



Science Unit: *Marine Pollution*

Lesson 6: *Oil Spill Cleanup*

This lesson is a modification of "Pollution Solution" from The Smithsonian – see References.

School year: 2006/2007
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Grade level: Presented to grades 4-5; appropriate for grades 4-7 with age appropriate modifications.
Duration of lesson: 1 hour and 20 minutes
Notes: Extension activities

Objectives

1. Simulate an oil spill and oil spill cleanup.
2. Evaluate the cost of an oil spill cleanup.

Background Information

When an oil tanker runs aground or is shipwrecked, millions of gallons of oil can be spilled in a small area in a short period of time. Oil spills from tankers contribute about 37 million gallons of oil to the marine environment every year. Industrial waste and automobiles put in 10 times that much (363 million gallons per year), which typically runs off the land into the ocean. In addition, oil naturally seeps out of reservoirs in marine sediments at the bottom of the ocean. Tanker spills along the coastline typically gain lots of attention because of the concentration of oil in a small area. Oil slicks can be dangerous for marine mammals and birds, plus intertidal organisms, when slicks come ashore. Cleanup efforts involve containing the floating slicks, skimming oil from the surface, emulsifying the oil, and cleaning the shoreline and animals with detergents. Oil-eating bacteria are also used for long-term clean up.

Vocabulary

Oil: A liquid substance made of hydrocarbons that is less dense than water
Oil slick: A patch of oil floating on water
Emulsify: To disperse oil into tiny droplets
Skim: To remove oil from an oil slick without removing lots of the water underneath
Labor: Work done by people

Materials

- Shallow, oblong pans, one per group of 3-4 students (aluminum pans work fine)
- Vegetable oil
- Cotton balls (lots)
- Teaspoons (or pre-measure one teaspoon of oil for each group)
- Medicine droppers, "skimmers" (one per group),
- Plastic bags for cotton ball disposal (one per group)
- Small yogurt containers (one per group)
- Copies of student data sheet - one per student
- Water



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- Liquid detergent for post-activity cleanup
- Optional: timers (or use clock)
- Optional: wire whisk to simulate the wind and stir up the oil slick
- Optional: calculators, if needed
- Optional: bird feathers, pebbles, to simulate materials on a shoreline
- Optional: scrub brushes to clean feathers and pebbles

In the Classroom

Introductory Discussion

1. How does oil get into the ocean? Discuss both human-caused spills and natural seeps of oil.
2. What happens to oil once it gets into the ocean? Does it float or sink? Is it more or less dense than water?
3. What methods do people use to clean up oil spills? Is it easy? Why/why not?
4. Discuss vocabulary.
5. Briefly describe activity. Explain how to use all available cleanup equipment and the costs associated with each one. Point out that waste disposal is expensive!
6. Review scientific method, particularly devising methods.
7. Safety: this is a messy activity. Advise students to wear washable clothing.

Science Activity/Experiment

Activity Title: Oil spill cleanup simulation

Purpose of Activity: Plan and conduct a simulated oil spill and cleanup, trying to minimize costs and maximize cleanup effectiveness. Experience difficulties associated with oil spill cleanup.

Experimental Observations: This is a simulation, not an experiment with controls and treatments.

Methods:

Set up prior to activity: Cover tables with newspaper. Set out all equipment for student groups on tables. Fill shallow pans about halfway with water.

ACTIVITY: Students will in groups of 3-4. In their lab notebooks or on data sheets, they should record today's date and lesson title.

1. First, each group of students needs to come up with a plan of action for their oil spill cleanup. What equipment are they planning to use? What equipment do they think will work best? Are they going to use the cheap equipment or the expensive equipment? Make sure each group has a plan. Get students to decide on a pair who will operate the "skimmer", one person to use it, and the other to time in 1-minute increments.
2. Make predictions about what will happen to the oil when they add it to the pan to simulate a spill. Ask for volunteers to share ideas.
3. All groups add their teaspoon of oil to the centre of their pan to simulate a leaking oil tanker. Time for one minute. Watch the oil and observe what it does during that minute. Ask for volunteers to share what they observed.



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4. Ask some students to blow on their pans to simulate the wind, or offer a whisk to a couple of groups to simulate a storm dispersing the oil.
5. Using each group's plan (and modifying if students deem appropriate), do the cleanup.
 - a. Time for 20 minutes (or less/more depending on the group)
 - b. Students need to keep track of all the equipment they use.
 - i. Used cotton balls go in the plastic bag and can be counted later.
 - ii. Students need to keep track of each minute they use the "skimmer"
 - iii. Students need to keep track of how many small yogurt containers they fill up with wastewater (these can be emptied by teacher or helpers)
 - iv. Labor is counted for each student in the group, per minute of cleanup.
6. After the time is up, students use the data sheet to figure out the total cost of their group's cleanup efforts.
7. Have students circulate around the room and decide which group did the best/worst job cleaning up their oil spill.
8. Write each group's cost on the board for discussion.

Closure Discussion

1. How easy is it to clean up an oil spill?
2. Which group did the best job cleaning up? What made it the best? What technique worked the best?
3. Which group did the job most cheaply? Which group spent the most money? Was the best/worst cleanup also the most expensive/cheapest?
4. What if different groups had used different types of oil? What do you think would happen?
5. What can we do to minimize oil pollution from human activities?

References

1. http://www.smithsonianeducation.org/educators/lesson_plans/ocean/acrobat/polsol.pdf for the PDF version of the three part "Pollution Solution" lesson plan.
2. http://smithsonianeducation.org/educators/lesson_plans/ocean/pollution/resource.html for a list of resources associated with this lesson, including information about the Exxon Valdez spill.

Extension of Lesson Plan

1. The Smithsonian "Pollution Solution" Lessons have three parts of which this lesson is a modification of "Step 2". Extensions of this lesson could include "Step 1" and "Step 3".



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STUDENT DATA SHEET – Oil Spill Cleanup

Name _____

Date _____

OIL SPILL CLEANUP COST SHEET (fill in the white spaces)

Equipment and Techniques	Cost		Number Used		Minutes Used		Total Cost
Medicine dropper "Skimmer"	\$100/minute	X	1	X		=	
Cotton Ball	20\$ each	X				=	
Waste Disposal:							
Used Cotton Ball	\$50 each	X				=	
Wastewater container	\$1000 each	X				=	
Labor	\$1000/person/minute	X		X		=	
TOTAL COST:							

1) Which group did the best job cleaning up?

2) Which group did the worst job cleaning up?

3) Which group spent the most money?

4) Which group spent the least money?