Average Temperature

Background

The Earth orbits the Sun in an elliptical path that is very nearly a circle. In early January each year, the Earth is nearest to the Sun; in July of each year, the Earth is farthest from the Sun.

Earth experiences seasons because its axis of rotation is tilted with respect to its orbital plane. The tilt of Earth's axis causes surface temperature variations as the Earth orbits the Sun. In the northern hemisphere during the summer, the Sun rises north of east and takes a very high path across the sky to set north of west. The Sun is in the sky for a longer period of time and the rays of sunlight strike the Earth at a high angle. In winter, the Sun rises to the south of east, travels a low path across the southern sky, and sets to the south of west. The angle of incident sunlight striking the northern hemisphere is lower. A low angle of sunlight is very inefficient at heating the Earth's surface because the energy is spread out over a larger area. Also in the winter, the Sun is up for a shorter period of time. The combination of these factors causes cold winter temperatures.

Temperatures also differ during night and day. In general, the temperature in daytime is higher than at night because the Sun's energy warms the Earth and its atmosphere during the day. Other causes for varying temperatures include changing amounts of cloud cover and the occurrence of atmospheric weather fronts.

Skills

- Reading a thermometer
- Averaging
- Graphing

Objectives

Students will:
- Record temperature data four times a day for one week.
- Calculate and analyze average temperatures.
- Design and construct a temperature vs. time line graph.

Overview

Students will record the temperature four times a day for one week. They will calculate the daily average temperature, then calculate the average weekly temperature. Once all of the averages are completed, they will create a temperature vs. time line graph.

Key Question

How can scientists use data to determine the average climate of a particular region?

Key Concepts

- Data collection
- Analyzing data sets
- Conducting scientific investigations
- How scientists use technology to help them in their research

Materials & Preparation

- 1 Thermometer (F)
- 1 Student Worksheet per student
- Graph paper
- Red & black pencils or markers

1. Assign students to cooperative roles, discuss concepts presented in the Background section, then have the students do the following:

2. Choose four different times in the school day to collect temperature data. Each time must be at least an hour apart.

3. At each of the chosen times during "Day 1," the students will record the temperature in degrees Fahrenheit on the Student Worksheet.

4. Convert the temperature to degrees C. Use the formula: $°C = (°F-32) \times 5/9$.
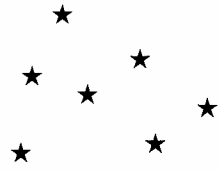
5. Find the average temperature for "Day 1."

   Average temperature = (temp. time #1 + temp. time #2 + temp. time #3 + temp. time #4)/4

6. Plot each temperature for Day 1 on the graph in black.

7. Plot the average temperature for Day 1 on the graph in red.

8. Repeat steps 2 - 7 for each consecutive day (Days 2 - 5).

9. At the end of Day 5, find the average temperature for the week.

   Average temperature = (Average temp. Day 1 + 2 + 3 + 4 + 5)/5

Management

This activity will take a few minutes a day for one week. At the end of the week, you will need about one class period to discuss the data and for students to complete the line graph.

Reflection & Discussion

1. What factors contributed to the low and high temperatures on each day?

2. If a particular day had a higher or lower average temperature than the weekly average, give possible reasons for this phenomenon.

3. Choose one of the following occupations: farmer, city planner, fire fighter, or school principal.

   How does knowing this type of temperture information on a regular basis help them do their job?

Transfer & Extension

1. Collect additional data regarding pressure, humidity, and rainfall.

2. Using local newspaper or TV weather reports, collect data from other regions of the world. Compare your results.

3. Determine actual average temperatures for the classroom. Take temperatures at several locations within the room and determine the average.

4. Research information about the temperatures for four selected dates such as the winter and summer solstices and the fall and spring equinoxes. Do this for a northern hemisphere site and a southern hemisphere site.

Average Temperature

Student Procedures

1. Choose four different times in the school day to collect temperature data. Each time must be at least an hour apart.

2. At each of the chosen times during "Day 1," record the temperature in degrees Fahrenheit on the chart below.

3. Convert the temperature to degrees C. Use the formula: °C = (°F-32) x 5/9

4. Find the average temperature for "Day 1".

   Average temperature = (temp. time #1 + temp. time #2 + temp. time #3 + temp. time #4)/4

5. On the graph, plot each temperature for Day 1 in black.

6. On the graph, plot the average temperature for Day 1 in red.

7. Repeat steps 2-6 for each consecutive day (Days 2-5).

8. At the end of Day 5, find the average temperature of the week.

   Average temperature = (Average Temperature Day 1 + 2 + 3 + 4 + 5)/5

Reflection & Discussion

1. What time of day had the highest temperature? Why?

   _____

2. What factors contributed to the lowest temperature on a daily basis?

   _____

   _____

3. If a particular day had a higher or lower average temperature than the weekly average, give reasons for this phenomenon.

   _____

   _____

4. Choose one of the following occupations: farmer, city planner, fire fighter, or school principal.

   How does knowing this type of temperature information on a regular basis help them do their job?

   _____

   _____

   _____
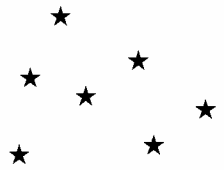
	Temp. #1		Temp. #2		Temp. # 3		Temp. # 4		Average Temp.	
	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
Day #1										
Day #2										
Day #3										
Day #4										
Day #5										

Temperature

Time