

Climate Change and Human Impacts in your Classroom

Action Project Lesson Plan

Purpose

To demonstrate the effects of climate change and human impacts on plants using a hands-on experiment.

Overview

This hands-on project will demonstrate the effects of climate change and other human influences on plant life. Students will grow plants in a windowsill garden. Once the plants are established, they will undertake experiments that will allow them to observe firsthand the effects that climate change and other environmental influences have on the growth of plants.

Getting Organized

Level: Grade 6

Curriculum Connections:

Math - Data Management

Social Studies - Canada's Interactions with the Global Community

Science - Biodiversity

Length: 1 hour lesson, ongoing experiment (4-6 weeks minimum to allow time for observations to be made), time for follow-up and presentation of findings by students.

Materials:

- Eco Adventure Guides (Action Project planning pages)*
- Plants or seeds
- Soil
- Plant containers
- Salt
- Clear plastic container to cover a plant
- Water
- Observations Chart *(attached)*
- Worksheet *(attached)*

Teacher Background

The following environmental conditions will be examined by students.

Greenhouse effect

When the sun's rays travel to Earth, they come through the atmosphere, are absorbed by the earth's land, water and biosphere, and are sent back out into the atmosphere in the form of heat energy. Some of this heat returns to space, however much of it is trapped by greenhouse gasses which are found naturally in the atmosphere. We need this to happen to keep the Earth warm enough, but if there is too much heat trapped, our Earth will start to get too warm. If the Earth gets too warm, it could cause problems for humans, plants and animals. Humans contribute to this problem by releasing gasses such as carbon dioxide into the atmosphere when driving vehicles. Think of a greenhouse that plants grow in; on a sunny day it gets hot in a greenhouse because the glass allows light in but the heat gets trapped, just like a car on a sunny day.



Flooding

Flooding is a predicted result of climate change. More intensive rain events could cause flash flood conditions. As the climate changes, a region's average rainfall could increase. This would impact plants, animals and humans.

Drought

Similar to flooding, drought may be experienced in certain areas that historically had more rainfall. This could have an enormous impact on global food and water supplies.

Salinization

Salinization is another environmental impact caused by humans. When crops are irrigated, the water naturally contains minerals such as salt. As the water evaporates, the minerals are left behind, leaving a white crust on the soil. This causes the soil to become toxic to plants and inhibits them from absorbing water. This causes the soil to become infertile. Humans 'solve' this problem by flushing the soil with large amounts of water. Unfortunately, this causes other problems because the salty water is often drained into nearby rivers and lakes.

Invasive Species

Invasive species are plants and animals that are introduced to an area from another region. The foreign species will find a habitat that suits its needs and will take over an area, often becoming more successful than the local native species. If the invasive species does well in this habitat, it can overcrowd and eliminate the native species. These species are often a challenge to eradicate once established. As the invasive species takes over an area, the biodiversity of the area is depleted. Some examples are garlic mustard, European buckthorn, zebra mussels and Asian carp.

Activity

1. This project uses experiments to simulate the effects of climate change and other human environmental impacts on the growth of plants. Students will observe and record plant growth over a six-week period.
2. Plant some seeds or purchase some plants with your students. Plants should be grown in a windowsill that students can access to observe and care for the plants. Whichever plant you choose to grow, it should be something hardy and easy to grow in a window. Each plant should be the same species. If your window doesn't have ideal lighting conditions, you can purchase a full spectrum light bulb and a timer to provide light.

Recommended seeds/plants:

- Herbs- you could buy two or three plants and split them
 - Grass seed
 - Cat grass
 - Any indoor plants from a garden centre
 - Tomatoes, corn, peppers, or other early start vegetables. If you are starting in early spring, these plants will need plenty of sunlight each day.
3. Prepare at least 10 plants; you will need 6 healthy plants to do your experiments with.
 4. Choose the 6 plants that you are going to work with, they should be of equal health and size.



