NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
ACTIVITY : 45 MINS

Latitude, Longitude, and Temperature

Students look at lines of latitude and longitude on a world map, predict temperature patterns, and then compare their predictions to actual temperature data on an interactive map. They discuss how temperatures vary with latitude and the relationship between latitude and general climate patterns.

GRADES

5, 6

SUBJECTS

Earth Science, Geography, Physical Geography

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OVERVIEW

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For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/latitude-longitude-temperature/

DIRECTIONS

1. Discuss differing temperatures in different places.

Activate students' prior knowledge by asking if students have relatives who live in places that are much warmer or cooler during June, July, and August than in the students' hometown. Locate those places on a wall map or globe. On the board, make a Three-Column Chart or project the one provided. In the first column, list those places students named, and in the second column write whether the temperatures in those places are similar, cooler, and warmer than where you are located. Ask: *How would you dress differently if visiting those places?* In the third column, list clothing needed for those places in the summer months. Discuss students' ideas for why the temperatures might vary. Tell students that in this activity they will make predictions about temperature patterns around the world.

2. Review the difference between lines of latitude and longitude on a world map.
Give each student a printed MapMaker 1-Page world map, and also project the map from the provided website. Have students point to and explain the difference between lines of latitude and longitude.

3. Create a legend that shows temperature.
List the temperatures below on the board. Make sure students know these temperatures are in degrees Fahrenheit, not degrees Celsius. Have students contribute their ideas for a color range for hot to cold temperatures. Help them determine the following typical color range where red is the hottest and violet is the coldest.
violet = 30° F and below
blue = 40° F
green = 50° F
yellow = 60° F
orange = 70° F
red = 80° F and higher

4. Have students draw the average temperatures around the world in June, July, and August.
Ask students to think about climate and temperature, and what areas they think are warmest or coldest. Give each student six crayons of the colors listed in the legend, and ask them to draw their best predictions of the average temperatures around the world in June, July, and August. Tell students that the purpose of this activity is to think about patterns of temperature around the world, so their predictions will not be exact.

5. Discuss with students what they drew and why.
Conduct a class discussion about the maps. First, ask students to explain what they drew and how the colors related to latitude and longitude. Then have them work in small groups and compare their maps to their classmates' maps. Finally, ask students to work on their own to make lists of questions the activity raised for them.

6. Have students compare their maps to an accurate map of average temperatures around the world in June, July, and August.
Show students the National Geographic MapMaker Interactive with the data layer showing average surface air temperatures around the world in June, July, and August selected. Ask students to describe similarities and differences between their map and the interactive map, surprising or unexpected parts of the map, and questions that they have about the map.

7. Have students use what they've learned to determine how latitude and longitude are related to temperature.
In pairs, have students discuss and answer the following questions:

- *How is latitude related to temperature?* (farther from equator = colder)
- *How is longitude related to temperature?* (no relationship)

8. Make sure students understand the relationship between latitude and general climate patterns.
Regroup and discuss students' answers. Make sure students understand the general climate patterns that occur as latitude increases. Explain to students that the areas farther away from the Equator tend to be cooler. Point out that the general climate patterns might not show exceptions and variations as a result of elevation, ocean currents, precipitation, and other factors. Have students follow the line of latitude from their location to the east and west to determine variations around the world at that latitude.

9. Discuss with students the importance of latitude and longitude.
Have students share why latitude and longitude are helpful map tools. Prompt them to explain how latitude and longitude can help them to identify specific locations, as well as explain general climate patterns.

Tip

Define *temperature* and *climate* at the start of this activity, and talk about how they are related. Students may also need to discuss the meaning of *average temperatures*.

Modification

In Step 4, some students will draw temperatures straight across the map. Other students may not include temperatures for oceans and other bodies of water. Use this opportunity to correct these common misconceptions.

Modification

In Step 5, give students five minutes for small group discussions before the whole-class discussion to give them more practice describing locations and positions on the map, an important spatial learning skill.

Modification

In Step 8, help students see how physical features affect temperature by viewing both the Surface Elevation and Surface Air Temperatures layers on the National Geographic MapMaker Interactive. Project the interactive map so all students can view it. Zoom into areas with varied elevations, and then move the transparency bars to look for areas where there is a correlation between temperature and elevation. Have students describe the relationship.

Tip

Students might not realize that the seasons are reversed when crossing the equator. Have them compare the June-July-August Surface Temperatures and Dec-Jan-Feb Surface Temperatures layers to discover that much of the southern hemisphere experiences warm temperatures when the northern hemisphere is cool, and vice versa.

