ACLIPSE
Data Skills Needed for Different Aspects of Teaching with Data

Prior to Having a Data Visualization[1] – teachers will gain the ability to:
    a. Differentiate between types of data and how they are each collected
    b. Articulate good quality and reliable sources of online data as well as identify steps to take to actually find online data portals to access the data
    c. Use physical models and simulations effectively (includes understanding of how they are developed and used in science as well as their accuracies and inaccuracies)
    d. Explain how and why proxies are used in science
    e. Use a variety of different types of data visualizations
    f. Choose the right type of data visualizations for the data that you have
    g. Describe the benefits and limitations of using simulated data[2]

Orientation – teachers will gain the ability to:
    a. Recognize the basic components of data visualizations (e.g., title, labels, legends) that are needed to start reading the visualization
    b. Attend to the details (e.g., scale) and context of data (e.g., knowledge of what the variables mean)
    c. Identify and read different types of data visualizations (e.g., color maps)

Interpretation – teachers will gain the ability to:
    a. Draw conclusions from the averages AND variation of the data
    b. Observe the overall pattern/trend by developing a line of best fit
    c. Determine the confidence you have in commenting on the overall pattern/trend by developing confidence intervals/range envelopes/trend bars
    d. Interpolate and/or extrapolate appropriately from the data
    e. Recognize and apply acceptable AND unacceptable reasons for excluding outlier data from analysis/conclusions
    f. Compare and contrast data sets

Synthesis – teachers will gain the ability to:
    a. Identify the benefits and limitations of analyzing multiple data sources at once
    b. Use patterns/trends in data to support explanations of what the data indicates
    c. Relate and connect the observed data pattern/trend to physical phenomena and/or larger science concepts

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[1] Data Visualization = any visual form of looking at data – table, graph, figure, chart, image, map, etc.
[2] Representations of data manipulated to emphasize a particular scientific concept with minimal confusion. Often textbook graphs and diagrams representing the idealized version of science concepts.

d. Compare predictions of a pattern/trend with the observed pattern/trend in data visualizations (of learner or scientist generated data)
e. Determine how and when to interpret a pattern/trend as correlation between the variables as opposed to causation between the variables
f. Identify how the temporal and/or spatial scale in a data visualization determines what influences you can draw from the data
g. Identify how confounding factors could influence the data and/or the observed pattern/trend in the data
h. Combine more than one data set to find an answer/explanation to a testable question
i. Evaluate the impact of a new data set on previously formulated explanations