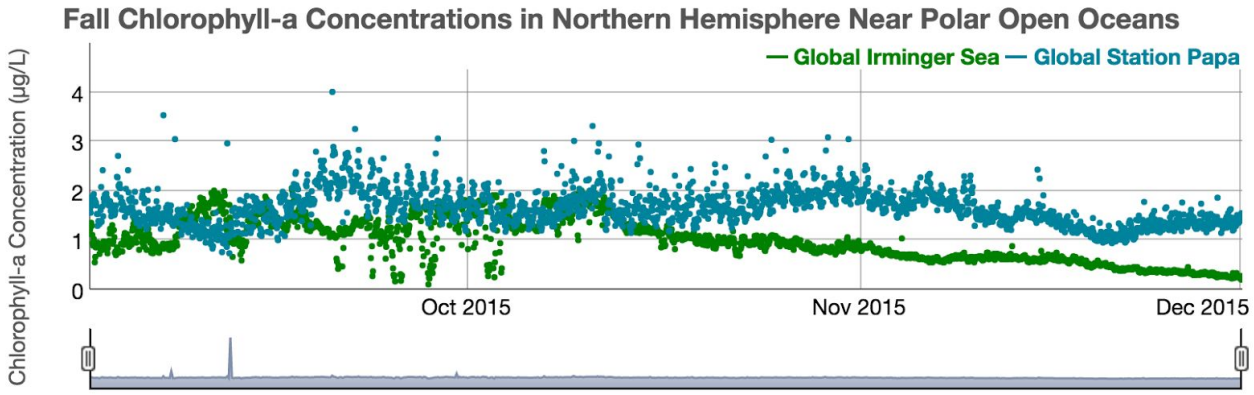
Ocean Observatories Initiative (OOI) Teaching with Data Workshop
June 2-4, 2017

Three Levels of Engagement with Data Visualization



…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 chlorophyll-a concentration (µg/L) and time (days). Also, there are two different locations of data.
	Understanding the context of the data (metadata/data provenance, sort of)	I need to know what chlorophyll-a and time are and how the data on chlorophyll-a concentration and time were collected. I need to know where Global Irminger Sea and Global Station Papa are located in the world.

2. **Interpretation –**

Question being asked	***Things that students are doing to answer the question***	***Example***
What does the data (on the page) show?	Using pattern recognition to determine what is going on in the data in relation to the axes and other points.	I see varying pattern over time for both locations, but they are not the same across the locations.
	Determining if there are	There are no obvious outliers, but there are some

[1] The example a graph from the OOI Teaching with Data Explorations – Chlorophyll-a Across the Globe activity.

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	outliers.	data points that are farther out than others.
	Determining the variation/range of the data.	There is a lot of daily variation and variation among the locations. The chlorophyll-a concentration data ranges from a little over 4 µg/L to around 4 µg/L overall. For Global Station Papa the data range from 0.8 to 4.01 µg/L and is much lower towards the end of fall, but for Global Irminger Sea the data range from 0.2 to 2.01 µg/L.
	Deciding what the pattern in the data is showing with respect to the variables.	Therefore, the chlorophyll-a concentration varies over the fall in different ways between the two locations.

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 varying pattern of chlorophyll-a concentration means that organisms that live at these near polar locations in the ocean experience changes to the amount of phytoplankton available in the ecosystem, and the amount may decrease over time later in the fall.
	Articulating why that could be.	There may be another factor, not graphed in this data figure, that is influencing chlorophyll-a concentration during the time series.
	Relating the findings to prior knowledge of broader science concepts.	There are seasonal patterns in phytoplankton growth due to sunlight and nutrient availability. These data are of chlorophyll-a concentration from the September to December and while there is variability there is a small trend towards decreasing chlorophyll over time, which could indicate a decrease in the amount of phytoplankton. However, these data also indicate that the pattern is not uniform among different near polar sites in the ocean.

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