Effect of Technology on the Environment
5th Grade
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References: (Checked 1/2005)

- http://www.epa.gov/oilspill/elemlab.htm
- http://gk-12.osu.edu/Lessons/02-03/OilSpills_Web.pdf

Benchmarks:

SLC 4: Identify the positive and/or negative impact of technology in their lives.

Objectives:

Students will become aware of the technologies they use day to day and the impacts, both positive and negative, of these technologies. They will be given a concrete example of a negative impact of technology on the environment.

Materials:

- Small aluminum pie pan
- Water
- Vegetable Oil
- Cocoa
- Paper towels
- Sponges (cut in quarters)
- Cotton balls
- Dish towels (cut in small strips)
- Rubber bands
- Dish detergent
- Oops! Worksheet

Initial Demonstration:

Have students get into pairs. Hand out aluminum pie pans and the “Oops!” worksheet. Fill the pie pans about ½ way with water. Next, ask the students to use their prior knowledge of oil and water to predict what will happen if oil is put into their model ocean. Further, have them predict what effect wind/waves would have on the oil. After the students have written their responses on the worksheet, put a small amount of vegetable oil, mixed with cocoa, into each model ocean. Let the students test their predictions.

Target Observations:

- Students observe that oil floats on water. It also stays together.

Target Model:

- In an ocean, an oil spill will stay on top of the water, even under the influence of wind and waves.
**Procedure:**

Ask the students to predict which material—paper towel, dish towel, sponge, or cotton ball—will do the best job of removing the oil from the water. Once their predictions are made, pass out the materials and set them to work testing their predictions. After this step is completed, have the students brainstorm ideas as to how a rubber band might aid them in cleaning up the oil. Give them a rubber band to test their ideas. Lastly, go to each group and add liquid dish detergent to their “ocean.” They should observe and record what happens.

Review their results from the experiment. The students should have discovered that the oil initially sat in a blob on their ocean then spread out as they added “wind and waves.” Collect their results on the effectiveness of each material for cleaning up the spill. Was it difficult to clean up the spill? Were they surprised about which material worked best? What were their ideas for using the rubber band? In “real life,” oil spill cleaning crews use booms to collect oil for easier cleaning. What happened when detergent was added to their ocean? Detergents are also used in real spills to break the oil up and send it to the shore where it is easier to clean up.

Discuss how an oil spill affects the ocean environment. Fish and other aquatic species may die because their food/water has become contaminated. Birds may starve because they can’t see through the oil to find fish for food. They may also become covered in oil if they try to dive below the surface for fish; this makes it difficult for them to fly to find more food or to escape predators. Aquatic plants may be harmed because sunlight can’t permeate through the oil to provide the energy necessary for photosynthesis. This may, in turn, harm aquatic animals that depend on plants for food. In short, the food chain of the ecosystem is disrupted.

Finally, ask students what we use oil for. There are many good uses of oil, including heat for homes and gas for cars. However, the transport of oil can be very harmful to the environment when accidents occur or people are negligent in their responsibilities.

**Target Observations:**

- It was very difficult to remove the oil from the water.
- The detergent made the oil break apart towards the edges.
- The cleaning tools were very dirty afterwards.

**Target Revised Model:**

- Oil is necessary to power many very helpful technologies.
- However, accidents and negligence can result in oil spills, which are very harmful to aquatic ecosystems.

**Procedure:**

Call on students to give examples of technologies they make use of everyday. Have the students copy the list into their science journals. Next, ask them how technology improves their
lives. (Saves time, money, aids learning, makes things cleaner and prettier.) Are there any drawbacks to technology? (TV/movies/video games spread violence, malfunctions of electronics can cause injury, spreads inequities between classes, pollution is created during production.) Discuss the idea of pollution from production. Here, great connections can be made back to the water and carbon cycles. Some examples:

a. Factories release smoke (CO and CFCs) into the air disrupting the carbon cycle, creating acid rain, harming human lungs and ruining aesthetics.

b. Deforestation disrupts the carbon cycle by removing CO₂ producers, disrupts the water cycle by allowing more erosion, and reduces animal habitats.

c. Acid rain harms fish/aquatic plants and reduces the quality of our drinking water.

d. Chemical runoff from factories also harms fish/aquatic plants and reduces the quality of our drinking water.

e. Oil spills cause severe damage to ecosystems.

Ask students if they think that technology generates more good than harm or vice versa. Which do they suppose is better—more harm than good, or more good than harm? When decisions are made, one must always consider the outcome. This is true not only for production/manufacturing companies, but also for ourselves. We always want to maximize the good and minimize the bad.

**Target Observations:**

- We use technology every day.
- Technology makes certain tasks easier for us.
- Technology can also have drawbacks, like pollution.

**Target Revised Model:**

- Our technology has the ability to make things easier for us, but this advantage may be offset by the harm it can do the environment.

**Summary:**

New technologies are important to helping us improve our lives. There is a downside to every new technology, however, and the positive and negative impacts have to be weighed against each other to determine if the technology should be produced. Likewise, in our own decisions, we must consider the possible outcomes, and always seek to maximize the good.
Oops!

**Creating an Oil Spill:**
Use your prior knowledge about oil to think about what will happen if we put oil in water. Do you think it will float, sink, mix in? Write down your ideas.

What effect do you think wind/waves will have on the oil spill? (Break apart, stay together?)

Observe what happens when I create an oil spill in your ocean. Blow and/or gently shake your ocean to create “waves.” Record your observations. Were your predictions correct?

**Cleaning it up:**
Which material (paper towel, sponge, cotton ball, towel) do you think will clean up the oil spill the best? Explain the reasoning behind your choice.
Once you have made your prediction come get these materials from me. Experiment with each material. Rate the effectiveness of each material: 1 = best, 4 = worst

- Paper Towel: _____
- Sponge: _____
- Towel: _____
- Cotton Ball: _____

Come get a rubber band from me. How do you think you could use the rubber band to help clean up your spill? Experiment with your ideas and write down your results.

Next, ask me to add detergent to your ocean. Observe and record what happens. Where do you think the oil would go in a real ocean?

**Environmental Effects:**
In a real ocean, how might an oil spill affect the animals and plants living in and around the ocean?