



# **Design and Collecting Data Science Workshop #2**

11/17/18



# Agenda

- Setting up and organizing a scientific notebook
- Preparing and conducting experiments
- Organizing data into graphs, charts and figures
- Reading and analyzing data
- Unexpected results
- Peer mentoring



## Before the Fair

- Screening! Visit <https://www.gsdsef.org/teachers/screening-teacher> for more info.
- Must do for Entrance to the Fair, coordinate with your teacher.
- Staggered dates throughout January and February, different for every school.



## Fair Week Schedule

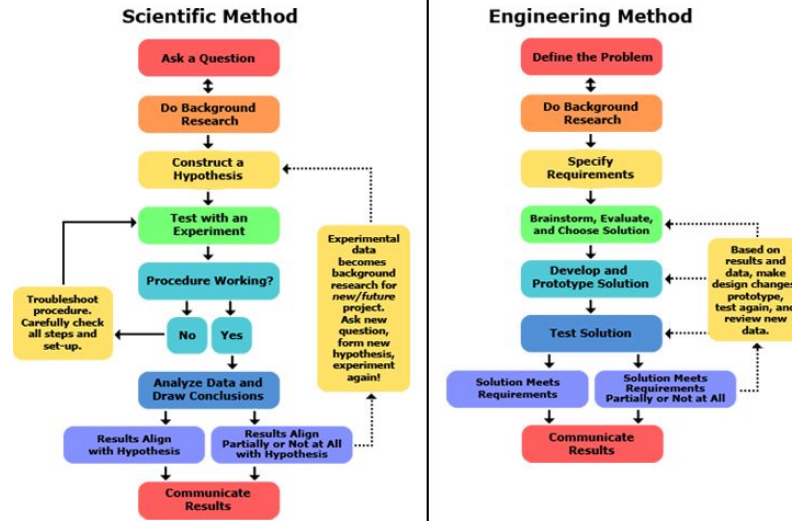
Tuesday, March 12th: Project Set-Up Day \*\*1-7pm, may come at any time

Wednesday, March 13th: Judging Day! \*\*Students present all day

Thursday, March 14th: Awards Ceremony \*\*Evening

Sunday, March 17th: Family Fun Day/Clean Up Day \*\*Boards must be cleaned up by 4pm

# A note on Engineering vs. Science





# Experiments: Basic Terminology

Variables:

- Independent variable: the thing you are changing to have an effect
  - I.e. temperature, water
- Dependent variable: what you're measuring
- Controlled variables: things that never change



# Planning/Conducting Experiments

- Make sure it's feasible (time, money)
- Make sure it will help you answer your question/test your hypothesis
- Recommended: at least 3 trials, but the more the better (may vary depending on the kind of project you are doing)
- Helps to have a timeline



# Calculations and Summarizing Data

- Figure out interesting ways to summarize your data: average, ratios, percentages, individual data points
- Calculate with formulas to show relationships between data points
- Pay attention to different units and conversions!





# Graphs

- Can use Google Spreadsheets or Microsoft Excel
- Many types of graphs: line graph, bar graph, scatter plot,
- **Make sure to clearly label** all tables and graphs. And, include the **units of measurement** (volts, inches, grams, etc.)
- Place your **independent variable on the x-axis** of your graph and the **dependent variable on the y-axis**



# Analyzing Data

- **Review** your data. Try to look at the results of your experiment with a critical eye. Ask yourself these questions:
  - Is it complete, or did you forget something?
  - Do you need to collect more data?
  - Did you make any mistakes?
- Look for trends in the data or main patterns



# Treating Unexpected Results

- Keep an open mind!
- It's okay if your hypothesis isn't supported, it's still something new you learn



# Scientific Notebook

Refer to Sample Science Notebook:

[https://www.gsdsef.org/sites/default/files/notebook\\_rev\\_for\\_2019b.pdf](https://www.gsdsef.org/sites/default/files/notebook_rev_for_2019b.pdf)



# Introduction

- Tell a narrative of why and how your project came to be.
- Give a brief overview of the background and goals of your project in no more than a single page



# Review of Literature

5 to 10+ typed pages and will summarize the information you found about your topic before you start your experiment

1. Start with an introductory paragraph that generates interest and indicates what is coming
2. describe information you found while researching your topic.
3. Give credit where credit is due!
4. Have a concluding paragraph that “pulls” it all together.



# Statement of Problems or Purpose

- What **intrigued** you about your topic?
- Why you are so **passionate** about it?
- State the problem you are finding an answer for



# Hypothesis

- Make a **prediction** as to what the answer or outcome will be
- Based on:
  - what you have read as you did a review of the literature on your topic
  - the problem you have identified





# Materials and Procedure

- Everything you used in your experiment should be listed on this page
- On this page give a step-by-step description of how you tested your Hypothesis.
- \*MORE IS ALWAYS BETTER WHEN YOU DO YOUR EXPERIMENT!



# Findings

- Polished version of the raw data like responses, reactions, results you observed and recorded
- KEEP the raw data and include it in the end of the notebook
- Be sure to label all parts of your graph appropriately



# Peer Mentoring!!



# Future Workshops!

- January 12th, 2019 8:30-11:30am
  - Room 306
  - Designing your board, any last screening questions.
- February 27th, 2019 4:40-7pm
  - Room 401-402
  - All about judging, what to expect at the fair, practicing your presentations!