Exploration Lab

Data Analysis

Comparing Climate Features

Teacher Notes

PURPOSE

To have students use climate data to compare their local climate with those of other regions of the United States

INTRODUCTION

When the monthly temperatures and amounts of precipitation for an area are graphed for an entire year, the graph will reflect conditions that are similar to one of seven world climates. In this investigation, students will use climate data to compare their local climate with that of other regions of the United States. Then, they make comparisons of their graphed data with the different world climates and develop a conclusion about the type of climate in their location.

DURATION

Six months, from October through March

FREQUENCY

Daily

SUGGESTED SCHEDULE

This investigation will take six months to complete, from October through March. When you reach the chapter entitled "Climate," you might have students relate what their observations have indicated thus far.

SKILLS ACQUIRED

- Collecting Data
- Measuring
- Organizing and Analyzing Data
- Classifying
- Inferring

Name ANSWER KEY

Comparing Climate Features continued

THE SCIENTIFIC METHOD

In this lab, students will

- Make Observations
- Ask Questions
- Analyze the Results
- Draw Conclusions
- Communicate the Results

MATERIALS

The materials listed for this project are enough for one student or one group collaborating on the project.

TIPS AND TRICKS

Advance Preparation

- 1. Each student will need access to an almanac or an atlas. These can be made available in the classroom, obtained from a library, or located on the Internet.
- 2. If applicable, check to see if the students know how to use and read thermometers and rain gauges. Have several students make the same observation by using a thermometer and rain gauge, and look for differences in the readings.

Possible Problems

- 1. Students may be confused about estimating the amount of daily precipitation when rain continues for more than one day. Suggest that they divide the entire amount of precipitation into portions that are proportional to the hours of rainfall each day.
- 2. Because such a large file of daily data is collected, it is helpful to check student logs at the end of each month. The calculation of monthly data provides an opportunity for feedback. Periodic reminders are necessary to help students remember to make their observations.

Teaching Suggestions

- 1. If direct measurements will be taken, secure a location on the school grounds for students to observe temperature and precipitation. The instruments should be kept safe from their theft or vandalism. An ideal arrangement would be to use a permanent weather station.
- 2. Maximum-minimum thermometers are best for recording temperatures in this project. If the maximum-minimum thermometers are available, students should be instructed in the proper use of the thermometer.

Name_____

- **3.** Arrangements should be made to permit students to record data at appropriate times during the school day.
- **4.** On days when direct measurements cannot be made, students should record data taken from newspaper, television, or radio reports.
- **5.** A classroom calculator or computer may ease the task of monthly averaging. A computer spreadsheet or graphing program could be used to track, average, and graph data.
- 6. Data could be collected by several students and averaged. This would tend to produce more reliable observations and account for any missing data. **Co-op** Learning
- 7. A group of students could compare climatographs for a large number of cities. Each member of the group should prepare climatographs for a few cities and share this information with other members of the group or class. **Co-op** Learning
- 8. Different groups of students could be assigned different days to monitor the local and national weather conditions. The groups could then share the data so that daily observations by each group would not be necessary. **Co-op Learning**

Comparing Climate Features

A graph of the monthly temperatures and amounts of precipitation for a region is called a *climatograph*. Climatographs can be used to compare the climates of different areas or to classify an area's climate.

In this investigation, you will use climate data to compare your local climate with that of other regions of the United States. You will keep a daily temperature and precipitation log. You will record data every day from the first day of October until the first day of April. You will then compare your graphed data with information about the world's climates. You will use this comparison to develop a conclusion about the type of climate that your location has.

DURATION

6 months (October 1 to April 1)

OBJECTIVES

Record temperature and precipitation data for eight regions.

Using Scientific Methods Graph and analyze climate features for eight regions. Classify regions by using two climate classification systems.

