

# WORKSHEET 1 (MAR 7): MEET YOUR MENTORS & BRAINSTORM!

## Tasks for this week:

- **Print these worksheets out to fill them out! Share a copy with your mentor(s)!**
- Learn more about your topics!
  - Use science journal articles, books, and internet resources to look for **testable** ideas related to your topics
- **Save** a full list of sources to refer back to them and use them in your **bibliography**
  - A bibliography is a way to let others know where you found your information
  - You can print out copies of articles or save them in a folder online
  - Make a list of websites, magazines articles (online or in print), and other resources you can use for your research

## Getting started:

What are 2 facts about yourself that you'd like your mentor(s) to know about you? (Examples: hobbies, pets?)

- 1.
- 2.

What is your mentor's first name, last name, and email? (If you have 2 mentors, write both)

- 1.
- 2.

What are some facts about your mentor(s) that you think are cool?

- 1.
- 2.

What are some science questions you're interested in that you also want to learn more about?

- 1.
- 2.
- 3.

## WORKSHEET 2 (MAR 7): DEVELOP A RESEARCH QUESTION

**Part 1 - PROJECT EXPLANATION:** Explain why you chose your project topic (How will others benefit from your project? Be creative! Market your project like you're selling lemonade when everyone else is also selling lemonade)

**Tasks for this week:**

- Summarize important facts you learned by researching your topic
- Discuss how those facts relate to your project question
- Explain why your project is important or relevant to a group of people / an ecosystem
  - Keep in mind: as long as you present it well & factually, it is a valid justification

**Getting started:**

Write down any questions you might have based on your research:

1.

2.

Why is your research question important? This can mean something important to you, a plant/animal/other species, or important to people who knit, play football, or build houses!

1.

2.

**Part 2 - RESEARCH QUESTION / GOAL / HYPOTHESIS (different names for the same thing)**

**Tasks for this week:**

- Decide on a single research question (aka hypothesis, aka engineering goal)
- Describe your question or goal & describe all expected outcomes to your project
- Explain how your research question is based on your "project explanation / rationale"

**Getting started:**

What, exactly, do you want to find out? What is a goal or an expected outcome for your project?

1.

2.

How does your project relate to your project rationale?

1.

If your project results do not support your hypothesis, what information have you gained?

1.

2.

# WORKSHEET 3 (MAR 14): CREATING YOUR PROCEDURES/METHODS

## What does a procedure consist of?

- Experiment design
- Materials
- Data collection methods

## Tasks for this week:

- Come up with a detailed, step-by-step procedure of how you will set up your experiment
  - Make sure this procedure is well-written so it can be replicated by someone else
  - **\*\*Good hypotheses and methods are those that can be repeated by other scientists!\*\***
- Think about the materials you will be using - are you keeping to a budget?
- Think about which **photos** you'll want to take to show your setup!
- Think about what kind of data you'll need to gather
- When you follow your procedure, write down anything that doesn't go to plan and what you could do to make it better - this can go in your discussions section

## Getting started:

What materials are you using? Include any physical items or computer software. (Bullet points)

- 
- 
- 
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What are the steps for setting up your experiment? Include all relevant details: relevant times of day, materials, necessary logical steps, etc.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.

**Now that you've gotten this far, conduct your experiment!**

## WORKSHEET 4 (MAR 21): DATA ANALYSIS / RESULTS

### Tasks for this week:

- Assess your plan to analyze the data and results from your project - does it still work?
  - This might include calculating means, averages, percentages, yields, or etc.
  - You can compare and contrast data, show frequency of data, and more
- Think how you will best show your data to other people - a bar graph, pie chart, etc.
  - **Note:** data tables are usually kept as unpolished or “raw” data, so we make these tables into graphs to show others how your data may show a trend
  - Fun fact: “data” is plural for “datum”

### Getting started:

What is a trial and how many trials do you still have the time and resources for? Do you need to run more trials?

What is a dependent variable? What is the dependent variable in your experiment?

What is an independent variable? What are the independent variables in your experiment?

What is a confounding variable? What are the confounding variables in your experiment?

What did I decide to measure? How can I use those measurements as a way to compare my data points? Will I be using the mean, median, or something else?

Will I use a bar graph, scatterplot, pie chart, word cloud, or etc. to show my data?

What photos did I take that best illustrate my comparisons between trials?

## **WORKSHEET 4.5 (MAR 28): RESULTS/DISCUSSION - PUT IT TOGETHER**

### **Tasks for this week:**

- Describe how your results were expected or unexpected
- Describe what went according to plan and what didn't
- Describe what you would do next time and see if there is still more time to run your experiment with updated parameters (changes in conditions)

### **Getting started:**

What does my data mean for my hypothesis? Is my hypothesis supported or not supported? (Remember, hypotheses cannot be "correct" or "incorrect")

What would I do to improve my experiment if I were to run it again? Would I use more trials, control for confounding variables, etc.?

What were some unexpected outcomes, if any? How do I suspect these arose? If I did this experiment again, would I want to change my experimental conditions to account for these?

