Grade Level: High School (10-12)

Time Required: 45-60 minutes

Keywords:
• Statistics
• Graphing
• Data analysis

Learning Objectives:
• Students will be able to take a raw data set and organize it in a meaningful way (e.g. by experimental treatment) in order to derive useful statistics such as mean, variance, etc.
• Students will then be able to plot the data as organized in a meaningful way, with inclusion of some measure of error. For example, a bar graph with values representing means, and error bars representing standard deviations.

Materials:
• Companion graphing handout with instructions and tips for MS Excel
• Digital copy of companion “graphing exercise spreadsheet” so that every student/computer has a copy of the file.
• Computers: one per student or shared as necessary.
• Instructor computer with overhead projector and MS Excel

Background Information: For the data set included as a companion to this lesson, students should understand the basic concept resulting in a relationship between wind speed and water wave height. Otherwise, different and more appropriate data may be substituted.

Lesson Procedure:
1. Initial period of instructor demonstration of how to organize data, calculate statistics and graph data in Excel (15 minutes).
   a. Instructor familiarity with Excel necessary. See handout for help/tips. For instructor demonstration use “demonstration” tab/spreadsheet. Yellow highlighted columns should be blank at the beginning, and steps to replicate all data (in yellow columns) should be performed on overhead so students can see how it is done.
   b. Step 1: label columns (day 1 – day 6)
   c. Step 2: transfer wave height data from column B to proper days’ columns
   d. Step 3: calculate means, standard deviations, etc.
   e. Step 4: graph data (bar graph - means, standard deviation error bars)
2. Student data analysis: Students will then do the same thing for themselves using the data in the “student” tab.
a. Same steps as demonstration. If time is an issue, have student calculate only means and standard deviations, skip other stats.

**Discussion Questions:**
Do the graphs they created look like they should?
Further assessment questions could revolve around:
1. Comparison of the demonstration and student graphs (wind speed versus wave height)
2. Students’ grasp of the statistics calculated
3. Homework where they have to create a 3rd graph without instructor guidance

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