New Jersey Agriculture in the Classroom

Tomato plants after four weeks

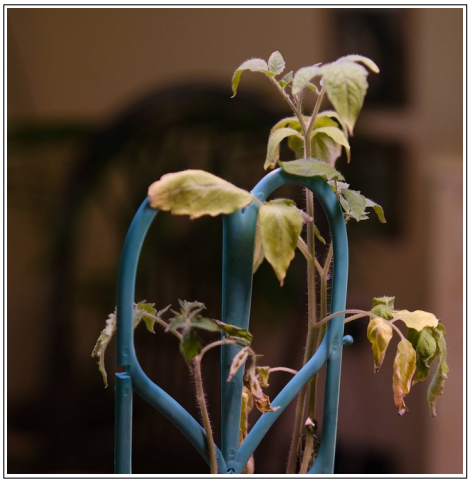
Normal Water

Climate Change and Plants

A lesson in the NJAITC Climate Change Series

OVERVIEW: Even the youngest student knows that all plants need sunlight and water to survive. But what does it mean for plants when climate change brings huge swings in weather? Periods of fierce rain storms and flooding can be followed by long stretches of hot weather and drought. This lesson shows students the impact of weather extremes on plants.

GRADES: K-5



No Water

OBJECTIVE: Students will be able to:

- Describe what all plants need to survive
- Predict and observe the impact of weather extremes on plants
- Explain how climate change causes large swings in weather patterns.

MATERIALS:

3 one- or two-liter clear plastic bottles
Potting soil to fill the bottles halfway
3 plants of the same size or seeds to grow plants in the containers

You can use any type of plant as long as the plants are basically the same size, but since this experiment talks about New Jersey agriculture, it would be advantageous to use vegetables that are some of New Jersey's top crops, such as tomatoes, sweet peppers, sweet corn, cucumbers, or squash.

Optional: a copy of experiment observation sheet for each student.

Optional: the book *Understanding Climate Change, Facing a Warming World,* by Melissa McDaniel

Too Much Water

NOTE: The experiment can be done as a whole class demonstration or by small groups of students. If you are doing the experiment in small groups, you will need three clear plastic bottles, soil, and seeds or plants for each group.

Once you start the experiment, it will take at least four weeks for students to see the full impact on the plants. Be advised that if you choose to start your plants from seeds, the plants will need to grow for at least five weeks for them to be big enough to begin the experiment.

PREPARATION

Cut each of the three clear plastic bottles in half. Drill two or three small holes for water drainage in the bottom of two of the bottles. The third bottle should not have any holes.

BACKGROUND

Begin a discussion about climate change and its causes. The Earth's temperature has been rising at an unusually rapid rate due to the increase of greenhouse gases in the Earth's atmosphere that hold heat in.

NJAITC's lesson The Greenhouse Effect is a very simple and quick experiment that shows students how this is happening.

Temperatures in New Jersey have increased about 4°F since the year 1900, and 2023 was the hottest year on record. As Earth's climate continues to warm, storms such as hurricanes become stronger and bring more rain. Droughts and heat waves are also expected to become more intense as the climate warms.

PROCEDURE:

Optional: Read Chapter 1, The Dangers of Climate Change in *Understanding Climate Change, Facing a Warming World,* by Melissa McDaniel.

Begin by asking students what all plants need to grow: air, water, and sunlight. Ask students what they think would happen to plants when big storms with heavy rains cause widespread flooding. Ask students what they think might happen to plants when it's very hot outside and there is not rain for a long time.

Tell students that they are going to start an experiment that shows the possible impact big changes in weather caused by climate change can have on plants and the crops that New Jersey farmers grow.

Transplant a small plant into each of the containers, or plant seeds in the containers and grow the plants before starting the experiment. *Be advised that if you choose to start your plants from seeds, the plants will need to grow for at least five weeks for them to be big enough to begin the experiment.*

Week 1

To set up the experiment: place the three plants in a row. Label them: No Water, Normal Water (or Just Right Water) and Too Much Water. Explain to the students that the plant that receives a normal amount of water is called the control and that you will compare what happens to the other plants with the control plant.

Next, make sure the Normal Water plant has enough water - if you press your finger one inch into the soil, the soil should feel damp. If not, water it. Then fill the container of the plant labeled Too Much Water with water until the water almost reaches the top of the container. Do not water the No Water plant.

Observe the control plant during the week to see if it needs more water. If your classroom is very dry, it may be necessary to water this plant more than once a week. Again, use the test of pressing your finger down one inch and feeling if the soil is dry. Likewise, if water evaporates from the Too Much Water container quickly, you may also have to add water.

Week 2

At the beginning of each week, ask students to observe and compare the leaves, stems, and roots of the three plants. (The roots will be visible through the clear plastic.) Ask them to describe in writing the condition and the changes in the three plants. Most likely, there will not yet be any dramatic changes in the No Water and Too Much water plants. Next, water the Normal Water plant and add water to the Too Much water container if needed. Do not water the No Water plant.

Week 3

At the beginning of each week, ask students to observe and compare the leaves, stems, and roots of the three plants. Ask them to describe in writing the condition and the changes in the three plants. They should begin to see some changes in the plants with no and too much water. Next, water the Normal Water plant and add water to the Too Much Water container if needed. Do not water the No Water plant.

Week 4

At the beginning of each week, ask students to observe and compare the leaves, stems, and roots of the three plants. Ask them to describe in writing the condition and the changes in the three plants. They should begin to see dramatic changes in the plants with No and Too Much water. Next, water the control plant and add water to the Too Much Water container if needed.

Week 5 and Beyond

Continue the weekly process of observing the three plants until the No Water and Too Much water plants are dead. The No Water plant will probably die in 4-5 weeks. The Too Much Water plant will probably hang on for a few more weeks.

EVALUATION

Depending on the grade level of your students, ask them to write an essay, a paragraph, or sentences accompanied with drawings to describe what happened to the three plants in the experiment. Ask them how they think the heavy rain storms that cause flooding and periods of high heat and drought brought on by climate change can impact the plants that farmers grow for us to eat.

EXTENSION

Learn about farming in New Jersey by reading *From the Garden State to Your Plate, Farming Fruits and Vegetables in New Jersey.* Discover New Jersey's top crops and where they are grown. Click here for a digital copy of the book, available on the NJ Agriculture in the Classroom website.

Teach the lesson *New Jersey Farming and Climate Change,* part of the NJAITC Climate Change Series.

New Jersey Learning Standards

Climate Change Education, Science: K-LS1-1, K-PS3-1, 2-LS2-1, 3-LS4-4, 3-ESS3-1, 4-ESS3-2

Social Studies: 6.1.2.Geo.HE.1

NAME_____

Climate Change and Plants Experiment Observation Sheet

	Week One – Describe each plant
Normal Water	
No Water	
Too Much Water	
	Week Two – Describe each plant and any changes you see
Normal Water	
No Water	
Too Much Water	
	Week Three – Describe each plant and any changes you see
Normal Water	
No Water	
Too Much Water	

	Week Four – Describe each plant and any changes you see
Normal Water	
No Water	
Too Much Water	
	Week Five– Describe each plant and any changes you see
Normal Water	
No Water	
Too Much Water	
	Week Six – Describe each plant and any changes you see
Normal Water	
No Water	
Too Much Water	