

Brandi Matthews

Grades: 9-11

Time: 6 days

Title: The Perfect Storm

HS-ESS3-5: Climate Change and Future Impacts

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 systems. (Stability and Change)

Clarification Statement: *Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).*

SEP: Analyzing and Interpreting Data Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data

- Analyze data using computational models in order to make valid and reliable scientific claims.

Connections to Nature of Science :Scientific Investigations Use a Variety of Methods

• Science investigations use diverse methods and do not always use the same set of procedures to obtain data. • New technologies advance scientific knowledge. Scientific Knowledge is Based on Empirical Evidence • Science knowledge is based on empirical evidence. • Science arguments are strengthened by multiple lines of evidence supporting a single explanation.

DCI: ESS3.D: Global Climate Change

- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

CC: Stability and Change

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.

Math Connection: The SEP for this standard is “Analyzing and Interpreting Data,” which means students will analyze data using computational models. This correlates to MP 7, Look for and make use of structure.

Materials: Internet access, literacy cubes, dice

Synopsis: As students have previously studied weather and climate, we will delve into this standard with hurricanes. Students have seen weather updates and news bulletins about the unusually large number of hurricanes that have been named this year. It even affected several students' fall break

vacation plans this year. 2017 was a record-breaking year as well. Hurricane Harvey roared into the Texas coast and brought biblical flooding with it. Hurricane Maria and Irma caused billions of dollars of damage and many deaths. Why was 2017 such a record-breaking year? Are hurricanes becoming more destructive as the years progress? If so, why is this occurring? Is it due to climate change? Was 2017 the year of the “perfect storm?”

Engage: Before showing the video, ask students what comes to mind when they hear the phrase “biblical flooding.” Or devastating damage. Discuss with the class what they believe this means. Ask the students if anyone has ever lived in an area that has been hit by a hurricane. Let them share their experiences. Then show the video clip of the 2017 Hurricane season.

[2017 hurricane season](#)

Students will be given post-it notes to write down any questions they have about the phenomenon. These questions will become part of our driving question board. Students will categorize questions and we will come up with driving questions that we need to answer. This is a regular occurrence in our classroom as we start a new unit or lesson and students know to ask open questions.

Questions that I hope will be asked: If not I will guide students into these areas....

What causes a hurricane? Why do they turn into hurricanes?

Why do we see them in certain times of the year?

Where do they start?

Why would 2017 be worse than other years?

How many hurricanes were named that year?

How many of the hurricanes were devastating?

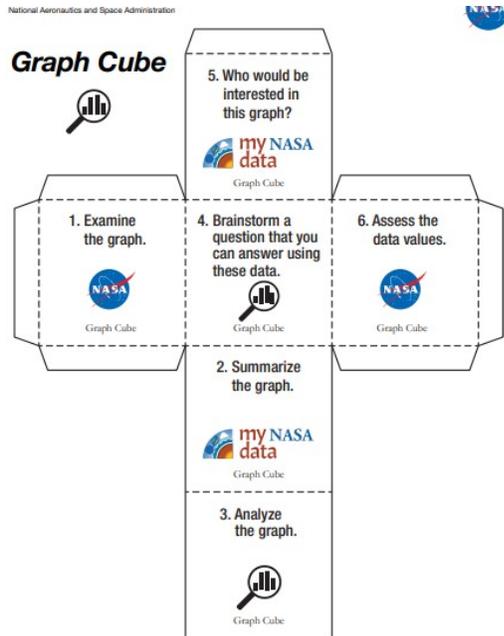
Why do they all seem to hit the gulf area or eastern US?

Is global warming causing weather to be more devastating?

Exploration: Students will be given several snippets of data both from the web and My NASA Data. They will use this data to develop an idea about what is causing storms to become more violent. This material will be divided into stations. We use stations regularly in my classroom and students move through them with ease.

Station 1: Students will view the NASA simulation of earth temperatures since 1951. Students will be given a paper cube for those who are face to face, or a link to virtual dice for those who are learning at home. The data set is shown below. This is from My NASA Data.

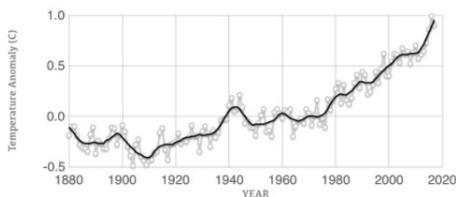
Virtual Dice



My NASA Data has a wonderful idea called literacy cubes. Students will interact with the data below to answer the questions that appear on the cube. This makes students think critically as they examine the graph and make predictions. A small section of the data is shown below.

Analyzing Air Temperature Graphs

This graph illustrates the change in global surface temperature relative to 1951-1980 average temperatures.



Station 2: Hurricanes Ed Puzzle How exactly does a hurricane form? What is the energy source?

Students will be assigned the Edpuzzle via google classroom. This is a video from NASA called "The Ocean: A Driving Force for Weather and Climate." As students watch the video, it explains how the oceans and solar energy are a major driving factor for weather phenomena. The video stops several times and asks students to reflect on the questions, which will serve as a formative assessment. The link is below.

[EdPuzzle](#)

Station 3: NASA global temperature change simulation: [NASA air temperature simulation video](#)

Students will watch the video simulation of air temperatures from 1880 to 2017. They can rewind and watch the short clip any time they like. As they watch, they should develop a commentary for this video. Students should explain what is occurring over time, predict what will happen if the simulation continues for 100 more years, and then describe what is the likely cause of the increase of global temperatures.

Assessment with a single point rubric.

[single point rubric](#)

Station 4: [Recap of 2017 hurricane season](#)

As students watch the video, they will answer questions and reflect on the hurricane season of 2017. They will discuss with their shoulder partner and then we will all come together to discuss 2017's significance.

1. What was so unique about the hurricane season of 2017?
2. What will happen to the names Harvey, Maria, and Irma?

(13 News Now, 2017.)

Explain: This is a teacher led session with guided notes for the students. We will look at exactly how a hurricane forms and the fuel it uses to grow stronger. This will clear up any misconceptions that students have so far. Students will use Nearpod for the presentation and formative assessment is embedded into the presentation. This powerpoint is from a teacher named Chris Keslar. I often look to Teachers Pay Teachers for bits and pieces of my lessons and I purchased this powerpoint from him. It is so much better than anything I could create!

[Hurricanes Powerpoint](#)

(Kesler, 2020.)

Elaborate: Students will do a CER (claim, evidence, reasoning) about hurricanes and whether global warming is causing an increase in intensity. Students will be provided with several resources to use to make support their claim. A CER template will be used for organizing their ideas. CER's are a regular embedded assessment item in our classroom.

Resources for students include:

[Live Binder Hurricane Resources](#)

[CER template](#)

CER question: Are hurricanes becoming more energized due to climate change?

(Live Binder, 2020.)

Evaluate: Students will do a performance assessment about wildfires and global warming using data from recent wildfire activity. This will ensure that they are able to transfer their knowledge and analyze data with a different scenario. This scenario is part of a database of NGSS questions that have been uploaded at Wonder of Science for teachers to tweak and make their own.

[Performance Assessment Forest Fires/Global Warming](#)

(Wonder of Science, 2020.)

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