

Message in a Bottle

A Classroom Activity for Ocean Gazing Episode #17: The prince's predictions: Part I

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Grade Level: 8-12

Lesson Time: 3-4 days

Materials Required

For drifter prototypes: Pipe cleaners; popsicle sticks; Elmer's glue; string; yarn; Styrofoam balls, cotton balls, rubber bands, flotation material, toothpicks, bee-bee pellets, plastic tubes/bottles, wood strips, corks, metal washers.

For Major Oceans and Ocean Currents activity:

http://www.eduplace.com/ss/maps/pdf/world_country.pdf

Summary

This activity is subdivided into three components that allow students to explore concepts related to density, buoyancy, ocean currents, and technological design. Part I guides the students through an exploration of drifter buoys used by scientists to collect in situ data in various parts of the hydrosphere. The students will use this information to design and test their own drifter buoy. In Part II, students will use mapping skills to plot world ocean currents on a world map. Part III encourages students to use the knowledge gained in Parts I and II to determine an appropriate launching point that will return their drifter to the origination point of the message they received in the bottle.

Objectives

- ✓ Include clear, measurable statements of what students will be able to do, such as:
 - Students will **observe** drifter technology and **identify** various parts and functions of drifters.
 - Students will **record** and illustrate parts of a drifter. Students will measure and **record** the mass, volume, and density of various materials used in their drifter design.
 - Students will **demonstrate** technological design skills by creating a drifter prototype using materials provided. Students will **demonstrate** graphing skills by plotting the mass/volume relationship of their drifter materials.
 - Students will **communicate** results during class discussions and through an oral presentation reviewing their "Message in a Bottle" journey.

Key Concepts

Nature of science, nature of mathematics, nature of technology

Part I: Design a drifter

Objective:



You have discovered a message in a bottle that presents you with an opportunity to discover your fortune as you complete your adventure. Your mission is to learn about drifter buoys and ocean currents and to use this information to locate the origination point of your “message in a bottle.”

Use the following websites to learn about drifters and answer the questions below:

- <http://oceanexplorer.noaa.gov/technology/tools/drifters/drifters.html>
- <http://literacynet.org/sciencelincs/showcase/drifters/buoy.html>

1. What are the different parts of a drifter?
2. How is the drifter designed so that it is moved by water and not by wind?

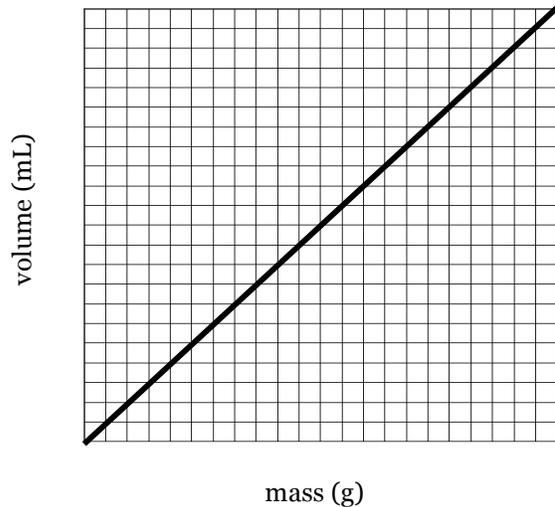
Rules & Regulations: When working in the ocean there are many limitations placed upon scientists.

Procedure:

1. Discuss (with your group) the design of a drifter and what materials you might use.
2. List the materials you have chosen to use for your drifter in the table below.
3. Determine the mass and volume of each piece of material you have listed and complete the table.

material	mass (g)	volume (mL)	density (g/mL)	sink or float?

4. Graph your data below. (Be sure to label your data points with each material name.)



5. What does it mean if the object falls above the $y = x$ line?
6. What does it mean if the object falls below the $y = x$ line?
7. Draw your drifter design below and make sure that you label each of the parts and their function.

- Build your drifter. Be sure your prototype does not exceed the dimensions of 15cm³. Your prototype must be able to keep a cotton ball dry.
- Test your completed drifter prototype in the water tank provided. Make observations of your prototype test to use in your analysis.

Findings and Conclusion:

- How did your drifter perform? Did it move with the currents?
- What problems did you encounter? How could you improve your drifter?
- If you had unlimited funds and materials, what type of sensors would you put on your drifter? Would you change your design? *How and why?*

Part II: Major ocean currents

Objective: Use a world map with latitude and longitude lines to locate and label the major currents of the world's oceans.

Materials: Color pencils (blue and red) and the World Grid Map with the latitude and longitude coordinates listed.

Procedures: Each of the currents is located by a starting point (A) and an ending point (B). Use the correctly color pencil to mark and connect the two points and label each current. When you have located and labeled all the currents, identify and label the major oceans also.

Step 1: Use your blue-colored pencil to locate and label the following currents:

45°S	165°W	48°S	180°E	(West Wind Drift)
40°S	0°	5°S	5°E	(Benguela)
32°S	90°E	25°S	110°E	(West Australia)
55°N	140°W	25°N	115°W	(California)
75°N	65°W	50°N	45°W	(Labrador)
80°N	10°W	45°N	45°W	(Labrador)
40°N	15°W	15°N	20°W	(Canaries)
60°N	170°E	45°N	150°E	(Kuroshio)
47°S	105°W	20°S	75°W	(Peruvian)

Step 2: Use your red-colored pencil to locate and label the following currents:

15°S	80°W	0°	150°W	(S. Equatorial)
15°N	105°W	10°N	165°W	(N. Equatorial)
0°	10°W	25°S	30°W	(Brazilian)
15°N	60°E	20°S	45°E	(Mozambique)
25°N	75°W	40°N	50°W	(Gulf Stream)
40°N	45°W	75°N	10°E	(Gulf Stream)
65°N	5°E	80°N	45°E	(N. Atlantic Drift)
10°N	180°E	30°N	150°E	(N. Pacific Drift)
40°N	155°E	40°N	180°E	(N. Pacific Drift)

Step 3: Use the map in your agenda or textbook to locate and label the major oceans of the world.

Part III: Virtual drifter launch

Today is your lucky day! As the discoverer of this message in a bottle, you have an opportunity to fulfill your wildest dreams. A fortune awaits you at the journey's end so do not tarry. Follow the directions and begin your adventure.

Your goal: Locate the origination point for this message in a bottle and launch a virtual glider that will return to this point.

Guidelines for your adventure:

- Use your completed World Ocean Current Map and the message from your bottle to determine the origination point for your message in a bottle.
- Determine the release point for your drifter that will insure that it arrives at the origination point for the message in the bottle.
- First drifter to correctly complete the goal receives the treasure.

Assessment

- ✓ **Performance:** Students will demonstrate mathematical, scientific, geographical, and technological skills to successfully determine the origination point of their message in a bottle.

- ✓ **Product:** Students will produce a drifter prototype that achieves slightly positive buoyancy and a complete World Ocean Currents Map to demonstrate understanding of the concepts and objectives identified in this activity.

Sources

To access an online version of this activity, you can go to the following URL:

http://www.mbari.org/earth/rough_grid.html

The related podcast episode for this activity can be found by going to the podcast section of <http://coseenow.net>