Session 10: Analyzing & Graphing Data

Session Overview

In Session 10, students explore how to analyze their data set on Google Sheets. As they calculate averages and construct a graph, they determine how the different types of mulch affected the growth of two different species of seedling.

In the optional Dig Deeper extension, Conservancy staff demonstrate how to check to see if the differences in their data are statistically significant by adding error bars to their bar graphs. Note that this is a more challenging use of Google Sheets, so you can decide whether to share this extension with your class.

Learning Objectives

By the end of the session, learners will be able to:

- Reflect on how scientists use averages to compare groups of numbers within a data set
- Use Google Sheets to calculate the average growth for seedlings in woody mulch, straw-like mulch, and no mulch treatments
- Create a graph to compare the average seedling growth between woody mulch, straw-like mulch, and no mulch treatments

Session Outline

Introduction (5 minutes)

Students are introduced to the topic that they will be investigating today.

- Introduction Slideshow: https://docs.google.com/presentation/d/1uMbIF-nGK3MvtEDmLk-ZgMPKqA06svB8WsXlmVxD46s/edit?usp=sharing

Investigation (30-60 minutes)

During this investigation, students use Google Sheets to analyze their data. First, they reflect on how to represent and compare different groups of numbers. After watching a screencast demonstrating the task, they practice using Google Sheets to calculate an average for each seedling and treatment. Next, they consider what kind of graph will work best to represent their data, and then follow directions in a screencast to create a graph in Google Sheets.

Note that for this section, you will need to set up a Google Sheets file for students in your own Google Classroom using our template for them to analyze.

- Analyzing & Graphing Data Slideshow: https://docs.google.com/presentation/d/1w015POzV4cT2pEKEK2Y3e0Tz2YLVq1IjPv9uhbVwrk0/edit?usp=sharing
- Seedling Data template on Google Sheets: https://docs.google.com/spreadsheets/d/15mUIB5oeuhyAkJ4klZ6Fi9SapglH6XAKbbBN08G2dFM/edit?usp=sharing

Dig Deeper (Optional) (30 minutes)
In this optional extension, students are introduced to the idea of statistical significance through a short video. They then use Google Sheets to add error bars to their graphs, giving them a way to check to see if the differences between the populations of seedlings are truly significant.

- Checking for Statistical Significance Slideshow: https://docs.google.com/presentation/d/1j06fSZrXxQ0uV7F7x1jFJZ6oaRh89_bybx5zukGQt3E/edit?usp=sharing
- Project Crystal Research Site Field Guide: https://crystalcove.org/wp-content/uploads/2020/04/Calculating-Confidence-Intervals-Instructions.pdf

Discussion (10 minutes)
Students respond to the prompt below. You can set this up as a Question on your Google Classroom, use Flipgrid to have students share responses, or give it to students as a writing prompt that they can respond to offsite.

Question: Did your graph support your hypothesis?

Now that you've had a chance to analyze and graph your data, it's time to think back to your original hypothesis.

As science practitioners, we use data to test our hypothesis. If the data matches what we predicted, we can conclude that our hypothesis is probably correct (or possibly needs deeper investigation). But if the data doesn't match what we predicted or if it seems inconclusive, then we need to rethink and revise our hypothesis.

Take a few minutes to think back to your original hypothesis about how the different types of mulch would affect seedling growth. Then, respond to the following questions.

1) What was your original hypothesis? Where did you think seedlings would grow the most, and where did you think they would grow the least?
2) What did your data show? Based on the graph that you created, where did Monkey Flower grow the most? Where did it grow the least? What about Coastal Goldenbush?
3) Based on your data, how would you revise your original hypothesis? What effect do you think that woody mulch, straw-like mulch, and no mulch have on seedling growth?