



Soil Temperature

Goals

Students will use thermometers to measure soil temperature and use the information to determine if the soil is warm enough to support plant growth.

Curriculum Alignment

Find a list of which Common Core State Standards and NC Essential Standards this lesson plan aligns with on the lesson plan page at www.growing-minds.org.

Materials

- 4-5 soil thermometers (meat thermometers work well as a substitute)
- 4-5 thin wooden skewers marked at 2, 4, and 6 inches
- Clipboards
- Plain white paper
- Pencils
- Watch (or way of keeping time)



Book to Read
And Then It's Spring
by Julie Fogliano

Vocabulary

Weather: Weather is the condition of the air – things like hot or cold, windy, cloudy, wet. How it feels outside.

Meteorology: The study of weather. Meteorologists study air, wind, rain to forecast weather.

Thermometer: An instrument used to measure temperature. Heat causes liquid inside to expand and climb up the tube.

In Class (or In Garden) Discussion

Ask students, "What is weather?" Write some of their defining words on the board.

What do students know about weather in each of our seasons? What months are hot, cold, warm, cool, snowy, or rainy? Write the seasons on the board and record the students' answers next to the season's name. What are average temperatures in the winter, summer, fall, spring? Include example temperatures next to descriptive words for the seasons like hot, cold, warm, cool.

Explain to students that soil temperatures change in the seasons, just like air temperatures change. So when the air feels cold, the soil is cooling too. What seasons are best for growing plants? What does it feel like outside during those months?

Tell students that before gardeners plant, they often measure the temperature of their soils. Explain that we are planning on planting in the garden, but want to be sure the soil temperature is correct.



Soil Temperature

Soil Temperature

Soil temperature has a significant role in helping to determine the rate of plant growth, and whether a plant will even survive. Draw the chart below on the board and explain it to students.

Soil Temperature	Conditions during growing season
Less than 40 F	no growth
40 F to 65 F	some growth
65 F to 70 F	fastest growth
70 F to 85 F	some growth
above 85 F	no growth

Garden Activity

Before going to the garden, divide the class into four or five groups (with three-four students in each group). Give each student a clipboard with a pencil and a piece of paper. Tell them that they are going to record the temperature of the soil in different areas of the garden. To keep track of the data collected, you need the students to record their measurements in a chart. Guide students in creating the chart below (or a similar chart) on their pieces of paper. Explain that they will measure the soil temperature at different depths. Do they think the soil temperature will be warmer or cooler as they measure the temperature deeper into the ground?

Garden Soil Temperature				
Date:				
Location	Depth 1	Temperature (°F) of Depth 1	Depth 2	Temperature (°F) of Depth 2
<i>Under the straw, next to the building, in the sun.</i>	<i>2 inches</i>	<i>60°F</i>	<i>6 inches</i>	<i>55°F</i>

Take students to the garden and demonstrate how to measure soil temperature.

Instructions

First measure the air temperature. Using a thermometer, measure the air temperature at shoulder height. Measure the temperature at the surface of the ground. Is there any difference?



Soil Temperature

To determine the soil temperature, use the skewer that you have marked at 2, 4 and 6 inches. Push the skewer into the ground until you reach the 2 inch mark. Remove the skewer and insert the thermometer for one minute, then remove the thermometer and quickly record the temperature. Demonstrate how to record the data on the chart. Repeat at 4 or 6 inches.

Ask each group of students to measure and record the soil temperature in at least three locations, at two depths (2, 4 or 6 inches) per location. Help the groups identify three distinct locations for their measurements (an example of three measurement areas might include a raised bed, in a grassy area, under mulch).

After the students measure the temperature in three locations, gather them together and ask each group to report their findings. Ask students to refer to the temperature chart (above) to determine if the soil temperatures are good for planting.

If the soil is warm enough, plant with your students in the garden within the next several days.

Extensions

Find the Difference and Compare

As students most likely discovered, the soil temperatures change with soil depth. Ask students to compare the temperatures they recorded at different depths. At which depth is the soil the warmest? Which is the coolest? Guide students in subtracting the coolest temperature from the warmest temperature to determine the difference (in degrees).

How the Sun affects Soil Temperature

To determine how direct sunlight affects soil temperature, guide students in measuring soil temperature one area that gets full sun (next to a brick wall is great!) and one area that is in full shade. Students will note that the soil temperatures in direct sun are typically much higher than in the shade.