

Latitude is Everything

Essential Question: How does latitude affect the Amount of Solar Energy an Area Receives and that Area's Climate?

Objective: Students will be able to explain how the sun's energy is related to the Earth's climate.

Standard(s):

SC.6.E.7.5:

Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.

SC.6.E.7.6:

Differentiate between weather and climate.

Materials:

- laptop
- projector
- student handouts

Set up / prep: 10 to 15 minutes

Lesson Duration: 1 class period

Procedure:

1. Show video (engagement) <http://www.youtube.com/watch?v=IHIwHcE1EIo>
2. Students will complete "Latitude and Longitude Video" handout while viewing video.
3. Possible strategies – Have students do stand-up/pair-up at the end of the video to compare answers. Jig-Saw questions to assigned groups then share information. (25 – 30 minutes)
4. Read Article – "Latitude and Climate Zones". Have students underline/highlight information. Students will answer handout questions. Use strategies mentioned in number 3 to review answers. (25 – 30 minutes)
5. The following are some online extensions:
 - a. classification of world climates - <http://www.blueplanetbiomes.org/climate.htm>
 - b. Recommend that this is shown – excellent demonstration on How latitude is a fundamental control on climate
<http://people.cas.sc.edu/carbone/modules/mods4car/ccontrol/controls/latitude.html>
 - c. Latitude and Climate – Unit 5, Activity 5 – demonstrates Difference between Climate and weather. <http://www.polaris.iastate.edu/NorthStar/Unit5/activity5.htm>
 - d. UCAR: Climate Changes with Latitude -
http://www.windows2universe.org/earth/climate/cli_latitude.html
 - e. Why Here? Why Not There? (2-3 day activity in which students decide where to hold the Olympics because of weather or topography.
http://www.edgate.com/wintergames/design/lesson_plans/lp6.html

Assessment: – Completion of Student Handouts

Cross Cutting - “Introduction to Orienteering and the Orienteering Map” and “Here Comes Sun – Latitude is Everything”. This lesson share the concept of making and understanding coordinates and mapping skills.

FFLE

Name _____ Period _____ Date _____

Latitude and Longitude Video

Directions: While viewing the video please answer the following questions.

Define Latitude - _____

1. Name the 5 major lines of Latitude along with their degrees starting from North going to South on the Earth.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

2. What are some ways to memorize where Capricorn and Cancer are located?

3. What does the equator divide? _____

4. What seasons take place when the sun hits directly 23°N, 23°S, and the equator (2x)?

- a. _____
- b. _____
- c. _____
- d. _____

5. Define longitude - _____

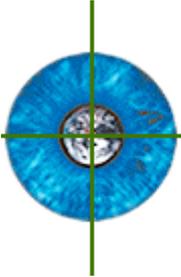
6. What is the most recognizable longitudinal line? _____

7. How are time zones determined? _____

8. What is located at 180 degrees? _____

9. What happens when you travel east or west? _____

Name _____ Period _____ Date _____



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FILE

Latitude & Climate Zones



Land

Latitude provides the location of a place north or south of the equator and is expressed by angular measurements ranging from 0° at the equator to 90° at the poles. Different latitudes on Earth



Water

receive different amounts of sunlight, and are a key factor in determining a region's climate. For example, the higher the latitude of a given place (the farther away it is from the equator), the sharper the angle of the sun's rays that reach it, meaning that the rays of the sun are spread across a broader area. Therefore, higher latitudes receive less energy than lower latitude areas nearer the equator.



Ecosystems

The Earth's axis is tilted 23.5° to the perpendicular, meaning that the amount of sunlight that particular latitude receives changes with the seasons. From April to September, the Northern Hemisphere is tilted toward the Sun, where it receives more energy; the Southern Hemisphere receives this additional energy between October and March, when it is tilted toward the Sun.



Energy

Although there is no specific 'type' of climate, there are three general climate zones: arctic, temperate, and tropic.



Food



Arctic Environment & Society

From 66.5N to the North Pole is the Arctic; from 66.5S to the South Pole is the Antarctic. Places within the arctic climate zones tend to be snow or ice-covered year-round. This is despite the fact that they tend also to be exceptionally dry, sometimes receiving as little precipitation as the world's driest deserts. Very little snow falls on these high-latitude regions, but even less melts due to the cold temperatures and scarce sunlight. The deep ice and snow that covers these regions has been built up over hundreds, indeed thousands, of years. In these regions, the Sun hovers above the horizon at midnight in the summer and never rises at all at times during the winter.

Temperate

The temperate zone is located between the arctic and tropic zones. However, 'temperate climate' is something of a misnomer since most regions located within the temperate climate zones experience distinct changes across four seasons. For example, in much of

eastern North America - from the Ohio Valley in the United States to the southern shores of Hudson Bay in Canada - the 'temperate' climate can experience both arctic and tropical weather in the same year. These climate variations increase the further an area is from an ocean or another large body of water; they diminish in areas where oceans and other large bodies of water are able to influence the climate more strongly. Temperate regions are also affected by the direction of the air flow they receive. Areas in Canada, for example, have cool Arctic air passing through, while the southern United States receives warm air from the Gulf Stream.

Tropic

The tropical belt of land and sea extending around the globe on both sides of the equator - between 23.5S and 23.5N - receives the most sunlight, but it is not necessarily the hottest since it is covered extensively by oceans that use some solar energy for evaporation. This combination of high moisture and intensive solar heating results in a persistent zone of convection (the upward movement of moist, unstable air) known as a tropical low, which often results in generous cloud formation and frequent rainfall. These factors also help moderate the temperatures within this zone.

Most areas, however, are characterized by distinct sub-climates where average temperatures, precipitation, and other factors vary noticeably. Although there are different [classifications](#) of world climates, many of these sub-climates include low latitude tropical rainforest and tropical savanna; middle latitude maritime, mediterranean, and steppe; high latitude subarctic, tundra, and polar ice cap; as well as desert and highland areas.

Recommended Resources

[Latitude](#)

This page, part of a meteorology module from the University of South Carolina, is an interactive illustration of how temperature patterns respond to changes in solar intensity across a variety of cities.

[Latitude and Climate](#)

The Polaris Project, an online astronomy and astrophysics resource

from Iowa State University, offers a somewhat advanced explanation of the effects of altitude on climate focusing on the geometry of sun angle.

[UCAR: Climate Changes with Latitude](#)

The University Corporation for Atmospheric Research provides this site to explain the effects of latitude on climate. Also listed are different climates with descriptions of each, including links to additional information.

FOR THE CLASSROOM

[Why Here? Why Not There?](#)

In this activity, middle school students will learn about the various locations where the Olympics have taken place, and evaluate the possibility of different countries hosting the games based on weather, climate, and location.

 [Printer Friendly Version](#)

Name _____ Date _____ Period _____

Latitude and Climate Zones

Directions: Answer the following questions

1. What determines climate?
2. How is the sun's energy related to Earth's climate?
3. What is the difference between the sun's rays that strike at the equator and the sun's rays that strike the poles?
4. List and describe the three general climate zones.
5. **Answer this question if you have completed the Social Studies lesson entitled, "Introduction to Orienteering and the Orienteering Map".** What connections can be made with "Here Comes the Sun – Latitude is Everything" to the Social Studies Lesson.