



ACTIVITY 7

HOW DO ECOLOGICAL DISASTERS AFFECT ME?



EXPERIMENT OBJECTIVES AND CONTENT

The goal of this activity is to introduce students to the origins of the food they eat and to the effects that faraway ecological disasters can have on their daily lives.



ESSENTIAL KNOWLEDGE

Energy:

- Transformation of energy in living things: food chain

Systems and interaction:

- Interaction between living organisms and their environment: living things and their habitats
- Interaction between humans and their environment
- Environmental technologies

Appropriate language:

- Terminology related to an understanding of living things



SUGGESTED MATERIALS

Perishable non-scientific materials:

- Water
- Salt
- Vegetable oil
- Chocolate powder
- Plush animals

Household materials:

- Bowls
- Towels
- Soap
- Spoons

School supplies:

- Paper
- Pencils



CONTEXT: SITUATIONAL PROBLEM OR RESEARCH QUESTION

You get home after school one day and ask your mom if you can have your favourite fish sticks for dinner. She tells you that fish is really expensive right now and you will have to pick something else. Later on in the evening you hear updates on the clean-up of a nearby oil spill off the coast of Newfoundland. How did the oil spill affect the creatures that live there? What methods are being used to clean it up? Does it affect me at all?





SUGGESTED PREPARATORY ACTIVITIES (INTRODUCTION)

The teacher could conduct a discussion about life in the ocean. The students will talk about different fish and marine mammals. Have the students consider marine microbes as part of the ocean food chain. Also direct the discussion towards human uses of the ocean, including fishing and transportation of materials and goods by boat. Discuss oil spills.



INITIAL IDEAS AND HYPOTHESES

Here are a few examples of hypotheses the students might formulate based on their initial ideas:

Example 1

I predict that an oil spill will not mix with the water and will float in globs on the surface. I predict that this can be cleaned by scooping the oil off the surface. I predict this because when there is oil in the driveway it floats on the surface of puddles when my father washes the car.

Example 2

I predict that the oil from an oil spill will stick to animals' fur and feathers and that it can be cleaned by being wiped off with a towel. I predict this because when I get grease on my hands from my bicycle this is the best way to clean it off.

Example 3

I predict that the oil from an oil spill will stick to animals' fur and feathers and that it can be cleaned by being washed with soap. I predict this because when my parents want to clean a greasy frying pan, using soap is the best way to clean it off.



WORK PLAN AND EXPERIMENTATION

Here are a few examples of experiments the students can carry out to verify their hypotheses:

Example A

The students conduct an experiment with a bowl of salt water, using vegetable oil mixed with chocolate powder to simulate an oil spill. The students can try to scoop the oil out of the water to see how effective it is as a clean-up method.

RECORD ALL YOUR IDEAS AND OBSERVATIONS IN YOUR EXPERIMENT WORKBOOK.



**Example B**

The students conduct an experiment with a bowl of salt water, using vegetable oil mixed with chocolate powder to simulate an oil spill. Using a plush animal with the simulated oil, they try to wipe it off with a towel to see how effective it is at cleaning off the oil.

Example C

The students conduct an experiment with a bowl of salt water, using vegetable oil mixed with chocolate powder to simulate an oil spill. Using a plush animal with the simulated oil, they try to wash off the oil with soap to see how effective it is at cleaning off the oil.

EXPERIMENTAL FACTORS

To ensure scientific rigor, the students should evaluate the experimental factors that might influence the experimental results.

- Amount of oil used in each experiment
- Type of oil used
- Type of fabric used to wipe the animal
- Type of soap used to wash the animal

**DISCUSSION: SUGGESTED
INTEGRATION ACTIVITIES
(CONSOLIDATION)**

Students should discuss their findings to answer the original research question and discuss how the availability of fish and other sea food as a human food source may be affected after an oil spill. Have the students talk about the different ways to clean up an oil spill and how effective they are. Discuss the effects an oil spill will have on animal life.

**SUGGESTED ACTIVITIES
FOR APPLYING KNOWLEDGE
(APPLICATION)**

Have the class make a list of ways they think oil companies and countries clean up after an oil spill. Try to consider these three situations: cleaning oil out of the water, off of animals, and off the shoreline. Lead a discussion about different clean-up methods and ways to prevent future oil spills.





SCIENTIFIC CONCEPTUAL CONTENT

Ecological catastrophe

An ecological catastrophe is when an environmental disturbance has negative effects on the ecosystem. Environmental disturbances can be natural, such as tsunamis, droughts, or volcanic eruptions, or they may stem from human activities, such as oil/chemical spills, accidental forest fires, invasive species, or over-hunting. These disturbances upset the natural order of ecosystems by disrupting such things as the food chain or habitats. No matter where ecological catastrophes occur, their effects can be felt worldwide through our natural resources.

Effects of oil spills on microscopic life

When we think about the effects of oil spills on marine life, we usually think mostly of fish, marine mammals, seabirds, and coastal wildlife. But it is also very important to consider the effects on algae and marine microbes.

Some species of marine microbes are able to break down and use oil as an energy source if the amounts are relatively small. These organisms help the environment by decreasing oil's toxic effects. With large oil spills, however, there are not enough of these microbes to protect the ecosystem, and toxic chemicals build up in other microbes such as plankton.

