Unit 1: Doing Science

Essential Questions

How do we know which measuring device to use?
What type of questions and hypotheses can be answered by science?
How do we know if scientific data are accurate?
How do we ensure that scientific investigations are both safe and consistent with scientific practice?
How do we know if the conclusions of a scientific investigation are valid?

Instructional Goals

By the end of this unit, you should be able to do the following:

1. Fundamentals of measurement
   Develop an operational definition for the length of an object
   Select appropriate measuring devices
   Use the SI units to express length for the appropriate device
   Collect and organize data into a table
2. Experimental design
   Identify and classify experimental variables as independent, dependent or controlled.
   Make qualitative (non-mathematical) predictions about the relationship between variables.
   Record the procedure used to gather data from the apparatus.
   Construct and label a data table.
3. Data Collection
   Consider the accuracy of a measuring device
   Collect data for the widest reasonable range of independent variable values.
   Use metric units and prefixes.
4. Mathematical Modeling
   Make test plots of data to find linear relationships.
   Write mathematical representations, in standard $y = mx + b$ form, for linearized data.
   Replace y and x with dependent and independent variable names.
   Replace m and b with constants including units and provide interpretations for the physical significance of the slope and y-intercept.
   Relate mathematical and graphical expressions.
   Use proportional reasoning in problem solving.

Sequence

1. Activity 1 - Measuring the measuring tool
2. Activity 2 – Precision in measuring
3. Activity 3 - Spaghetti Bridge Paradigm Lab; Alternate – Wingspan vs Height Lab
4. Activity 4 - Circumference vs Diameter additional Paradigm Lab
5. Exercise 1 (HW)
6. Exercise 2
7. Quiz