

Teacher Moves for Rising Air Temperatures

Take home: While there is natural variability to everyday temperatures, which is one component of weather, the overall trends are more consistent and part of a changing climate. World-wide air temperatures are rising. We are experiencing hotter and longer heat waves, which are also becoming more frequent. Satellites and on ground measurements from the Arctic to the Mediterranean reveal this trend. This unit focuses on this warming trend and looks at the factors that influence how much warming is occurring.

Here is a suggested sequence to this unit:

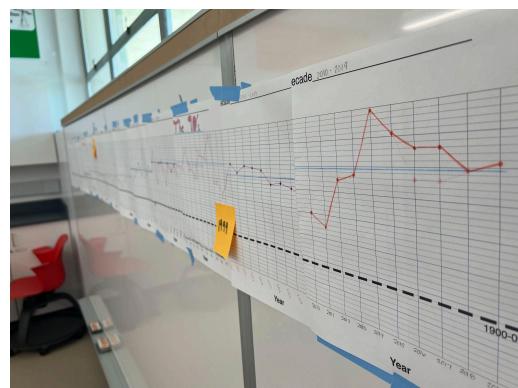
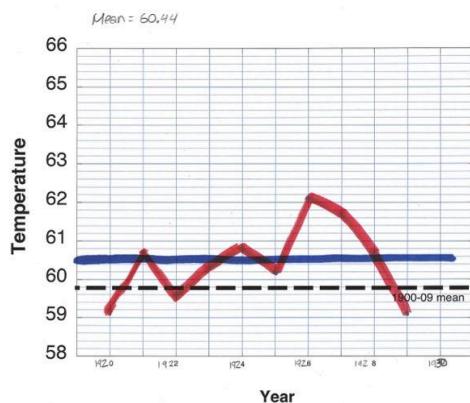
Phenomenon - One simple way to begin this lesson is to compile some headlines about heat waves and cold snaps from the past year. How can these both be happening? This introduces the idea of weather versus climate.

Another possible way to engage the students is to put up the focus question “Is it REALLY getting hotter?” Then have them discuss their ideas with a partner. They then repeat this process with another partner. This simple question accesses their prior knowledge.

Activity #1 - Sacramento Temperature Data Jigsaw Graph.

In this jigsaw style activity each student plots a decade of temperature data. The entire class’ graphs get compiled into one century-long record of air temperatures with a discernible warming trend. It is a striking visual demonstration of a difficult to discern trend (on a human scale and year to year difference).

Before you start this lesson, it is a good idea to review mean and anomalies since they are both used in this activity.



After this activity it might be helpful to have students write a claim that answers the driving question and any new questions they have.

Activity #2 - Reading Weather versus Climate.

At this point it might be helpful to directly address this distinction with students through a reading.

What's the Difference between Weather and Climate?

One winter day you notice that it has been a lot colder than usual, or you may have seen on the news that there's a strong winter blizzard with freezing temperatures.



But you have also heard that the Earth is warming. How can these be happening at the same time?

This is because weather and climate mean different things.

Weather describes current, local conditions of the atmosphere

You're probably more familiar with the word weather, which describes the current conditions of the atmosphere at a specific time and place. If someone asks you about the weather you might tell them about the temperature, whether it's raining or snowing, if it's windy, where the wind is coming from, whether it's cloudy or sunny. You would be referring to what the atmosphere is like on that particular day and that specific location.

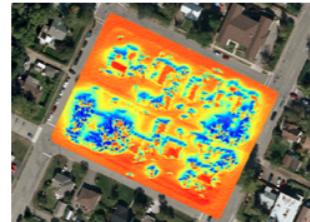
These conditions can change rapidly, even hour to hour. There are many factors that influence what the weather is like at any time of day, season, distance from the ocean, whether a storm is approaching, or even where the weather is coming from. Meteorologists use satellite images, computer models, and weather stations to try to predict what the weather will be like in the days or weeks to come. These predictions help cities avoid dangerous storms, cities prepare for possible floods, and warn utility companies of possible wildfire conditions such as dry, warm winds. Meteorologists are not always correct because many factors affect what the weather will be like, and these conditions can change rapidly making weather unpredictable.

Activity #3 - Urban Heat Island. In this activity students take temperature measurements around their campus and learn that not all surfaces (and landscapes) heat up equally from the sun. This idea is the fundamental idea to understanding the urban heat island. The latter part of the activity encourages students to think about changes that could be made to their campus to keep it cooler or how cities could incorporate more parks and greenspaces to cool urban centers.

Exploring Surface Temperatures with Infrared Thermometers

Introduction

In this activity you will explore how the sun heats up different surfaces around your school.



Supplies

- Infrared thermometer
- Calculator
- Clipboards (optional)

Instructions

1. As a class, identify several outdoor locations in your school yard with different types of surfaces (concrete, asphalt, grass, etc.) to conduct the activity. (For the sake of comparison, make them all in full sun and make sure they are horizontal surfaces.)

A very powerful extension to this activity is to have students look at cities that were redlined and how that affects what the cities look like in terms of parklands, industrial uses, location of highways, etc. Then have them connect those observations to surface temperatures. This put an environmental justice lens onto this activity.

Activity #4 - Albedo. In this last activity students measure the temperature of various colored paper sheets to show that the reflectivity (albedo) of a surface has a large impact on how much it warms up. The paper sheets model the different landscapes such as snow, deserts, forests, or oceans and illustrates how the Earth's surface is not equally heated by the sun.

A final part of this activity could be to have the students look at this NASA generated image of the Earth and rank the surfaces from most to least reflective. This will connect the results of their activity to actual landscapes. It will also remind them that there are places on Earth that are snow and ice covered and vital since they reflect a large portion of the Sun's rays. If gone, the Earth will become more absorptive and increasingly warmer.

