



Oil Change

Objectives: This is designed to provide oil activities that are contained, clean, and can be done repeatedly without cleanup and reset time. Participants will observe and manipulate properties of oil and water and oil and water with dispersant. Participants will learn about petroleum products. Participants will think critically about how oil affects habitats and animals.

Time needed: 5-20 minutes

Target age: General Public

Materials needed:

- Lidded Jar with water (colored with food coloring) and vegetable oil
- Lidded Jar with water (colored with food coloring) and vegetable oil (in equal proportions to the first jar) with dishwashing* detergent mixed in
- Assorted small items, including several that are petroleum based and several that are not (Examples include plastic spoon, metal spoon, magnet, cotton ball, popsicle stick, styrofoam cup, picture of gasoline, petroleum jelly, etc.)
- Laminated cards with northern Gulf of Mexico habitats (sargassum, seagrass, salt marsh, oyster reef, beach)
- Laminated cards representing a variety of Gulf of Mexico animals throughout the water column, and representative of different phyla, life stages, motility, gills and lungs, etc. (Examples include seaturtle, cormorant, blue crab, megalops, pelican, deep-water coral, shark, swordfish, dolphin, oysters, worms, etc.)

Description: Participants will be asked to recall the oil spill in the Gulf of Mexico in 2010 and to consider what happens to oil when it is in water. Then they will be shown the jar with water and oil and invited to try to mix them by turning the jar, then by shaking vigorously. Then they should set the jar down to observe the separation. Participants should then be shown the second jar of oil and water with dish detergent, but they should be told only that the jar has oil and water but there's something different about this jar. The two jars should be shaken vigorously for the same length of time and set down at the same time for separation and observation. Participants should be asked to make observations about how the jars compare (mixing, separation rate, bubbles at top of one, etc.). This should lead into a discussion about dispersants; what they are, how they work, their relationship to the bacteria that consume oil, their role in the Deepwater Horizon oil spill, the controversy surrounding their use in that oil spill, etc. Next, participants should be asked to view the animal cards, think about which would be most and least vulnerable to an oil spill. Discussion should recall where oil is in the water column and include thoughts about where the animals are in the water column (plankton, air breathers, birds at top vs. benthic at bottom), whether they are motile and to what degree, whether they are more vulnerable at different life stages. Next, participants should be asked to view the habitat cards and rank them based on vulnerability. Discussion should include an evaluation of habitats based on types, number and variety of animals that utilize them, human ability to protect them from approaching oil and clean them of oil, and economic value. Next, participants should be shown an assortment of items, some of which are made of petroleum and some that are not. They will then be asked to separate the two. Discussion should include different types of earth materials and resources (petroleum, metal, wood, cotton, etc.) and should also make note that even when products that made of petroleum, petroleum is used in the mining, production, packaging, shipping, marketing, etc. of the product.

* We used Dawn.

Extensions:

- Discussion might include different animals' life cycles, and how a catastrophic event such as an oil spill might impact some populations for a period of time beyond the end of the event.
- This might include a more in-depth discussion of human uses of fossil fuels, the finite nature of fossil fuels, alternatives to fossil fuels, some of the challenges and advantages of different energy options, etc.
- Discussion might include varying ways to value different Gulf of Mexico habitats (beaches are valued for the tourism dollars they bring in, marshes are valued as nursery grounds for commercially important species, among others, etc.).
- Discussion might include impacts the oil spill had on coastal communities.

National Science Education Standards:

Unifying Concepts and Processes – Evidence, models, and explanation

K-4

Physical Science – Properties of objects and materials

Life Science – Life cycles of organisms, Organisms and environments

Earth and Space Science – Properties of earth materials

Science and Technology – Abilities of technological design; Understandings about science and technology;
Abilities to distinguish between natural objects and objects made by man

Science in Personal and Social Perspectives – Personal health; Types of resources; Changes in environments;
Science and technology in local challenges

5-8

Physical Science – Properties and changes of properties in matter

Life Science – Populations and ecosystems

Science and Technology – Abilities of technological design; Understandings about science and technology

Science in Personal and Social Perspectives – Personal health; Populations, resources, and environments;
Risks and benefits; Science and technology in society

9-12

Physical Science – Structure and properties of matter

Earth and Space Science – Geochemical cycles

Science and Technology – Abilities of technological design; Understandings about science and technology

Science in Personal and Social Perspectives – Personal and community health; Natural resources;
Environmental quality; Natural and human-induced hazards; Science and technology in local, national,
and global challenges

Ocean Literacy: Essential Principles and Fundamental Concepts:

2. *The ocean and life in the ocean shape the features of the Earth.* – a. Many earth materials and geochemical cycles originate in the ocean. . . .
5. *The ocean supports a great diversity of life and ecosystems.* – f. Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is “patchy”. Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.
6. *The ocean and humans are inextricably interconnected.* – b. From the ocean we get . . . mineral and energy resources. In addition, it provides jobs, supports our nation’s economy, serves as a highway for transportation of goods . . .; e. 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 pollutions (point source, non-point source . . .) and physical modifications (changes to beaches, shores and rivers); g. Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.
7. *The ocean is largely unexplored.* – b. Understanding the ocean is more than a matter of curiosity. Exploration, inquiry and study are required to better understand ocean systems and processes.; c. Over the

last 40 years, use of ocean resources has increased significantly; therefore, the future sustainability of ocean resources depends on our understanding of those resources and their potential and limitations.; d. New technologies, sensors and tools are expanding our ability to explore the ocean. Ocean scientists are relying more and more on satellites, drifters, buoys, subsea observations and unmanned submersibles.

Extensions:

NSES:

K-4

Science in Personal and Social Perspectives – Characteristics and changes in populations

History and Nature of Science – Science as a human endeavor

Ocean Literacy:

1. *The Earth has one big ocean with many features.* – h. Although the ocean is large, it is finite and resources are limited.
5. *The ocean supports a great diversity of life and ecosystems.* – b. Most life in the oceans exists as microbes. . . . Not only are they the most abundant life forms in the ocean, they have extremely fast growth rates and life cycles.
6. *The ocean and humans are inextricably interconnected.* – c. The ocean is a source of inspiration, recreation, rejuvenation and discovery.
7. *The ocean is largely unexplored.* – f. Ocean exploration is truly interdisciplinary. It requires close collaboration among biologists, chemists, climatologists, computer programmers, engineers, geologists, meteorologists, and physicists, and new ways of thinking.