Lesson Plan

Description

Students will learn what acid rain is and how certain ways of generating energy can cause it. In a hands-on activity, students will monitor and assess changes to plants caused by acid rain.

Learning Outcomes

Students will learn about human impact on the environment and how to mitigate these impacts.

Students will make observations and record their findings.

Specific Expectations

C1.1- Assess the impacts on society and the environment of various processes used in the manufacture of common products.

C1.2- Assess how the use of specific materials in the manufacture of common products affects the environment and identify actions that society and individuals can take to mitigate negative impacts.

E1.1- Analyse long-term impacts of human uses of energy and natural resources, on society and the environment, including climate change, and suggest ways to mitigate these impacts.

Materials Needed

- Two large glass jars per group
- Two flowering plants per group (can be gathered from the school yard)
- Vinegar
- Water
- Plastic wrap
- Two small glasses per group (to fit inside the large glass jars)
- Two elastics per group
- 4-6 weights per group (paper clamps, marbles, small building blocks)

Introduction

Before Greater Sudbury began its environmental remediation, there was a period of acid rain that caused a lot of environmental devastation.

Students will create an experiment that produces acid rain, and they will monitor how their plants react.

What is acid rain and what causes it?

Acid rain occurs when pollutants like coal, oil, and gas enter the air. This causes changes to the pH levels of the rain, making it acidic. These pollutants release gases like nitrogen oxides and sulphur dioxide into the air.

When these gases mix with water vapour in the atmosphere, they then turn into acids. These acids continue to float around in the atmosphere until it rains. When it starts to rain, these acids fall with the rain, creating 'acid rain.' Acid rain is like regular rain, but it brings the gases that have been trapped in the atmosphere along with the rain.

This can be harmful to the environment because the increase in acids can cause damage to ecosystems and everything in them like plants, trees, and even bodies of water like lakes.

Why was there acid rain in Sudbury?

For more than a century, Greater Sudbury has been closely tied to the mining industry

In Sudbury, early mining led to acid rain because of the process of smelting. During the smelting process, sulphur dioxide was released into the atmosphere. When it rained, the sulphur dioxide fell with it.

For more than a century, Greater Sudbury, Ontario, has been closely tied to the mining industry, starting way back in the late 1800s.

How did Sudbury react?

Over the years, Sudbury has seen the industry change a lot as technology advances. But it was not until people started noticing how mining was affecting the environment that they began to act. The impact of mining became clear as local wildlife started suffering, and trees began disappearing fast. Sudbury realized it needed to do something to fix the damage caused by years of mining.

That is when the regreening process began – a plan to bring back greenery and restore the environment. Since then, Sudbury has been working hard to become more sustainable and was also able to make the smelting process more environmentally friendly.

They have learned from past mistakes and focused on making things better for the future. They have put a lot of effort into fixing damaged ecosystems and making sure they do not harm the environment again. In 2018, Sudbury celebrated 40 years of its regreening program, showing how committed they are to taking care of the environment.

Action

Goal of the experiment: To understand how acid rain occurs and learn how to monitor their experiments. This activity can be done in groups of 2-4 students.

Instructions:

1. Have the groups of students each take two large jars and two small jars.
2. Get students to fill up one jar with roughly ½ cup of vinegar and the other jar with roughly ½ cup of water.
3. Depending on the time of year, have students go outside to gather a couple of flowers per group. Ensure that they pick two of the same plant.
4. Once they have their flowers, place them inside their small glass jar with some water.
5. Place the small glass jar with the plant and water inside of the larger jar. Make sure the flower has enough room to stand, if not, you can get students to trim the stems.
6. Put plastic wrap over the lid of the large jar, securing it with an elastic band.
7. Get students to pick a couple of weights and have them place them on the plastic wrap. You just want enough weight so the plastic wrap curves into the glass.
8. Place both mason jars next to a window in direct sunlight, if possible.
9. Discuss what they think might happen to their plants. Have them write or draw their own hypothesis on their handout.
10. Have students monitor for changes using their handouts.

Observation:

Students should be able to notice a difference in the plants within the first hour or two. They should observe the plant with the water surrounding the small jar remaining unchanged, whereas the flower with the vinegar surrounding the small jar should begin to wilt. The flower with the vinegar will continue to wilt throughout the day.

They can continue to monitor for changes throughout the school day. Students can leave their plants overnight and monitor the final changes the next day.

Accommodations/Modifications

If students cannot write or draw their hypothesis or their findings have them discuss it amongst the class.

You can modify the experiment to test putting cut flowers directly into tap water, slightly acidic water, and very acidic water.

Assessment

Students are expected to complete the experiment and monitor for any changes. Students can be graded on their observations.