Polar-ICE Science Communication Workshop Series
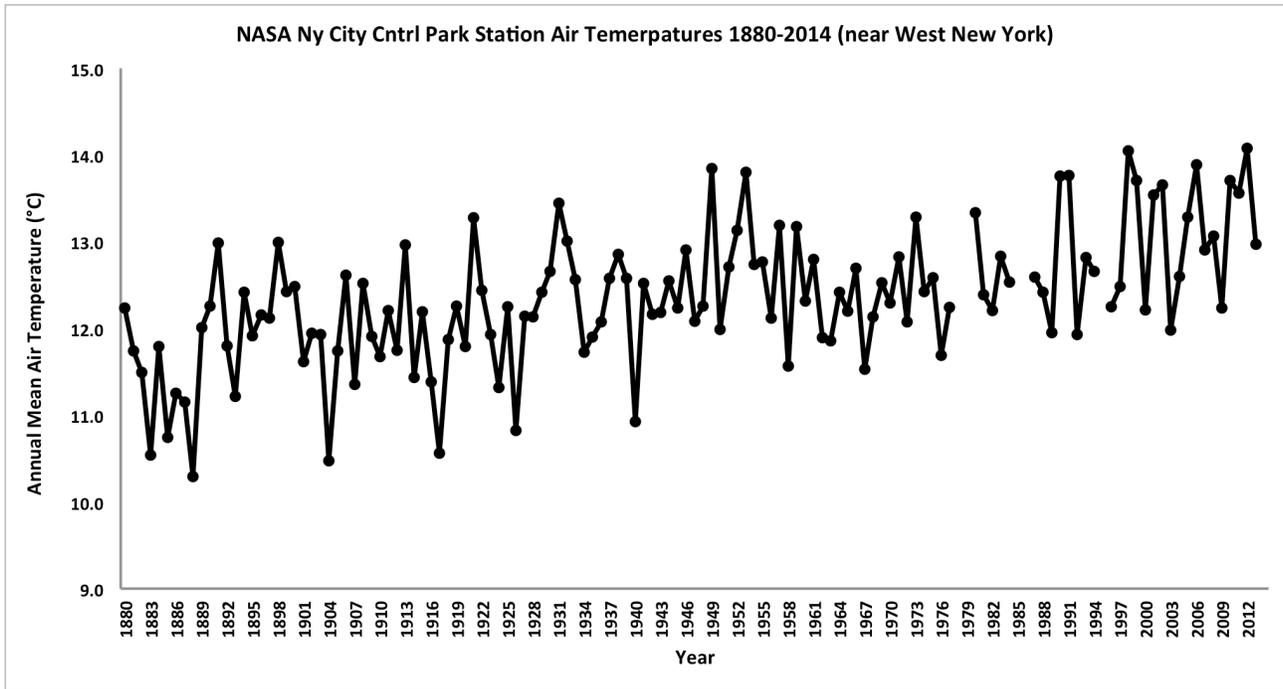Ocean Sciences Meeting 2016 – New Orleans, LA

Three Levels of Engagement with Data Visualization

NASA Ny City Cntrl Park Station Air Temerpatures 1880-2014 (near West New York)

…once you have the data in a data table and/or figure OR you have the model output…

1. **Orientation** –

Question being asked	Things that students are doing to answer the question	Example[1]
What is there (on the page)?	Determining what kind of graph	I am looking at a line graph...
	Determining what the axes are / what the variables are	…of average air temperature (°C) and time (year).
	Understanding the context of the data (metadata/data provenance, sort of)	I need to know what temperature and time are and how the data on temperature and time were collected.

2. **Interpretation** –

Question being asked	Things that students are doing to answer the question	Example
What does the data (on the page)	Using pattern recognition to determine what is going on in the data in relation to the	I see an increasing pattern.

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[1] The example column, for all three levels, relates to the NASA New York City Central Park Station of Air Temperature from 1880-2014 figure at the start of this document.

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show?	axes and other points.	
	Determining if there are outliers.	There are no obvious outliers, but there are some data points missing from the dataset.
	Determining the variation/range of the data.	There is a lot of inter-annual variation. The average air temperature data ranges from a little over 10°C to around 14°C overall. But in the beginning of the time series it ranges from around 10°C to 13°C and at the end of the time series it ranges from around 12°C to 14°C.
	Deciding what the pattern in the data is showing with respect to the variables.	Therefore the air temperature has been increasing over the time period of the data.

3. **Synthesis** –

Question being asked	Things that students are doing to answer the question	Example
What does that allow me to explain (with/about what is not on the page)?	Articulating what that means with respect to things off of the page.	The overall trend of increasing average air temperature means that organisms that live in New York City have experienced a 2°C increase in air temperature over the last 130 years.
	Articulating why that could be.	There may be another factor, not graphed in this data figure, that is influencing air temperature during the time series.
	Relating the findings to prior knowledge of broader science concepts.	Climate change has resulted in increased air temperatures in some areas since around the 1850s. These data are of air temperature from the 1880s to 2010s and the overall pattern is increasing. Therefore, these data indicate that climate change could be resulting in an increased average air temperature in New York City.

Especially related to NGSS Science & Engineering Practices:
- SEP-2 Using Models
- SEP-4 Analyzing and Interpreting Data
- SEP-6 Constructing Explanations