

Oceans – Temperatures, Currents, and Effects

Lesson Plan

Grade Level: 6-8

Curriculum Focus: Oceans

Lesson Duration: Two class periods

Student Objectives

- All the oceans on Earth are really one “world ocean.”
- Warmer water from the oceans around the equator rises to the top, while colder water from the oceans around the poles sinks to the bottom.
- Ocean currents are caused by the rising and sinking of warmer and colder water.
- Ocean currents affect weather and life all over the globe.

Materials

- Discovery School video on *unitedstreaming: Understanding Oceans*
Search for this video by using the video title (or a portion of it) as the keyword.

Selected clips that support this lesson plan:

- The Earth's Liquid Mantle
- Current News
 - Factors Affecting Ocean Currents
 - Understanding Deep Ocean Currents
- Globe
- Research materials about ocean currents and their effects on Earth
- Computer with Internet access
- Access to a freezer

Each group will need:

- Pitcher or container
- Tap water
- Food dye (dark color)

- Ice cube tray
- Long, glass baking dish

Procedures

1. Divide your class into groups, and have each group prepare for the activity by mixing a couple drops of food dye into their water, filling an ice cube tray with the colored water, and freezing it.
2. Display a globe and show your students that all the oceans on Earth are connected to form one “world ocean.” Ask them where they think the water would be warmer – near the equator or near the poles. Then tell students that they are going to perform an experiment to demonstrate how the colder waters nearer the poles and the warmer waters nearer the equator mix together and move to create ocean currents.
3. The students in each group should fill a clear baking dish with warm tap water to represent the warm water near the equator.
4. Instruct students to place one ice cube at each end of the baking dish, representing the cold water near the poles. Invite them to predict what will happen as the ice cubes melt.
5. Students will observe that the cold (colored) water sinks and moves along the bottom of the baking dish toward the warmer water in the middle; the warmer water moves toward the ends of the baking dish; as the cold water begins to warm, it begins to rise.
6. Students should record the results of their experiment, accompanying their reports with labeled diagrams and an explanation of how differences in water temperature in different parts of the “world ocean” cause ocean currents.
7. Have students use research materials and the Internet to find out more about ocean currents and how they affect our weather and life on Earth.

Discussion Questions

1. Explain why the oceans affect Earth’s weather. Consider the weather at the equator in comparison to the weather at the poles. How do the oceans affect the weather in your immediate community?
2. How do oceans deal with the large amount of carbon dioxide produced by humans? What are some ideas that scientists have about the ways global warming will affect the oceans? Should shoreline communities be taking any actions regarding global warming?
3. Discuss why it is important to study ocean currents. Include in your discussion ways that plants, animals, and humans use ocean currents. Are there historical events that were shaped by ocean currents? Are there present-day events that have been impacted by ocean currents?
4. All the water on land eventually reaches the ocean. Discuss how the area you live in impacts the environmental quality of the ocean. Can you describe areas that might add toxic material to the ocean? Are there ways in which your community works to protect the ocean?

5. Debate whether more money should be spent to explore space or to explore the ocean floor.
6. The United Nations has established the Law of the Sea. Discuss how this policy supports the idea that the ocean remains sustainable for the society, culture, and environment of a particular area.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- 3 points: Student reports clear, accurate, and complete; diagrams carefully drawn and labeled.
- 2 points: Student reports accurate and complete, but lacking in clarity; diagrams adequate.
- 1 point: Student reports inaccurate, unclear, and incomplete; diagrams carelessly executed.

Vocabulary

bioluminescence

Definition: The emission of light from living organisms as the result of internal chemical changes.

Context: Organisms in deep ocean water produce light and explosions of light by bioluminescence.

Coriolis effect

Definition: The result of a force in mechanics that deflects the motion of a body as it moves in a rotating system, influencing prevailing winds and ocean currents and named after French physicist Gaspard de Coriolis.

Context: The Coriolis effect causes moving air to bend along the surface as it flows.

echolocation

Definition: The process of using the speed at which signals travel to determine distance.

Context: Scientists found the Challenger Deep by using echolocation.

tide

Definition: The alternate rising and falling of the surface of the ocean that occurs twice a day.

Context: The ebb and flow of water due to the tug of the moon and the sun on Earth's water creates tides.

wave

Definition: A ridge or swell on the surface of a liquid that normally moves in a forward motion.

Context: A wave is a pattern of flowing water molecules; the water does not move forward with the wave.

wind

Definition: A natural movement of air.

Context: The movement of air as hot air rises and cold air flows in to take its place is how winds are created on Earth's surface.

Academic Standards

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/>.

This lesson plan addresses the following national standards:

- Science – Earth Science: Understands basic features of Earth.
- Science – Physical Science: Understands energy types, sources, and conversions, and their relationship to heat and temperature.
- Science – Life Sciences: Understands how species depend on one another and on the environment for survival.
- Geography – Physical Systems: Knows the physical processes that shape patterns on Earth's surface.

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following science standards:

- Structure of the Earth system

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>

