ACTIVITY 4: MATHEMATICALLY MODELING CORRECTION FACTORS

In this activity, students will complete a graphing exercise to learn how correction factors work in mathematical modeling. They will use this activity in order to understand how the NOAA technology used to map the Great Lakes terrain can correct its measurements to adjust for temperature variance in the water and accurately determine the lake depths using SONAR.

Materials Needed:

- graph paper
- bathroom scales

Begin by having a few students volunteer to step on the bathroom scale and record their weight. Have students consider the situation of taking someone's weight at the doctor's office when they go in for a checkup. Point out that at different times of the year people may wear more/less clothing into their appointment.

Ask them to think about and discuss how doctors could account for clothing when taking weight. Elicit a few responses and lead them to focus on having a set of rules to adjust the scale reading to approximate the accurate weight of a person with clothes on (e.g., light clothing/shoes might be 1-2lbs and heavy clothing/shoes might be 3-4lbs). Have them suggest a mathematical way to account for clothing/shoes in measuring a person's weight. (This should generate an equation of some sort that takes away an amount of weight based on clothing.) Have some new volunteers step on the scale and record their weights. Using the equation the group came up with, estimate the volunteers' weights by adjusting for clothing.

Explain that this is the concept behind a correction factor. Inform them that they will be conducting an experiment in groups to measure their weight and determine a correction factor equation that accounts for clothing and shoes.

***Teaching Tip*: if a student does not feel comfortable disclosing their weight, have them look up the weight of famous athletes to include in their data.**

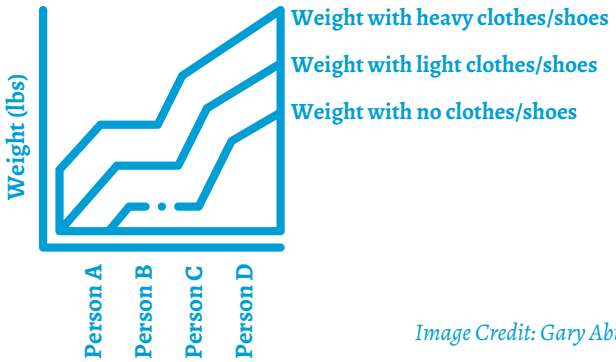

Image Credit: Gary Abud, Jr.

First, have students in groups take their individual weights and record them.

Next, have students estimate weights of the clothing/shoes they are wearing and come up with a set of rules that describes how much weight different categories of clothing accounts for. (**Note: if appropriate, students could remove their shoes and weight their shoes alone on the scale for reference.)*

Then, have students make a scatter plot of their group weight data with clothing included. Once the scatter plot is made, they should add a line of best fit. Have them make a second plot and line of best fit on the same graph for the weight data that corrects for the clothing.

Last, have them compare their two best fit lines. What they should notice is that these lines have the same slope but different y-intercept values, and on the graph one line should be shifted up/down from the other. This difference amounts to the correction factor for clothing.

Finally, combine all of the data from all the groups for a class set. This could be done by averaging their correction factors to generate an estimated mathematical model for the whole class that would allow them to have an equation that corrects for clothing no matter who is being weighed. **Note: If appropriate, the teacher can step on the scale to test the correction factor the class determined.*

Help students make connections between this correction factor and how the SONAR device on NOAA ships correct for water temperature and sound speed when doing bathymetry.