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ACTIVITY : 1 HR 45 MINS

Simulate an Oil Spill Cleanup

Students read about oil spills and the 2010 Gulf of Mexico oil spill and geo-locate the *Deepwater Horizon* spill on a map. Then students simulate an oil spill and cleanup both before and after the use of dispersants. They discuss the effectiveness and flaws of oil cleanup strategies based on the results.

GRADES

9 - 12+

SUBJECTS*Biology, Earth Science, Oceanography, English Language Arts, Geography, Physical Geography***CONTENTS**

4 PDFs

OVERVIEW

Students read about oil spills and the 2010 Gulf of Mexico oil spill and geo-locate the *Deepwater Horizon* spill on a map. Then students simulate an oil spill and cleanup both before and after the use of dispersants. They discuss the effectiveness and flaws of oil cleanup strategies based on the results.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/simulate-oil-spill-cleanup/>

DIRECTIONS

1. Build background on the 2010 Gulf of Mexico oil spill.

Distribute copies of the handout *Oil Spills in Marine Environments* for independent or small-group reading. Download and display the map *Gulf of Mexico: A Geography of Offshore Oil* from the October 2010 issue of *National Geographic* magazine. Describe for students the events that occurred on April 20, 2010. On the map, point out the location of the Macondo well—the site of the leak and the accidental destruction of the *Deepwater Horizon* drilling rig. Gesture to point out the loop current and explain how the oil has been distributed throughout these regions by currents, waves, winds, and tides.

2. Introduce the simulation.

Tell students that they will use a model to simulate an oil spill and its cleanup. Divide students into small groups of 3-6 students each. Have groups move to their assigned stations where materials are set out. Distribute copies of the worksheets *Observations Before the Use of Dispersant* and *Observations After the Use of Dispersant* to each group. Assign each member of the group a specific role—observer, data collector, and oil remover. Multiple students can have the same role in each group.

3. Explore the vocabulary.

Point out the definitions at the bottom of the handout *Oil Spills in Marine Environments* of types of equipment used to clean up oil spills: absorbers, booms, dispersants, and skimmers. Those same definitions can be found in the Background and Vocabulary tab of this activity. Ask students to observe the supplies they have available and discuss which supplies might represent each type of equipment used to clean up oil spills.

4. Have students simulate the oil spill.

Have students measure four tablespoons of vegetable oil and use a fork or a whisk to mix it with 1-4 drops of food coloring. Ask: *What do you think the oil and food coloring represent?* Explain to students that the oil represents crude oil and the food coloring represents chemicals trapped inside of the oil. Make sure they understand that the food coloring will not mix completely with the oil. Next, have students carefully pour the dyed oil into the center of the container with water and float a one-inch craft stick in the middle of the oil spill. Tell students that the craft stick represents a ship.

5. Have students simulate cleanup efforts before the use of dispersant.

Ask the oil remover in each group to use the supplied materials—pieces of cotton, cardboard, and paper towels smaller than one inch—to try to remove the oil before it reaches the sides of their container. Rotate around the groups and ask the observers to orally describe what the oil removers are doing and what material they are using. The data collector for each group should list the properties of each material and designate them as booms, skimmers, absorbers, or dispersants in columns 1 and 2 of the worksheet *Observations Before the Use of Dispersant*. Then the group should discuss and complete columns 3 and 4 together.

6. Have students simulate cleanup efforts after the use of dispersant.

After students have tried all other provided materials and completed the first worksheet, have them add a few drops of name-brand dishwashing soap and complete columns 1, 2, and 3 of the worksheet *Observations After the Use of Dispersant*. Then have a whole-class discussion. Ask:

- *What happened to the oil? Why?*
- *What happened to the chemicals (dye)? Why?*
- *What color is the water? Why?*

7. Have students re-test the first set of materials in the water with the dispersant.

Ask students to predict what they think will happen now that dispersants have been added. Have students re-test some of the supplied materials now that the dispersants have entered the environment. Ask them to add their observations to column 4 of the second worksheet.

8. Have a whole-class discussion about the methods and their possible flaws.

After students have tested all of the materials—both before and after dispersants were added—ask:

- *Did any method completely remove the oil?*

- *What happened to the chemicals (dye)?*
- *Do you think all toxins or chemicals behave the same way? Why or why not?*

Have students compare their results for each material before and after the dispersants were added. Ask students to share some of the successes they experienced and some of the possible flaws that they see with these methods. Ask:

- *Based on your observations, how effective do you think the Gulf oil spill efforts (equipment types) have been?*
- *Did any of your observations change the way you view the cleanup strategies being used in the Gulf?*
- *Did any of your observations change the way you view the effects cleanup strategies may have on the water quality and wildlife of the Gulf?*

Have each student independently write a summary of their simulation results and their answers to the discussion questions above.