5. Label each plant as follows:
 - Ideal Conditions
 - Greenhouse effect
 - Drought
 - Flood
 - Invasive species
 - Salinization
6. Prepare each plant for the experiment using instructions found on the *Observation Chart* (attached).
7. Care for the plant according to the chart. Try to keep the growing conditions as consistent as possible.
8. Using the *Climate Change and Human Impacts in your Classroom Worksheet* (attached), have students fill in **Section 1** by making a hypothesis as to what will happen to the plants for each of the different growing conditions.
9. Each week, have students fill in the *Observation Chart*, describing changes, height, colour, condition and other notable observations.
10. At the end of your experiment, have students review their weekly observations and record their results in **Section 2** of the worksheet.
11. Finally, divide the class into five groups. Assign a condition (other than Ideal Conditions) to each group and have them answer the questions in **Section 3** of the worksheet. Have each group present their conclusions to the class.

To complete this lesson with a higher grade level or an advanced class, have students research and formulate a test that includes the impact of acid rain or loss of nutrients such as nitrogen into this experiment. They could also come up with other factors that influence the growth of plants.

Extension

- Use your plants to demonstrate the real-life impacts of climate change to other classes. Have students share their knowledge of sustainable actions and discuss what can be done locally to reduce the impacts of climate change. The **Pledge Tree Mentoring lesson plan** outlines all of the steps needed for this activity.
- Plant a tree or garden at your school. It's a great way to remove carbon dioxide from the atmosphere and reduce the impacts of global warming!

Online Resources

Climate Change Ontario | <https://www.ontario.ca/environment-and-energy/climate-change>

A Quick Reference Guide to Invasive Plant Species | www.ontarioinvasiveplants.ca/files/Invasives_booklet_2.pdf



Climate Change and Human Impacts in your Classroom

Observation Chart – Weeks 1-3

Each week, observe and record changes to the plants in the chart below. Some observations you may want to record are colour, height, general health of the plant and any other noticeable differences or changes.

	Ideal Conditions Water as needed to keep the soil moist.	Greenhouse Effect Water as needed to keep soil moist. Cover with a clear air tight container to allow light in, but trapping the heat.	Drought Water less than normal conditions.	Flood Water more than normal conditions.	Invasive Species Add a variety of other seeds to the soil to increase the competition for water, nutrients and sunlight.	Salinization Add salt to the water when watering the plant.
Week 1						
Week 2						
Week 3						

Climate Change and Human Impacts in your Classroom

Observation Chart – Weeks 4-6

	Ideal Conditions Water as needed to keep the soil moist.	Greenhouse Effect Water as needed to keep soil moist. Cover with a clear air tight container to allow light in, but trapping the heat.	Drought Water less than normal conditions.	Flood Water more than normal conditions.	Invasive Species Add a variety of other seeds to the soil to increase the competition for water, nutrients and sunlight.	Salinization Add salt to the water when watering the plant.
Week 4						
Week 5						
Week 6						

Climate Change and Human Impacts in your Classroom

Worksheet

Section 1 Start of Experiment: My Hypothesis

Now that you have your experiment set-up, what do you think will be the result for each plant by the end of your test?

Growing Condition	My Hypothesis
Ideal Conditions	
Greenhouse Effect	
Drought	
Flood	
Invasive Species	
Salinization	
Were there any complications while the experiment was in progress?	

Section 2 End of Experiment: My Results

Now that you are at the end of your experiment, what was the final condition of each plant?

Growing Condition	My Results
Ideal Conditions	
Greenhouse Effect	
Drought	
Flood	
Invasive Species	
Salinization	

Section 3 So what? My Conclusions

What do your results tell you about the impact each growing condition might have on the environment, plants, wildlife and us? In the space provided, record your answers to the questions below for one of the growing conditions observed.

Growing Condition: _____
How will this affect natural plant growth?
How will this affect food crop growth?
How will this affect animal habitat?
How will this affect humans?
If the effects are negative, what could be done to help prevent this?