

Climate Variability

Grade Levels: 6-12

Essential Questions

- What are the differences and similarities of weather and climate?
- What factors influence the weather patterns and climate of a location?

Standards

- **SC.6.E.7.6:** Differentiate between weather and climate.
- **SS.912.G.3.2:** Use geographic terms and tools to explain how weather and climate influence the natural character of a place.
- **SC.912.E.7.7:** Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.

Student Objective

- This game was developed around the idea of another game to incorporate team building, along with explain the difference between climate change and climate variability.

Key Terms

- **Climate** - distribution of weather over a long period of time.
- **Climate Change** - significant alteration in the climate patterns, observed in climate data, which last decades or longer (Ice Age).
- **Climate Variability** - temporary fluctuation observed in climate data resulting from normal climate cycles (El Niño) or irregular climatic events (very cold winter).
- **Temperature** - the measure of molecular motion or the degree of heat of a substance. It is also the degree of hotness or coldness. In surface observations, it refers primarily to the free air or ambient temperature close to the surface of the earth.
- **Anomaly** - something that deviates from what is standard, normal, or expected.
- **Time Series** - a sequence of data points (measurements) over a period of time.

Materials

- 4-5 decks of playing cards (divided into stacks of 30)
- graph paper
- calculator
- pencils
- ruler

PROCEDURES

- Students are shown the following video by National Geographic from the Cosmo's series which describes the difference between weather and climate change:
https://www.youtube.com/watch?v=cBdxDFpDp_k
 - Another way to approach this is to ask the students to define climate change and climate variability and discuss their answers.
- Students are given the average annual temperature for Florida as a baseline temperature (70.6°F), graph paper, and a stack of cards.
 - For data from different states, use information from the National Centers for Environmental Information's data site: <http://www.ncdc.noaa.gov/cag/>
- Each playing card represents the anomaly value from the baseline temperature for a year. The anomaly is determined by the color and value of the face card.

Anomaly:

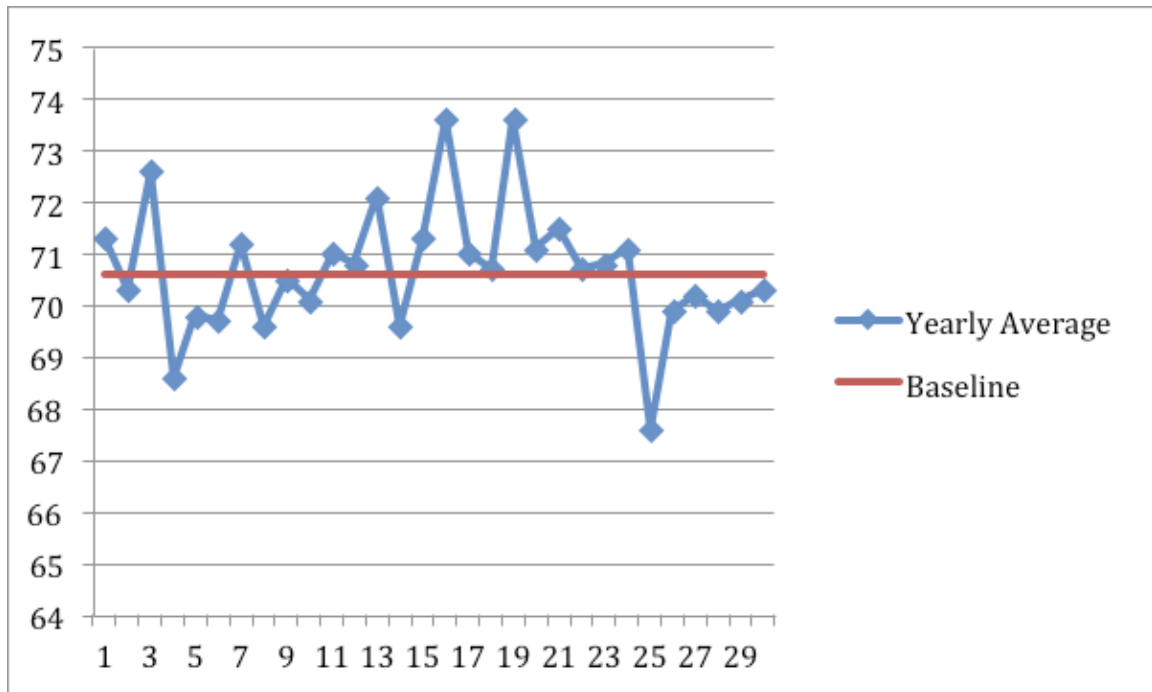
- Black- Negative Anomaly
- Red- Positive Anomaly

Value:

- Ace – 0.1°F
 - 2-10 – The face value of the card divided by 10. (Example: A three would be an anomaly value of 0.3°F)
 - Jack- 1.5°F
 - Queen- 2.0°F
 - King- 3.0°F
- Students are then asked to flip over the playing cards one at a time to determine the anomaly for each year of data. This step is repeated 10-30 times.
 - Example: Student flips over a Queen of Clubs. Since the card is black and a queen, the anomaly for the year would be -2.0°F. The average annual temperature for the year would be 68.6°F (70.6°F-2.0°F). The student flips over another card, which is the two of hearts (+0.2°F). This card is red, the students would add this to the baseline temperature (70.6°F+0.2°F = 70.8°F)
 - See table below for additional example:

Baseline Temperature	Anomaly	Yearly Average Temperature
70.6	0.7	71.3
70.6	-0.3	70.3
70.6	2	72.6
70.6	-2	68.6
70.6	-0.8	69.8
70.6	-0.9	69.7

5. After determining the anomalies for 30 years, students will then graph their time series analysis of their “climate.”



6. Once the graph is created, each student/group was able to analyze and talk about what their graphs showed. Groups were compared to one another and discussed. Given the patterns students see in their time series, they can come up with stories and reasons for the changes.
7. Final discussion should be focused on discussing the differences between climate variability and climate change, using the student’s graphs as illustrations.