

7E Organizer- What's the Difference Between Weather and Climate?

Learning Goals & Standards Addressed

Excel data tools – tables and graphs
Real data collection and analysis
Compare and contrast weather and climates between study area locations
Prepare data visualization to present scientific information
Relate climate characteristics to biome types in study areas and globally

Next Generation Science Standards (draft)

Evaluate and communicate the climate changes that can occur when certain components of the climate system are altered.

Use global climate models in combination with other geologic data to predict and explain how human activities and natural phenomena affect climate, providing the scientific basis for planning for humanity's future needs.

Construct explanations, from models of oceanic and atmospheric circulation, for the development of local and regional climates.

As an indicator of understanding, students should be able to...

Observe daily weather variables for four consecutive days comparing NY and CA study area locations
 Use real monthly average temperature & precipitation data for one year to create climate graph using excel

7-E Description of Unit

Phase	Activity Sequence	Desired Outcome or Purpose
Elicit (Day 1)	A. Ask class what they think makes climate different than weather B. Ask class to compare California and New York weather on a typical day "like today" and the climate differences C. Determine the major differences between CA and NY climate extremes D. Inquire about snow differences between CA and NY	<ul style="list-style-type: none"> • Discover misconceptions about weather vs climate • Discover climate/weather stereotypes held about CA and NY
Engage (Day 1)	A. Show: What's the Difference Between Weather and Climate? National Geographic video (3:22) http://video.nationalgeographic.com/video/science/earth-sci/climate-weather-sci/ B. Introduce Weather Underground website and weather data available Form small groups (2 – 3) to work together throughout Climate Change unit C. Using the student responses about what the weather is like in (CA or NY) use Weather Underground to see what it is actually like across a variety of locations, including the study area weather station locations. D. Use Google Earth to "Fly" from Buffalo to Santa Cruz -While in Buffalo elicit factors that might effect Buffalo weather and climate, then do the same for Santa Cruz. Expand to larger view of CA and elicit factor differences for an inland location within the CA study area's region. E. Introduce Excel for creating data tables. Show how to organize data, label rows and columns, and format data.	<ul style="list-style-type: none"> • Students can describe the difference between weather and climate and provide examples of each. • Students form groups that will work cooperatively over time. • Students become familiar with locations of the study area stations, and how they may differ weather-wise. • Students make connections to the effects of bodies of water (lake vs. ocean), latitude of locations, and topography (possibly) for local weather & climate. • Create daily weather data table in Excel (provide template for lower skill students to use for collecting data) <p>*Be sure to discuss organizing and saving files and work products for this unit- flash drive, network, drive, wiki, or some other reliable location)</p>