MATERIALS

- almanac
- atlas
- paper, graph
- rain gauge (optional)
- thermometer (optional)
- weather reports, daily



PROCEDURE

- 1. Listen to or watch a daily weather report for your area, or find this information in a daily newspaper or on the Internet. You may also keep your own records by using a thermometer and a rain gauge.
- 2. Beginning on the first day of October, keep a daily record of the high and low temperatures and of the amount of precipitation that occurs. During winter, snow should be melted before determining the amount of precipitation (in centimeters).
- **3.** Calculate the average temperature for each day by dividing the sum of the day's high and low temperatures by 2. Record this information.
- **4.** At the end of each month, record the average monthly temperature given by the weather report, or calculate the average monthly temperature by dividing the sum of the daily averages by the number of days in the month. Also, record the total monthly precipitation given by the weather report.

- 5. Use the Internet or an almanac to look up climate data for your town or city and for seven other cities in the United States. Select one city from each of the following regions: New England, the Gulf Coast, the Midwest, the Southwest, the Pacific Northwest, the interior of Alaska, and the Hawaiian Islands.
- 6. Look up the average monthly temperatures and precipitation for your town or city and for each city that you chose. Record these data in a table.
- 7. Use the eight blank climatographs on the next two pages to graph the data you collected.
- **8.** Label each blank climatograph with the name of one of the seven cities. Label the eighth climatograph with the name of your town or city.
- **9.** If you recorded temperature and precipitation in English (American) units, such as degrees Fahrenheit or inches, convert your measurements to SI units, such as degrees Celsius or centimeters. Use the SI conversions shown below to convert English units to SI units.

$$^{\circ}C = \frac{5}{9} (^{\circ}F - 32)$$

1 in. = 2.54 cm
1 in.³ = 16.4 cm³

- **10.** For each of the eight locations, plot the average temperature for January by placing a dot in the center of the square that is located in the column representing January and in the row representing that average temperature.
- **11.** Using the same method, plot the average precipitation for January.
- **12.** Repeat steps 10 and 11 for each month's data for each location. Then, connect the temperature points in order of consecutive months to form a line, and shade the columns from 0 up to the recorded precipitation amount.

ANALYSIS AND CONCLUSION

1. **Making Comparisons** Compare each of the climatographs of your seven chosen U.S. cities with the sample climatographs on the last page of this lab. Identify the climate type or types for each location that you selected. What features of each climatograph helped you classify each region?

The New England region has a humid continental climate. The Gulf Coast region has a subtropical climate. The Midwest region has either a steppe or humid continental climate depending on the city selected. The Southwest has either a desert or steppe climate, depending on proximity to the west coast mountains. The Pacific west coast has either a Mediterranean or marine west coast climate. Interior Alaska has a subarctic climate. The Hawaiian Islands have both tropical rain forest and savanna climates. Temperature range and precipitation patterns were used to classify the climates

- 2. Analyzing Results Use the climatograph for your area to classify your regional climate. What features of your climatograph helped you identify the climate type? Answers may vary depending upon local conditions.
- **3. Examining Data** Compare the average temperatures and precipitation amounts for your location that you collected to the values that you obtained from the Internet or an almanac. Do you think that this year's climate data are typical for your region? Explain your answer.

Answers may vary.

4. Classifying Information How would each of the climatographs, including the one for your region, fit into the climate classification system outlined in the chapter entitled "Climate"?

Answers may vary. Students should attempt to correlate rainfall and temperature with each type of climate mentioned.

5. Evaluating Methods In this investigation, you compared climates by looking at average precipitation and temperature. What other factors might affect the climate of an area? Give examples of each factor.

Factors include altitude, proximity to large bodies of water, patterns of winds, vegetation cover, and pressure systems. Examples may vary.

EXTENSION

1. Bermuda is a small island in the Atlantic Ocean. Bermuda is at about the same latitude as St. Louis, Missouri, which lies in the middle of a continent. In which of the two locations does the temperature vary least from month to month? Explain the cause of the temperature pattern in the location that has the more moderate pattern.

Bermuda; Water changes temperature much less than land that has been similarly heated or cooled does. Therefore, the surrounding water moderates island temperature. Exploration Lab

Name

Data Analysis

Comparing Climate Features

A graph of the monthly temperatures and amounts of precipitation for a region is called a *climatograph*. Climatographs can be used to compare the climates of different areas or to classify an area's climate.