Informal Assessment

Circulate around the room during the laboratory experience. Use the following prompts to ask questions about the materials and what they represent:

- *What material are you using?*
- *What role does it have?*
- *How effective is it at cleaning up the oil?*

Look at groups' observation sheets to see if they are accurately documenting their results. Collect and assess students' written summaries.

Extending the Learning

Have students research the chemical makeup of dispersant Corexit 9500 and investigate the possible ecological effects that this chemical could have on marine ecosystems.

OBJECTIVES

Subjects & Disciplines

Biology

Earth Science

- Oceanography
- English Language Arts

Geography

- Physical Geography

Learning Objectives

Students will:

- simulate an environmental disaster in a classroom environment
- analyze the effectiveness of oil cleanup efforts
- discuss cleanup tactics and the environmental impacts of using dispersants

Teaching Approach

- Learning-for-use

Teaching Methods

- Discussions
- Hands-on learning
- Information organization
- Lab procedures
- Reading
- Reflection

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes

- Learning and Innovation Skills
 - Communication and Collaboration
- 21st Century Themes
 - Global Awareness
- Critical Thinking Skills
 - Analyzing
 - Applying
 - Evaluating
- Geographic Skills
 - Acquiring Geographic Information
 - Analyzing Geographic Information

National Standards, Principles, and Practices

NATIONAL COUNCIL FOR SOCIAL STUDIES CURRICULUM STANDARDS

- Theme 3:

People, Places, and Environments

NATIONAL GEOGRAPHY STANDARDS

- Standard 14:

How human actions modify the physical environment

NATIONAL SCIENCE EDUCATION STANDARDS

- (9-12) Standard A-1:

Abilities necessary to do scientific inquiry

- (9-12) Standard F-3:

Natural resources

- (9-12) Standard F-4:

Environmental quality

OCEAN LITERACY ESSENTIAL PRINCIPLES AND FUNDAMENTAL CONCEPTS

- Principle 6e:

Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (such as point source, non-point source, and noise pollution) and physical modifications (such as changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Duct tape or other strong tape
- Paper towels
- Bendable straws
- Cardboard
- Cotton balls
- Craft (popsicle) sticks
- Dense foam wedge makeup sponges
- Pencils
- Large-mouth gallon buckets
- Name-brand dishwashing soap
- Red food coloring
- Tablespoons
- Vegetable oil
- Water
- Writing paper

REQUIRED TECHNOLOGY

- Internet Access: Optional
- Tech Setup: 1 computer per classroom, Projector

PHYSICAL SPACE

- Classroom
- Laboratory space

SETUP

Before starting the activity, set up a station for each small group with all necessary materials.

GROUPING

- Large-group instruction
- Small-group instruction

BACKGROUND & VOCABULARY

Background Information

Our increasing reliance on oil and petroleum products has resulted in multiple marine oil spills at offshore drilling sites and from transport vessels. Oil spills are detrimental to the health of marine environments and marine organisms. Scientists and volunteers try to remove oil from the open ocean and coastal environments when oil is spilled in order to lessen the effects that the oil will have on the ecosystem. Cleanup strategies include corralling and burning, skimming, absorbing, and dispersing oil. Some of these methods are more effective than others.

Prior Knowledge

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Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
absorber	<i>noun</i>	material used to make up booms that helps absorb oil while it is being contained.
boom	<i>noun</i>	oil-containment device that floats on the surface of the water and is used as a barrier to keep oil in or out of a specific location.

Term	Part of Speech	Definition
dispersant	noun	chemicals sprayed on oil to cause it to break up and sink.
ocean	noun	large body of salt water that covers most of the Earth.
oil spill	noun	accidental release of petroleum products into a body of water, either by an oil tanker or an offshore oil rig.
skimmer	noun	floating boom system that sweeps oil across the water surface, concentrating the oil.

For Further Exploration

Articles & Profiles

- [National Geographic News: Gulf Oil Spill Anniversary: Resilience Amid Unknowns](#)

Interactives

- [National Geographic Magazine: Interactive—Layers of Life](#)
- [National Geographic Magazine: Interactive Map—The Geography of Offshore Oil](#)

Websites

- [National Geographic News: Gulf Oil Spill News and Pictures](#)
- [National Geographic Animals](#)
- [National Geographic Environment: The Ocean](#)
- [National Geographic Environment: The Ocean—Gulf Oil Spill](#)

FUNDER

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