



LESSON TITLE: *Art Meets Science in the Deep Blue Sea*

BACKGROUND INFORMATION: This lesson allows students to merge Art with Science as they explore the affects of pressure with increasing ocean depths. Styrofoam cups are made using foam and air in a way that adequate insulation can be provided for hot or cold beverages. The air is forced out of the cups by the increase in pressure when the cups are secured to marine equipment (e.g., CTD) and lowered to depths exceeding 500 meters. It is recommended that this activity be completed during a unit that explores Earth's ocean; including its unique ecosystems and species found in the deep sea. Art and Science educators may work collaboratively on this activity to insure that appropriate art and science standards are met. (This lesson was designed for middle school students and field-tested in grades 6, 7, and 8.)

OCEAN LITERACY PRINCIPLES:

- Principle #1: Earth has one big ocean with many features.
- Principle #5: The ocean supports a great diversity of life and ecosystems.
- Principle #7: The ocean is largely unexplored.

NC ESSENTIAL STANDARDS FOR SCIENCE:

- 8.E.1.2: Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: estuaries; marine ecosystems; upwelling; behavior of gases in the marine environment; value and sustainability of marine resources; and deep ocean technology and understandings gained.
- (This activity also reinforces objectives related to Interactions between Force and Matter and Density.)

MATERIALS:

- Lab Sheet: Styrofoam Cup Experiment
- Styrofoam Cups (1 per student)
- 1 Styrofoam Cube
- Permanent waterproof markers (various colors)
- Paper towels, Nylon weave bag, and zip ties
- Access to deep sea marine equipment and research vessel
- Blue Planet DVD or You Tube® video clips of the "Deep Sea"

PROCEDURES:

DAY 1: Facilitate a class discussion about the challenges of living in a deep, cold, and dark ocean. (Video clips will be useful for this discussion.) Discuss species adaptations to temperature, pressure, and darkness. Assist students with mathematical practice to calculate the changes in pressure with depth. Citing real world examples, such as SCUBA and deep sea submersibles may also assist students in understanding their calculations.

DAY 2 – 3: Distribute lab sheets and display a small (10 oz.) Styrofoam cup.

- Encourage students to address the hypothesis based on DAY 1's discussion of changes in pressure from sea level to the deep sea.
- Instruct students to consider a design they would like to draw on a cup and to create a sketch on scrap paper.
- Provide students with class time to draw their illustration onto their Styrofoam Cup. Students should write their name on the bottom of their cup.

DAY 3: Collect the completed cups and stack them in a crushproof container for transportation to the ship. Be sure to ship paper towels (not yet stuffed in the cups), 1 Styrofoam cube, and nylon bag with zip ties. (Be sure to record the Depth achieved during the cup submersion.)

AFTER COMPLETION OF CUP SUBMERSION: Distribute the shrunken cups to the students and review the Lab Sheet. Use the shrunken Styrofoam cube to assist students in completing the lab sheet and to reinforce previous discussions and objectives.

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