Class

In this investigation, you will use climate data to compare your local climate with that of other regions of the United States. You will keep a daily temperature and precipitation log. You will record data every day from the first day of October until the first day of April. You will then compare your graphed data with information about the world's climates. You will use this comparison to develop a conclusion about the type of climate that your location has.

DURATION

6 months (October 1 to April 1)

OBJECTIVES

Record temperature and precipitation data for eight regions.

Using Scientific Methods Graph and analyze climate features for eight regions. Classify regions by using two climate classification systems.

MATERIALS

- almanac
- atlas
- paper, graph
- rain gauge (optional)
- thermometer (optional)
- weather reports, daily



PROCEDURE

- 1. Listen to or watch a daily weather report for your area, or find this information in a daily newspaper or on the Internet. You may also keep your own records by using a thermometer and a rain gauge.
- 2. Beginning on the first day of October, keep a daily record of the high and low temperatures and of the amount of precipitation that occurs. During winter, snow should be melted before determining the amount of precipitation (in centimeters).
- **3.** Calculate the average temperature for each day by dividing the sum of the day's high and low temperatures by 2. Record this information.
- 4. At the end of each month, record the average monthly temperature given by the weather report, or calculate the average monthly temperature by dividing the sum of the daily averages by the number of days in the month. Also, record the total monthly precipitation given by the weather report.

© Houghton Mifflin Harcourt Publishing Company

- 5. Use the Internet or an almanac to look up climate data for your town or city and for seven other cities in the United States. Select one city from each of the following regions: New England, the Gulf Coast, the Midwest, the Southwest, the Pacific Northwest, the interior of Alaska, and the Hawaiian Islands.
- 6. Look up the average monthly temperatures and precipitation for your town or city and for each city that you chose. Record these data in a table.
- 7. Use the eight blank climatographs on the next two pages to graph the data you collected.
- **8.** Label each blank climatograph with the name of one of the seven cities. Label the eighth climatograph with the name of your town or city.
- **9.** If you recorded temperature and precipitation in English (American) units, such as degrees Fahrenheit or inches, convert your measurements to SI units, such as degrees Celsius or centimeters. Use the SI conversions shown below to convert English units to SI units.

$$^{\circ}C = \frac{5}{9} (^{\circ}F - 32)$$

1 in. = 2.54 cm
1 in.³ = 16.4 cm³

- **10.** For each of the eight locations, plot the average temperature for January by placing a dot in the center of the square that is located in the column representing January and in the row representing that average temperature.
- **11.** Using the same method, plot the average precipitation for January.
- **12.** Repeat steps 10 and 11 for each month's data for each location. Then, connect the temperature points in order of consecutive months to form a line, and shade the columns from 0 up to the recorded precipitation amount.





ANALYSIS AND CONCLUSION

1. **Making Comparisons** Compare each of the climatographs of your seven chosen U.S. cities with the sample climatographs on the last page of this lab. Identify the climate type or types for each location that you selected. What features of each climatograph helped you classify each region?

- 2. Analyzing Results Use the climatograph for your area to classify your regional climate. What features of your climatograph helped you identify the climate type?
- **3. Examining Data** Compare the average temperatures and precipitation amounts for your location that you collected to the values that you obtained from the Internet or an almanac. Do you think that this year's climate data are typical for your region? Explain your answer.

- **4. Classifying Information** How would each of the climatographs, including the one for your region, fit into the climate classification system outlined in the chapter entitled "Climate"?
- 5. Evaluating Methods In this investigation, you compared climates by looking at average precipitation and temperature. What other factors might affect the climate of an area? Give examples of each factor.

EXTENSION

1. Bermuda is a small island in the Atlantic Ocean. Bermuda is at about the same latitude as St. Louis, Missouri, which lies in the middle of a continent. In which of the two locations does the temperature vary least from month to month? Explain the cause of the temperature pattern in the location that has the more moderate pattern.

