water has an approximate density of 1g/cu.cm. If an object has a density of less than 1 it will float. An object with a density greater than 1 will sink. It is important to note that if an object's shape can be changed, that could affect the volume and density of the object. For example, a ball of clay dropped in water may sink while the same ball of clay changed to a bowl shape may float. The concepts of mass, volume, and changing of shape will be discovered in this lesson.</p> <p>In the video, Dante states that the marble is 1cm in diameter and has a mass of 4 grams. Dante also provides the bowling ball dimensions as 22cm diameter and a mass of 6 pounds. The big idea for density is that it is determined by the relationship between mass and volume. Advanced students may want to calculate the density of the marble and bowling ball using Dante's measurements. Use the following web sites to assist in the calculations: http://www.calculatorfreeonline.com</p>

	http://www.onlineconversion.com
Classroom Procedures	<p>This lesson is designed to provide students the opportunity to determine that density is a relationship between mass, volume, and the shape of an object. Students view the video, make predictions, and discuss their findings.</p> <ul style="list-style-type: none"> • Have student share their written observations from the video. Tell the student that they are going use what they learned in the video to determine if an object sinks or floats. • Provide each students with a copy of the Sink It-Data Table (http://www.sciencenetlinks.com/lessons.cfm?BenchmarkID=1&DocID=125) • Hold up an object and have students record if the object will sink or float. Have students record their finding on the Data Table. Discuss. • Repeat with all objects except the clay ball! • Building upon this exploration, students should discuss similarities and differences in the material characteristics of objects that they think affect whether they float or sink (i.e. objects made of wood will usually float; objects made of metal will usually sink). Students may come to the conclusion that heavier objects generally tend to sink in water. However, make sure that students understand that weight is not the only factor. As they continue to investigate floating and sinking, they should be building the understanding that objects float because of the relationship between volume and mass. In later grades students can build a more complete understanding of these phenomena by measuring mass, displacing volumes, and calculating densities. • Hold up the ball of clay and ask students to predict if it will sink or float. Drop into the water. Now, change the shape of the clay ball into a bowl shape. Drop. Discuss with students. Here are some questions you may want to discuss. <ul style="list-style-type: none"> *Why did the same piece of clay sink and float? *Did the mass change? *Did the volume change?

	<p>*What are the factors that determine density?</p> <ul style="list-style-type: none"> Remind students that water has an approximate density of 1g/cu.cm. An object with a density less than 1 will float and an object with a density greater than 1 will sink. Review all objects used and discuss/record if they have a density less than or greater than 1. Conclude the lesson with a discussion about everyday objects that sink and float in water (examples: life jackets, fishing sinkers, boats, etc).
Materials Needed	<p>Aquarium or tank of water 4 objects that sink and float 12 ounce can of diet cola 12 ounce can of cola Ball of clay</p>
Science Connections	
Additional Web Resources	

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