<p>Explore Round 1 (Day 2)</p>	<p>A. Record daily weather data: (Each small group will pick 2 to 3 locations from each state, at least one lower elevation and one higher elevation. Pairs will be responsible for 4 locations total, groups of 3 will record data for 6 stations) Use www.wunderground.com/</p> <table border="1"> <thead> <tr> <th>Station Location</th> <th>Elevation (ft)</th> </tr> </thead> <tbody> <tr> <td colspan="2">New York</td> </tr> <tr> <td>Buffalo-Niagara</td> <td>705</td> </tr> <tr> <td>Warsaw</td> <td>1820</td> </tr> <tr> <td>Avon</td> <td>545</td> </tr> <tr> <td>Geneva Research Farm</td> <td>718</td> </tr> <tr> <td>Tully – Heiberg Forest</td> <td>1899</td> </tr> <tr> <td colspan="2">California</td> </tr> <tr> <td>San Jose</td> <td>20.40</td> </tr> <tr> <td>Modesto City-County AP</td> <td>22.30</td> </tr> <tr> <td>Sonora RS</td> <td>510.50</td> </tr> <tr> <td>Mount Hamilton</td> <td>1282.00</td> </tr> <tr> <td>Twin Lakes</td> <td>2438.40</td> </tr> </tbody> </table> <p>B. Show video: Piecing Together the Temperature Puzzle http://climate.nasa.gov/warmingworld/</p> <p>C. Find monthly average temperature and precipitation data for selected study area locations at http://countrystudies.us/united-states/weather/ Construct and record data in Excel spreadsheet.</p>	Station Location	Elevation (ft)	New York		Buffalo-Niagara	705	Warsaw	1820	Avon	545	Geneva Research Farm	718	Tully – Heiberg Forest	1899	California		San Jose	20.40	Modesto City-County AP	22.30	Sonora RS	510.50	Mount Hamilton	1282.00	Twin Lakes	2438.40	<ul style="list-style-type: none"> Record the selected location's high temp, low temp, precipitation, sky, wind speed and direction at noon (or early afternoon), and air pressure in the excel spreadsheet created. Record the previous day's values as well as current day's values. *Be sure to REVIEW organizing and saving files and work products for this unit- flash drive, network, drive, wiki, or some other reliable location) From video: Relate angle of sun's incoming energy, reflectivity of surfaces, clouds, aerosols in atmosphere, greenhouse gases, and water vapor to Earth's energy balance, surface temperature, and climate change variables being monitored by NASA. Create new Excel data table for entering and graphing monthly average temperature and precipitation for selected location(s). <i>(Provide template data table for lower skill students and limit the collection of data to a single location per student)</i>
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<p>Explain Round 1 (Day 3)</p>	<p>A. Create and print out (or submit digital image for teacher display) climate bar graphs in Excel to visualize the differences and similarities between the locations selected. While in small groups, summarize the precipitation and temperature patterns over a year to share in larger class discussion.</p> <p>B. As a whole group, discuss similarities and differences of climate graphs across the locations of the two study areas.</p> <p>C. Create a whole class list of variables, factors, climate characteristics, and whatever else students deem important based on the discussion of climate graphs.</p>	<ul style="list-style-type: none"> Use graphical representations to compare and contrast precipitation trends and temperatures across a 12 month period to understand a location's climate. Observe similarities and differences between climate graphs from different locations. Begin to identify variables, factors, and characteristics of climates. <p>**Note: The daily weather data will continue to be collected during this time</p>																										
<p>Explore Round 2 (Day 3)</p>	<p>A. (Whole class or small groups) Explore world climates and learn more about climate characteristics and the Köppen Climate Classification System http://www.blueplanetbiomes.org/climate.htm (Higher level students may also explore http://www.physicalgeography.net/fundamentals/7v.html for a detailed description of climate variables and classification using the Köppen Climate Classification System.)</p> <p>(Higher level students may explore additional World Map & Additional Average Monthly Climate Data http://www.climate-zone.com/index.htm)</p>	<ul style="list-style-type: none"> Students classify climates using the Köppen Climate Classification System. 																										

<p>Explain Round 2 (Day 4)</p>	<p>A. Small groups - Students classify the climates of their selected stations using the Köppen Climate Classification System.</p> <p>B. Small groups- Students finalize the daily weather data collection in Excel and compare weather data of selected locations in NY and CA discussing similarities and differences.</p> <p>C. Small groups share their Köppen classifications for selected study area stations with whole class. Whole class will reach consensus about classification for each location.</p> <p>D. Small groups share DAILY collected data in a whole class discussion of the study area station locations within a single area and then compare the NY and CA areas.</p>	<ul style="list-style-type: none"> • Students apply Köppen Climate System to study areas and reach consensus • Students identify the differences and similarities of weather variables within and between the two study areas.
<p>Elaborate (Day 4 & 5)</p>	<p>A. Small groups explore the relationship between climate characteristics and Biomes http://www.blueplanetbiomes.org/world_biomes.htm</p> <p>B. Each small group randomly assigned a single biome type to profile, distributing biome types across whole class.</p>	<ul style="list-style-type: none"> • Students connect climate and predominant vegetation types that classify biomes.
<p>Evaluate (Day 5)</p>	<p>A. Final climate graphs submitted by small groups in electronic form (PPT, Wiki page, Word doc, etc)</p> <p>B. Small groups present brief biome profiles to class</p> <p>C. Quiz: -Students individually summarize the difference between weather and climate in a short paragraph to hand in. -Given three different climate graphs, students individually describe the climate characteristics shown by each of the graphs. -Students characterize similarities and differences of the NY and CA study areas in terms of current weather. -Students characterize climate similarities and differences within each of the two study areas. -Summarize the general relationship between climate characteristics and biomes and provide two examples from the NY and/or CA study areas.</p>	<ul style="list-style-type: none"> • Students present scientific data in graphical form to characterize climate variables of temperature and precipitation. • Students communicate biome profiles to whole class. • Students communicate in writing their understanding of how weather and climate area different. • Student interprets climate graphs. • Students identify the differences and similarities of weather variables within and between the two study areas. • Students characterize the climate across each of the study areas in NY and CA. • Students identify climate characteristics and biome type for two locations from NY and/or CA study areas.
<p>Extend (Homework)</p>	<p>NOTE: Next lessons in unit will extend ideas from this lesson.</p> <p>Higher level students: Create a travel product (brochure, podcast, video, poster, etc) promoting tourism in one of the study areas that includes climate and biome information.</p>	