

Human Impact on the Environment and Pollution

2nd or 3rd Grade

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Benchmarks:

SLC 14: Students identify and describe the relationship between human activities and the environment in terms of pollution (air, water, soil) and the conservation of natural resources (including plant and animal species).

Purpose:

This lesson is designed to illustrate for students the impact humans can have on the environment through analogies and models of the real thing. Day 1 consists of four disjoint demonstrations of human impact and pollution. These observations and the models derived from them come together in Day 2 to create a composite picture of how humans can have an impact on their environment.

Materials:

- “Dry” Flower Foam blocks (1 for each group) ~ 18 x 18 x 3 cm
- 1 large “dry” flower foam block ~ 50 x 30 x 3 cm
- Pipe Cleaners
- Plastic Animal Figures
- Magic Marker
- Clear Containers (1 for each group) (volume > 250 mL)
- Water
- Wood Blocks (~ (2.5 cm)³)
- Paper Clips
- Clay
- Cooking Oil
- Cocoa
- Dirt
- Candle
- Matches
- Paper
- Baking Soda
- Vinegar
- Pans (1 for each group) ~15 cm radius
- Coffee cans (1 for each group), 326 g size
- Large Plastic Tub (~ same size as large flower foam block)
- Iron Filings (+ magnet)
- Clear Plastic Tube (~10 cm long, 2-3 cm diameter)
- Cotton Balls
- Toy Cars
- Lego™ “Factory”

Day 1:

Demonstration 1:

Set Up: Demonstrator is to take the green flower foam and draw a ~5 cm radius circle on the surface with a black magic marker. Place Pipe Cleaners into the foam all over its surface in the shape of “trees,” and place a few plastic animals amidst the “trees.” This foam will represent a forest for the demonstration.

Break the class up into groups of 4-5 students per group. Give each student group a “forest.” For this demonstration, students will explore the consequences of cutting down trees.

Have the students (taking turns in their groups) remove the trees and animals that are outside of the black line, called the “cut line.” The students should put dirt in the area where the trees were removed.

Target Observations:

- After the trees were cut down the forest was smaller
- After the trees were cut down there were less animals
- There is lots of dirt where the trees used to be

Procedure:

Bring the class back together and talk about their observations. Why would someone want to cut down trees? What really happens to animals when trees are cut down? Is it good or bad to have a lot of dirt laying around (i.e. what happens when it rains?)?

Target Model:

-Cutting down trees destroys the forest and animals living there.

Demonstration 2:

Set Up: Demonstrator should take the paper clips and unbend them (one for each group) into a hook. Demonstrator should attach one end of the paperclip to the wood block and attach a piece of clay shaped into a fish onto the hooked end. This is the “floating fish” that students will use for this demonstration. In addition, demonstrator should also prepare containers of “Oil” – cooking oil mixed with cocoa – and containers of “sewage” – dirt mixed with water – before the lesson, and place the liquids in separate containers.

Break the class back up into their groups and give each group a clear container filled with clear water and 2 “floating fish” floating in it. Give each group a container of Oil and have them pour it into their container. Make observations. Give each group a container of “Sewage” and have them pour it into their container. Make observations.

Target Observations:

After adding Oil

- Floating fish cut off from surface
- Fish can get stuck in oil

After adding “sewage”

- Fish swimming in dark water
- Can’t see fish anymore

Procedure:

Discuss the ramifications of the observations on the health of the fish, and other aquatic wildlife. Is it good for the fish to be stuck under oil? Can fish breathe in oil? Can fish breathe in “sewage,” i.e. dirty water? Would you want to swim in this water?

Target Revised Model:

- Cutting down trees destroys the forest and animals living there.
- Water pollution like oil and sewage can be bad for fish and other water animals.*

Demonstration 3:

Demonstrator has students make observations about what happens when a candle burns, and what happens when a candle is blown out.

Target Observations:

- Smells funny when candle is lit initially
- Candle gives off smoke when burning
- Candle gives off smoke when blown out

Procedure:

Ask students what types of things give off smoke like the candle. What about cigarettes, cars, factories? Where does the black stuff come from? Do you think it is good to have that black stuff accumulate in your lungs?

Target Revised Model:

- Cutting down trees destroys the forest and animals living there.
- Water pollution like oil and sewage can be bad for fish and other water animals.
- Air pollution from smoke is bad for the lungs.*

Demonstration 4:

Set Up: Demonstrator should take coffee cans and poke holes in the lids.

Break class back into their groups. Demonstrator sprinkles baking soda on metal pans and gives one pan and one coffee can (filled with some water) to each of the groups. Students in the groups are to flip the can over and observe what happens when the “rain” falls into the pan. Demonstrator places a little bit of vinegar into each of the coffee cans. Students once again flip the can over and observe what happens when the “acid rain” falls into the pan.

Target Observations:

- When the water dropped on the baking soda, the baking soda clumped up like mud.
- When the vinegar dropped on the baking soda it didn't clump, but rather fizzed and bubbled.

Procedure:

Class should talk about how some factories, in addition to creating smoke, release chemicals into the air that act as acids. By reviewing the water cycle, the class should understand how chemicals in the air could affect things on the earth's surface (i.e. acid in the air combines with water in clouds and comes down as acid rain). Vinegar is a very weak acid, but some acids can burn through wood or skin. Do you think acid rain is good

for us? Do you think acid rain could hurt plants (excellent science fair experiment)?
Why are factories allowed to give off smoke that causes acid rain?

Target Revised Model:

- Cutting down trees destroys the forest and animals living there.
- Water pollution like oil and sewage can be bad for fish and other water animals.
- Air pollution from smoke is bad for the lungs.
- Air pollution from acid rain is bad for people and plants.*

Day 2:

Demonstration:

Set Up: Demonstrator should create a “factory” from Lego™ bricks, or some other building material. The factory ideally should have a smokestack(s) and a hole in the side where the clear plastic “waste” tube will be attached later. Demonstrator should also color cotton balls black to use as “smoke.” Finally, demonstrator should place large green “dry” flower foam in a plastic tub, with pipe cleaners and plastic animals arranged to make a forest as in Day 1, and ensure that there is room on one side for a “river” to form.

Demonstrator brings the class together and reviews the model developed previously about pollution (Day 1). Demonstrator shows the class the model of a “forest” that was set up as above. Demonstrator has a student help with each of the following steps, which the class observes as a group:

- Step 1:

Cut down (remove) trees to make room for factory. Factory is placed next to river.

Observations: Trees were cut down (removed) and dirt replaced them.

- Step 2:

Cut down more trees to add a driveway and parking lot (Iron Filings) for workers.

Observations: More trees were cut down and blacktop was added.

(Note: Iron Filings can be cleaned up easily using a magnet.)

- Step 3:

Sprinkle water on the foam to simulate rain.

Observations: Black stuff and dirt wash off into river, creating water pollution.

- Step 4:

Factory adds pipe to river to get rid of waste liquids. Oil and dark water are poured down the pipe.

Observations: Waste from Factory creates water pollution in river.

- Step 5:

Factory must let out smoke from smokestacks. Black cotton balls are attached to smokestacks.

Observations: Smoke from Factory creates air pollution.

- Step 6:

Employees drive their cars to work, putting more smoke into the air.

Observations: Smoke from cars creates more air pollution.

Target Model:

- Cutting down trees destroys the forest and animals living there.
- Water pollution like oil and sewage can be bad for fish and other water animals.
- Air pollution from smoke is bad for the lungs.
- Air pollution from acid rain is bad for people and plants
- Factories can destroy forests and animals and cause air and water pollution that is dangerous for wildlife and humans.*