

What's With the Weather Over There?

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Overview

For this activity, the students are going to draw on their own knowledge and experience with weather to predict the current temperatures around the world and then compare their predictions with real-time weather data from selected locations around the world. The students will then be provided with several factors that affect both daily changes in temperature and climatological temperature and develop a hypothesis regarding how and why they think these factors and geographic location affect temperature and climate.

Students will use their prior knowledge with weather (both academic and observational) to make reasoned conclusions about expected weather and climate predictions for various locations and then compare their prediction to actual real-time weather data.

Objectives

The student will:

- Make real-time observations of weather for several locations on earth (temperature, wind speed, wind direction and relative humidity)
- Record local weather observations and graph the data
- Record and graph real-time weather observations from several locations
- Compare their local data with the data from the other locations to include locations in Antarctica
- Observe the difference in conditions based on geographic location
- Become aware of multiple types of documenting and recording time

Details

- 📘 Lesson
- 🌐 Antarctic
- 🕒 More than a week
- 📄 Download, Share, and Remix
- ✍️ High school and Up

Standards

Next Generation Science Standards (NGSS)

High School

HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.

- Use and convert temperatures from Celsius to Fahrenheit

Lesson Preparation

- Students will need to be informed about the various ways time is recorded. They will also need to be instructed about the difference between the time where they are and the time at the location that the data was recorded, and the method that was used to document the time. Real-time data from most sites have a time stamp showing the date and time when the information was gathered. The time that the information was recorded is usually written in one of several ways, GMT (Greenwich Mean Time), Standard Universal Time (24 hour) or UTC (Coordinated Universal Time also called Zulu time).
- Students will also need a general understanding of world geography; a general understanding of longitude and latitude and the DMS (Degrees, minutes, seconds), DD (Decimal Degrees) coordinate methods.
- Students should be able to convert temperatures from Celsius to Fahrenheit and from Fahrenheit to Celsius using the following formula $F = \frac{9}{5} C + 32$ or $F = 1.8 C + 32$

Middle School

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Procedure

- Introduce the students to <https://www.weather.gov/> and instruct them to input their location into the search field.
- Have the students observe the real-time data for several locations around earth <http://worldweather.wmo.int/en/home.html> and locate the locations on a map or globe, observing the locations latitude and proximity to large bodies of water and season of the year. Suggested locations: Fairbanks, Moscow, Miami, Damascus, Hong Kong, New Delhi, Nairobi, Sydney, Christ Church.
- Have the students access the following three locations in Antarctica at <http://amrc.ssec.wisc.edu/data/view-data.php?action=list&product=surface...> the following locations of Automatic Weather Stations - Nico, Sabrina, and Phoenix. **note the temperatures are recorded in Celsius and should be converted to Fahrenheit for ease of understanding.
- For each location, record and plot (on a spreadsheet) the date, time, temperature, wind speed, wind direction, and humidity.
- Compare the data from Antarctic locations to the other chosen locations.
- Compare the data for the three Antarctic locations.
- Which location is the warmest? Why do you think that is?
- Compare the latitude of the various locations - Ask the students if they notice a general difference in temperature with the higher latitudes.

- Compare the climatic conditions for locations with respect to proximity to large bodies of water and temperature as compared to locations that are far from large bodies of water.

Extension

- This lesson could be extended by collecting data weekly over an extended period of time. It should run long enough to observe seasonal changes, particularly to observe the opposite seasons in the northern and southern hemispheres.
- Current data could be compared to the same date from 10, 30, 50, 70, 100 years in the past to look for trends in climate.

Transferability

This lesson is obviously geared toward a knowledgeable high school class. This could be adapted to an exhibit or a presentation at a museum or a science center. A kiosk could show a map of the world with the selected cities and Automatic Weather Stations. Each location's real-time data could be accessed by touch appearing on a screen next to other chosen locations. The students would be able to see the differences in temperature. This could be an even better presentation method because it would not be as abstract when presented visually and holistically.

Resources

<http://amrc.ssec.wisc.edu/data/view-data.php?action=list&product=surface...>

<https://amrc.ssec.wisc.edu/data/view-data.php?action=list&product=surfac...>

What is Coordinated Universal Time (UTC)? <https://www.worldtimeserver.com/learn/what-is-utc/>

Converting from AM to PM to UTC

<https://www.timeanddate.com/time/gmt-utc-time.html>

<https://www.navy.mil/navydata/questions/zulutime.html>

<https://www.nist.gov/pml/time-and-frequency-division/nist-time-frequentl...>

<https://www.latlong.net/degrees-minutes-seconds-to-decimal-degrees>

<http://worldweather.wmo.int/en/home.html>

<https://www.weather.gov/>

Assessment

Since this lesson is more of an observation, it is intended for exposure and interest rather than a strict lesson to be assessed with a formal test or evaluation. However, in order to gauge student growth and understanding; a pretest on general Antarctica information pertaining to weather, climate, and common misconceptions could be given. The same test could be administered at the end of the project for the teacher to form a summative assessment of the effectiveness of the task.

*adapted from <https://ams.confex.com/ams/10POLAR/webprogram/Paper152664.html>

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