Informal Assessment

Have students point out lines of latitude and longitude on one of the outline maps. Then read aloud the following statements to the class, and ask them to write what they think you might be wearing if you were really in these places:

- I am standing outside at 60°N latitude, 140°W longitude, and it is January.
- I am standing outside at 10°N latitude, 0° longitude, and it is February.

- I am standing outside at 35°N latitude, 60°W longitude, and it is July.
- I am standing outside at 40°S latitude, 140°E longitude, and it is August.

Extending the Learning

- Explain to students that Fahrenheit is a scale used for measuring surface temperature. Its unit of measure is the degree Fahrenheit (F). The Celsius scale is a second scale used for measuring surface temperature. Its unit of measure is the degree Celsius (C). Tell students that people in the United States mostly use the Fahrenheit scale. Scientists and people from other countries usually use the Celsius scale. 32° F, which is the temperature at which things freeze, equals 0° C. Have students use NOAA's Fahrenheit to Celsius Converter to familiarize themselves with converting temperatures between the two scales.
- Ask students to solve a mystery. Both Quito, Ecuador and Libreville, Gabon lie along the equator. Why does Libreville have much warmer temperatures than Quito? Through research, students should conclude that Quito's very high elevation contributes to a much milder climate than in Gabon, which is at sea level.
- Have students take the temperature data a step further by deciding which regions or cities around the world are "climate twins," places with similar climates. Examples include New York, U.S.A. and Seoul, South Korea; northern Canada and Siberia; Iraq and Arizona; Shanghai and Houston; and Tashkent and Salt Lake City. Give students a list with pairs, and include in the list some that have climates that are closely related and some that are not. Have students use the National Geographic MapMaker Interactive to help them determine which pairs have the most similar climates.

OBJECTIVES

Subjects & Disciplines

Earth Science

Geography

- Physical Geography

Learning Objectives

Students will:

- make predictions about temperature patterns around the world

- compare their predictions with actual temperature data on an interactive world map
- explain how average temperature varies with latitude

Teaching Approach

- Learning-for-use

Teaching Methods

- Discussions
- Hands-on learning

Skills Summary

This activity targets the following skills:

- Critical Thinking Skills
  - Analyzing
  - Understanding
- Geographic Skills
  - Analyzing Geographic Information

National Standards, Principles, and Practices

NATIONAL GEOGRAPHY STANDARDS

• **Standard 1:**
How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information
• **Standard 3:**
How to analyze the spatial organization of people, places, and environments on Earth's surface
• **Standard 7:**
The physical processes that shape the patterns of Earth's surface

NATIONAL SCIENCE EDUCATION STANDARDS

• **(5-8) Standard D-1:**
Structure of the earth system
• **(K-4) Standard D-3:**
Changes in earth and sky

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **Reading Standards for Informational Text K-5:**
Integration of Knowledge and Ideas, RI.4.7

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Crayons
- Globe or wall map of the world

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Projector
- Plug-Ins: Flash

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group instruction

BACKGROUND & VOCABULARY

Background Information

Latitude and longitude make up the grid system that helps humans identify absolute, or exact, locations on the Earth's surface. There is a relationship between latitude and temperature around the world, as temperatures are typically warmer approaching the Equator and cooler approaching the Poles. There are variations, though, as other factors such as elevation, ocean currents, and precipitation affect climate patterns.

Prior Knowledge

["latitude and longitude","temperature scale","Earth-sun relationships and seasons"]

Recommended Prior Activities

- Introduction to Latitude and Longitude
- The Reason for the Seasons

Vocabulary

Term	Part of Speech	Definition
average	*verb*	to calculate the middle amount among a group of numbers.
Celsius scale	*noun*	scale for measuring surface temperature, used by most of the world, in which the boiling point of water is 100 degrees.
climate	*noun*	all weather conditions for a given location over a period of time.
elevation	*noun*	height above or below sea level.
Equator	*noun*	imaginary line around the Earth, another planet, or star running east-west, 0 degrees latitude.
Fahrenheit scale	*noun*	scale for measuring surface temperature used by Belize, Liberia, Myanmar, and the United States.
latitude	*noun*	distance north or south of the Equator, measured in degrees.
longitude	*noun*	distance east or west of the prime meridian, measured in degrees.
map skills	*noun*	skills for reading and interpreting maps, from learning basic map conventions to analyzing and comprehending maps to address higher-order goals.
precipitation	*noun*	all forms in which water falls to Earth from the atmosphere.
temperature	*noun*	degree of hotness or coldness measured by a thermometer with a numerical scale.

For Further Exploration

Websites

- National Atlas: MapMaker Article—Latitude and Longitude
- NOAA: National Climatic Data Center
- Photos from NASA's Solar Dynamics Observatory