

Overview

Students will track and graph the following data and look for causation. What might be a cause for the changes we see with the seasons?

- Hours of daylight
- High and low temperatures
- Soil temperatures

Engage & Explore

Divide the class into groups of 4-6 students. What are the four seasons? Draw a picture to represent each season. Have a gallery walk to see each group's pictures. What do the pictures of Fall have in common? Winter? Summer? Spring? Why do these changes happen every year? How do the seasons impact us?

Activity

1. Students will track and graph the hours of daylight, high and low air temperatures, and soil temperatures. Students can collect their own data over a period of time or use databases. I recommend both. Students should collect their own data over a period of time to see the changes, firsthand. Using a database will give them access to a longer range of data. Students can be divided into groups and assigned one data point to collect.

Resources:

<http://jan.moesen.nu/daylight-calculator/>

Allows city and state selection; provides sunrise and sunset times, and hours of daylight

http://aa.usno.navy.mil/data/docs/RS_OneYear.php

Allows year, city and state selection; provides sunrise and sunset times in military time

Grade Level: 2, 5

Central Idea: Cycles impact the world around us.

Materials:

Thermometer
Soil thermometer
Plastic cups
Seeding soil
Radish seeds

Concepts:

Causation
Form
Connection

Line of Inquiry:

How weather conditions are related to the time of year (causation).

Standards:

2.E.1.3
2.E.1.4
2.OA.1
2.MD.10

5.P.3.2
5.E.1.1
5.E.1.2

The Rise app

Allows students to see the sunrise and sunset times on any selected day, can be selected for 12-hour or 24-hour clock.

<https://www.wunderground.com/history/>

Provides historic temperature data

<http://climate.ncsu.edu/map/>

Provides both air temperature and soil temperature (use the drop down menu in the upper right to select air or soil temperature.)

Example: Data obtained from the above websites

Date 2017	Hours of Daylight (nearest hour)	Low Temp (°F)	High Temp (°F)	Soil Temp (°F)
Jan 1	10	39	48	49
Feb 1	10	42	73	46
Mar 1	11	59	75	59
Apr 1	12	50	73	58
May 1	13	69	80	71
Jun 1	14	60	86	78
Jul 1	14	71	89	82
Aug 1	14	59	87	82
Sept 1	13	62	82	77
Oct 1	12	48	71	67
Nov 1	11	42	73	57
Dec 1	10	?	?	?

2. Graph the data collected in a bar graph. Graph each different data set on a different graph. Assign each group a different data set to graph.
3. Analyze the data and look for patterns.

Which month (or months) has the highest high temperature?

Which month (or months) has the highest low temperature?

Which month (or months) has the highest soil temperature?

Which month (or months) has the most hours of daylight?

Which month (or months) has the lowest high temperature?

Which month (or months) has the lowest low temperature?

Which month (or months) has the lowest soil temperature?

Which month (or months) has the least amount of daylight hours?

Is there a relationship between number of daylight hours and temperature?

Does the ____ temperature affect the number of daylight hours?

Does the number of daylight hours affect the temperature of the soil?

Does the number of daylight hours affect the high temperature?

Does the number of daylight hours affect the low temperature?

How does the air temperature affect your daily life?

How does the number of daylight hours affect your daily life?

How do you think the soil temperature affects the garden?

What do you think would happen to the garden if there were 8 hours of daylight?

What if there were 18 hours of daylight?

Extension/Curriculum Ideas

Does soil temperature affect seed germination?

Students will determine the effect of soil temperature on a radish seed.

1. Each group of students will fill a plastic cup with seed starting soil.
 2. Place one or more of the cups in each of the following locations:
 - Freezer
 - Refrigerator
 - A sunny window
 - Outside near the garden
 - Shady spot outside
- Allow the cups of soil to remain in the designated location for 24 hours.
3. Record the temperature of the soil at each location.
 4. Make 3 small indentations with a fingertip or the eraser end of a pencil ($\frac{1}{4}$ -inch to $\frac{1}{2}$ -inch) and place one radish seed in each indentation. Pinch the soil to cover the seed. Water the soil in each cup with the same amount of water. The soil should be moist throughout without being saturated.
 5. Observe seeds for the next 7-10 days, recording the soil temperature every day.
 6. Did all of the radish seeds germinate?
 7. Which seeds germinated first? What was the temperature of the soil?
 8. How did soil temperature affect the germination of radish seeds?
 9. What soil temperature is best for radish seed germination?
 10. Based on your data, which months would be the best for planting radishes?
 11. Choose two other vegetables and research the best soil temperature for germination. Based on your data, what would be the best months to plant each?

12. Check the temperature of the soil in the garden. If the temperature is within the appropriate range, the radish seedlings can be transplanted into the garden.

Teacher information:

Radishes usually germinate within 2 to 4 days and are ready to harvest after 25 to 30 days. Optimum soil temperature for germination is 45 – 85°F. They may germinate in temperatures as low as 40°F, but will typically take longer to germinate. They will not germinate when the soil temperature is above 95°F.

Your Notes & Ideas