



## 3.4 TEMPERATURE

### OBJECTIVES

The students

- Measure temperature three times each day.
- Graph daily temperature.
- Make hypotheses and generalizations about temperature and time of day.
- Develop a sense of how the sun affects outdoor temperature.

### CLIMATE EDUCATION FRAMEWORK

- 3-5Weather.A.1 By measuring weather conditions (temperature, amount and kind of precipitation, amount and kinds of clouds, wind direction and wind speed), scientists learn how the weather changes from day to day, month to month, and during the year.
- 3-5Energy.A.1 Whenever anything happens or changes, energy is involved. For example, whenever there is a change in an object's motion or temperature, energy is involved in those changes.
- 3-5Energy.A.2 Light is a form of energy that moves from one place to another place.
- 3-5Energy.B.1 Energy from the Sun travels to the Earth as light. When this sunlight is absorbed, it warms Earth's land, air, and water.

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### BACKGROUND

This activity should be started in the first weeks of school during the setting up of the Weather Data Center. Students begin by collecting, recording and graphing temperature data. They began to correlate changes in daily temperature with months and seasons. Next they add the relationship of temperature and sunlight. There are two aspects to this study. First, there are daily temperature variations that will be correlated with the shadow of cloud cover in the next activity 3.5 CLOUDS. Second, they will look at monthly and seasonal temperature variations that will be correlated with other weather data.

It is suggested that temperature be taken at the same time and place each day.

Ideally, temperature is taken three times—when the students first arrive in the morning, at noon, and right before the students leave in the afternoon. The three temperatures can be put on a triple line or bar graph using different colors.

Ideally, the thermometer will be mounted right outside the classroom window so that it can be read from inside. However, in many schools the thermometer is carried outside and read or is placed in some other permanent place.

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### STUDENT ROLES

Meteorologist

Mathematician (when graphing)

**MATERIALS**

chart paper

markers

Wonder and Discover Book

Celsius-Fahrenheit thermometer—large, with each degree marked is preferred

Class Responsibility Chart

Class Weather Data book or chart

Working Dictionary

Student Page 3.4A Daily Temperatures

Student Page 3.4B CM Grid

**PRODUCTS**

Concept map about temperature

Class chart about temperature predictions

Class graph of daily temperatures

Class temperature data

Working definition of temperature

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**PROCEDURES**

- 1. Help the students create a class concept map about temperature to assess their prior experience with temperature and thermometers.**
- 2. Review the use and care of thermometers with the students.**
- 3. Introduce the activity with a discussion about the Celsius-Fahrenheit thermometer if the Fahrenheit scale is used locally. If only Celsius is used, skip this step.**

Show them a thermometer and ask questions such as these:

  - Can anyone show us the Celsius scale on this thermometer?
  - Can anyone read the Celsius scale?  
✓The hands raised in answer to this question will provide a hint for teaming the students to carry out the remainder of the activity.
  - What is the other scale called?
  - Can anyone read this scale?  
✓This is another question that will help to organize work teams.

**4. Have the students make predictions about the temperatures they will measure during the coming year. List the students' predictions and their hypotheses as to why on a class chart about temperature predictions.**

Ask such questions as

- What do you predict will happen to the temperature during the day if you measure it when you first come in the morning, at noon, and right before you leave in the afternoon? Why?
  - ✓Have students discuss why the temperature changes during the day. Record the students' hypotheses and ideas.
- When do you predict it will be hottest during the day? Why?
  - ✓There is a natural anomaly here. The hottest part of the day could reasonably be argued to come at the time of most sunlight or noon. However, there is a lag, and the hottest time is most often in the early afternoon. The sun is still warming the earth at noon. The students will discover this. Accept and record all predictions and hypotheses.
- How do you predict that temperatures will compare between times when there are clouds and times when it is clear? Why?
- What do you predict will happen to the temperature from month to month? Why?
- What do you predict the highest temperature will be this month? The lowest temperature?
- What do you predict the average temperature will be in the morning this month? At noon? In the afternoon?
  - ✓Discuss the meaning of average temperature with the students. This does not need to be computed mathematically but can be simply defined as the most common temperature for that time on the graph.
- How do you think the temperature at noon on a sunny day will compare with temperature at noon on a cloudy day?
  - ✓This will be investigated in Activity 3.5 Clouds.

**5. Have the students graph daily temperature data on a class graph. Record measurements on Student Page 3.4A Daily Temperatures.**

Have them

- Add temperature data collection to the class Responsibility Chart.
  - ✓The three sets of data, morning, noon, and afternoon can be put on the same graph using different colors for each. Use SP 3.4B CM Grid.
  - ✓Blanks in the data will not affect the results. They will naturally exist over weekends and holidays.

**6. Ask the students if they have any other questions they would like to explore about outside temperature.**

Help them

- Record their questions and ideas in the Wonder and Discover Book.

Periodically ask such questions as

- Do any of your predictions seem to be right?
- Have you been able to answer any of the questions you put in the Wonder and Discover Book about temperature?
- Have you other questions you would like to add?

**7. Have the students write a working definition for temperature and record it in their Working Dictionary.**

**8. During the first monthly weather summary after the students begin recording daily temperature data, have the students analyze the morning, noon, and afternoon temperatures.**

Ask such questions as these:

- What were your predictions about temperatures in the morning, at noon, and at the end of the school day?
- Were your predictions correct?
- Why do you think so?
  - ✓Have the students look to see about what range most of the temperatures fall into. This is the easy way to finding a mathematical average and one they can more easily use.
- How did your prediction about the temperature of sunny and cloudy days in fall turn out?
- What was the highest temperature? Lowest? Average noon temperature?
- Were your predictions correct? Why do you think so?
- How do the temperatures at the beginning of the month compare with the temperatures in the middle of the month? At the end of the month?
- What do you predict will happen to the temperatures next month. Record predictions on Student Page 3.6B Weather Predictions.

**9. Review the class graph of daily temperatures during the monthly weather summary. See Activity 3.6 Monthly Weather Summary.**

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**EXTENSION**

- Set up a temperature center and have the students report on their own investigations.



