MRL **Materials Research Laboratory**
UNIVERSITY OF CALIFORNIA, SANTA BARBARA

Art and Science

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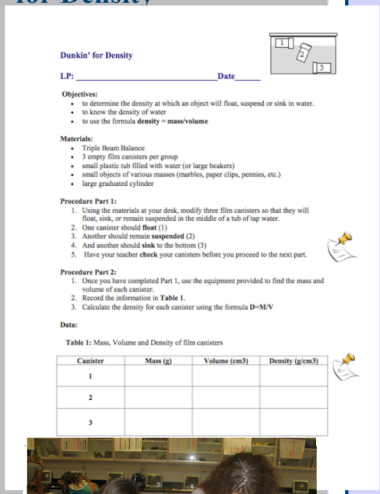
WHAT FLOATS YOUR BOAT?

Abstract

"What floats your boat?" is a collaborative project created to integrate art into the 8th grade science curriculum. This project begins with an introduction to buoyancy, fluid displacement, and density including how these concepts relate to boats. Activities such as Dunkin for Density, The Flotation of Different Shapes and the Materials Activity enable students to experiment with these concepts in order to better clarify how boats are affected by buoyant force through shape and materials. Through a PowerPoint presentation and Internet research students collect information on the history of boats including their use, ornamentation and effect on the people of that time period. Using this research students then choose a time period, boat type, materials and build a boat. These boats are tested individually for buoyancy and density using Archimedes Principle. Materials durability and artistic perception of their boat are then critiqued by a group of their peers. The project culminates with a presentation of the "Best Boats" as determined by the class and an individual final boat experiment write-up.

Dunkin' for Density

After reviewing displacement theory using a graduated cylinder and marble and taking notes on buoyancy/density, students complete the dunkin' for density lab to reinforce concepts.



Dunkin' for Density

LP: _____ Date_____

Objectives:
- to determine the density at which an object will float, suspend or sink in water.
- to know the density of water
- to use the formula **density = mass/volume**

Materials:
- Triple Beam Balance
- 3 empty film canisters per group
- small plastic tub filled with water (or large beakers)
- small objects of various masses (marbles, paper clips, pennies, etc.)
- large graduated cylinder

Procedure Part 1:
1. Using the materials at your desk, modify three film canisters so that they will float, sink, or remain suspended in the middle of a tub of tap water.
2. One canister should **float** (1)
3. Another should remain **suspended** (2)
4. And another should **sink** to the bottom (3)
5. Have your teacher **check** your canisters before you proceed to the next part.

Procedure Part 2:
1. Once you have completed Part 1, use the equipment provided to find the mass and volume of each canister.
2. Record the information in **Table 1**.
3. Calculate the density for each canister using the formula **D=M/V**

Data:

Table 1: Mass, Volume and Density of film canisters

Canister	Mass (g)	Volume (cm3)	Density (g/cm3)
1			
2			
3			

Program Activities

PowerPoint Presentation

Shape Activity

Students experiment with different shapes of clay to determine the shape of the boat they play on building and the shapes fluid displacement as it is subjected to added weight via pennies.

Materials Activity

Students make a preliminary choice of materials they believe would be good to build a boat out of. They determine the density of the material(s) then float them in water for 24 hours. Students then determine post density and evaluate the materials durability. Students then reevaluate their original materials choice.

WHAT FLOATS YOUR BOAT?
Materials Activity

PURPOSE: Test four different materials of your choice to determine the durability of those materials in water.

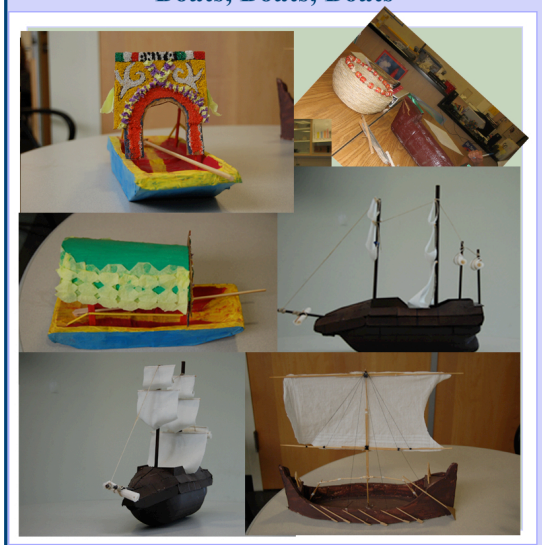
MATERIALS:
- *Four different materials
- *4 Petri dishes
- *Sharpie
- *Scissors
- *Water
- *Masking tape

PROCEDURE:
- Label each Petri dish (using tape) with group name/number and period
- Cut each material exactly the same size (approximately 4cm x 4cm) so that it fits in the middle of the Petri dish and does not touch the sides. **Note: some materials may expand in water so leave enough room.**
- Make a prediction for each material and how it will react to water
- Weigh each piece of material and record mass in grams.
- Fill each Petri dish with _____ mL of water
- Add one material to each of the four Petri dishes
- Leave overnight
- Weigh each piece of material and record
- Record observations

DATA:

Material	Prediction	Beginning Mass (g)	Ending Mass (g)	Post Observations

Boats, Boats, Boats



Standards Met

Art

Artistic Perception 1.0

1.2 Analyze and justify how their artistic choices contribute to the expressive quality of their own works of art.

Aesthetic Valuing 4.0

4.5 Present a reasoned argument about the artistic value of a work of art and respond to the arguments put forward by others within the classroom setting.

Science

Density and Buoyancy

8. **All objects experience a buoyant force when immersed in a fluid.**
a. know density is mass per unit volume
b. know how to calculate the density of substances (regular and irregular solids and liquids from measurement of mass and volume
c. know the buoyant force on any object in a fluid is an upward force equal to the weight of the fluid the object has displaced
d. know how to predict whether an object will float or sink

Investigation and Experimentation

7.**Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.**
e. construct scale models, maps and appropriately labeled diagrams to communicate scientific knowledge
f. communicated the steps and results from an investigation in written reports and oral presentations