Plankton are responsible for much of the world's photosynthesis (i.e., turning carbon dioxide into oxygen and sugar) and their destruction (in an oil spill, for example) can lead to a local decrease in carbon fixation. Plankton are also a food source for many types of marine life, and their contamination with oil affects the organisms that eat them. The predators of plankton-feeding fish are also then affected, and so on up the food chain.

Effects of oil spills on animals

Aside from affecting animals throughout the food chain, oil spills have direct effects on animals. Oil fumes affect their respiration, and the oil itself can cause blindness.

When oil builds up on the feathers of seabirds, their natural instinct is to clean them with their beaks, thereby ingesting the oil and becoming poisoned.

Otters rely on air bubbles in their fur to insulate them and keep them warm in the cold ocean waters; as oil builds up in these air bubbles, they become hypothermic and often die.

Oil coats the gills of fish, affecting gas exchange, and the toxins in the oil impair their ability to reproduce effectively.

Invertebrates living in intertidal regions are often killed in oil spills. Many animals are also affected due to the destruction of their habitats by oil spills.





Cleaning animals after oil spills

After an oil spill, many animals are brought to cleaning facilities. In the case of sea birds, their feathers, eyes and digestive tracts are flushed with water to clean off the oil. They are kept in the facility while they recover and undergo many tests to make sure they are capable of surviving before being released back into their habitat.

In the case of otters they are taken in and their fur is cleaned and their body temperature increased. They are tested for injuries and diseases before being released back into the wild.

Many fish and marine mammals cannot be cleaned using such methods, and many die as a result of the oil spill.

Clean up timeline

The time taken to recover from an oil spill depends greatly on the amount and type of oil spilled. Light oils (e.g. gasoline and kerosene) can be degraded naturally and evaporate quickly, whereas heavier oil (e.g. heating oil and oil) is harder to clean up and takes much more time. The location of the oil spill also affects the clean-up time required. Oil spills in the open ocean are easier and faster to clean up than those in coastal regions.



CULTURAL REFERENCES

Exxon Valdez oil spill

One of the more famous oil spills was when the ship Exxon Valdez spilled 40,000 litres of oil it was transporting in Alaska's Prince William Sound. The spill eventually covered 38,000 square kilometres in the area. Efforts were made to clean the spill by dispersing the oil, which proved ineffective, then by containing the spill with a boom and skimming the water's surface to remove the oil. The spill killed hundreds of thousands of animals, including fish, birds, whales, and other marine animals. Today, 20 years after the spill, there is still evidence of oil in the environment, and the ecosystem has not yet fully recovered.

Frequency of oil spills

It is estimated that there are an average of 30 minor oil spills per day. Most of these spills can usually be left for the ecosystem to degrade naturally without causing much damage. Major oil spills, however, have occurred at least once a year for the last 30 years. Even after spending hundreds of millions of dollars and expending an incredible number of man hours, the ecosystems in which oil is spilled are most often destroyed.

Responsibility for clean-up

The responsibility for the clean-up falls to private industry or the state that caused the spill. They are often bound by law to employ oil spill prevention methods and have contingency plans for action in case an oil spill does happen.

**FOR MORE CULTURAL REFERENCES,
VISIT THE ÉCLAIRS DE SCIENCES WEBSITE:
www.eclairsdesciences.qc.ca**





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Conception

Éducavif

Find out more about the educational activities and resources offered by this organization on their website: www.educavif.org

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PROCESS OF ACTIVE DISCOVERY

GENERAL LEARNING PROCESS IN SCIENCE AND TECHNOLOGY (IN ELEMENTARY SCHOOL)

Context related to everyday life



- Situation problem or
- Discovery question or
- Need to be fulfilled
- Question related to the operation of an object (how does it work?)



Initial ideas and hypothesis

My initial ideas:

- I share my own ideas.

My hypothesis:

- I predict that... I think that because...
- I imagine my prototype.
- I think it works like this...

Planning and carrying out



My equipment:

- I observe and handle the equipment.
- How could this equipment be useful to me?
- I choose my equipment and my materials.

Carrying out my process:

- What will the steps be?
- What precautions should I take?

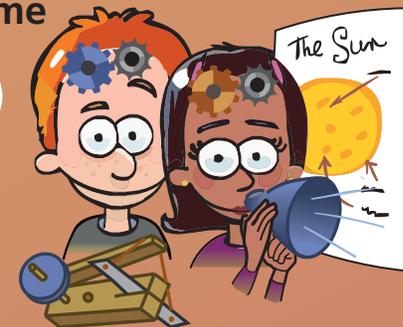
My actions:

- I carry out the steps of my protocol.
- I note or draw what I observe, what I do and what I discover.

My results:

- What is my answer to the problem, question or need?

Outcome



My outcome:

- Do my results confirm my hypothesis or not?
- Are my results similar to those of the other teams?
- Can the other teams' results help me to find answers to my problem, my question or my initial need?
- What could I communicate concerning my discoveries?

What I learned:

- What do I retain from this activity?
- What could I communicate concerning my results or my discoveries?

New question?