When did I stop the experiment? Was there a predetermined point in time? Did I run out of materials and then decide to stop?

## **WORKSHEET 5 (APR 11): ASSEMBLING YOUR PROJECT SUMMARY**

A research plan/project summary includes the following headers:

- a) Introduction & Background Information
  - i) One sentence on your project rationale
  - ii) Your research question (or hypothesis or engineering goal);
- b) Procedures;
- c) Data Analysis (results & conclusion);
- d) Research Bibliography

By this point, you know what your project rationale, research question, and procedures are.

### **Tasks for this week:**

- Gather all parts of your research plan together and put them in order
- Begin putting it together so you can explain it all to someone who knows nothing about your project
- This will help you create your abstract!

## **WORKSHEET 5.5 (APR 11): RESEARCH BIBLIOGRAPHY**

### **Tasks for this week:**

- Make a formal list of all the research you have used (APA format is preferred for scientific papers)
- You might need to add a few new sources to this list after your experiment is done, and that's okay

## WORKSHEET 6 (APR 11): WRITING AN ABSTRACT

### What is an abstract?

- A short summary of what your project is about - it includes:
  - The problem or the key issue
  - Key parts of your research methodology
  - Your most important findings
  - Your most important conclusions from your findings
  - Keywords to your method and content
- Usually has a 150-250 word limit, but check GATEway Science Fair guidelines

### Tasks for this week:

- Write 1-2 sentences of necessary background information about the key issue
- Write 1-2 sentences including key parts of your research methodology
- Write 1-2 sentences mentioning what your most important results are
- Write 1-2 sentences describing the importance of your results for other scientists in your field or for people this project could impact
- Put all the sentences together and edit what you wrote! Congrats, you have an abstract!

### Getting started:

Background info explaining why your project problem exists/why it is a problem:

Key parts of your research methodology:

Your results:

The importance of your results:

# WORKSHEET 7 (APR 11-18): PRESENTATION TIPS!

## Tasks for this week:

- Practice your presentation!

## When writing your presentation (papers and powerpoints)

- **Takeaway:** Imagine you're presenting in a classroom; you want the person in the last row to be able to clearly read your slides and hear your voice
- **References:** for any format you ever use, fill in all the information you have and leave blank any information you don't have (use citationmachine.net while you still can!)
- **When writing,** please tell us about what you did! 1st person, active voice
  - Ex: "I conducted research," "I collected data," "I overcooked the sausages"
  - This conveys that the scientist takes responsibility for their actions
  - In the past: 3rd person passive voice was used, but this has changed

## When putting your presentation together (poster presentation)

- **Use bullet points!**
  - This makes everything much easier to read (for you and the audience)
  - Use words on the slides to concisely state & emphasize your points; less is more
    - It takes practice to learn what to write down and what to leave out!
- **No paragraphs or long sentences**
  - Break your paragraphs into bullet points
  - Delete walls of text in your presentation that you can use notecards for
    - Notecards can contain more details on what to say or how you want to say something, these can be used as an aid when practicing
  - Use photos or diagrams rather than words when possible
- The background behind your text should be only one or two colors throughout
- The text should contrast with the background, so you can see the text clearly
  - Ex: a white background and black text or a dark blue background and yellow text

## When speaking and presenting your research (poster presentation)

- **When speaking,** please tell us about what you did! 1st person, active voice
  - ("I conducted research," "I collected data," "I overcooked the sausages")
- **Project confidence!** Life is too short for too many "maybes"
  - You know your project better than anyone - you know why you made your choices, and if a question comes up that is unexpected, do your best to answer with confidence

## WORKSHEET 7.5 (APR 11-18): HOW TO GIVE FEEDBACK

### Tasks for this week:

- Practice presenting
- Practice giving your peers good feedback on their projects

### What makes feedback “good” and why is good feedback important?

- Good feedback is **constructive** and is **delivered in a way that doesn’t make us feel bad**
  - Ex: “The sentences in your introduction would make more sense in a different order - let me show you what I mean.”
  - NOT: “You’re not good at writing introductions.”
- Good feedback is **specific**
  - Ex: “I like your use of bullet points because it makes your project easy to read.”
  - Ex: “I think a pie chart would work better here because you are trying to show percentages as part of a whole.”
  - NOT: “I don’t like your project.”
- Good feedback is **positive** and focuses on what can be changed and why
  - Note: positive doesn’t mean pretending you like everything, it just means that you roll with what is in front of you instead of tearing it down
- We can learn from good feedback and use it to improve our projects
- We can also learn how others may interpret our projects differently, so we can clarify our presentation beforehand

### What are some tips to help us give good feedback?

- **Ask your peer(s) if there is anything in specific they want feedback on**
  - Feedback is a two-way street; you’re not just giving feedback, they are also receiving it
  - We can learn from the feedback we give others as well
- **Use the “I like, I wish, I wonder” approach**
  - Mention something about the project that you like, something you wish were different, and anything it makes you wonder about
  - Ex: “**I like** how you did a project on daphnia (water fleas) and their heartbeats because of how transparent their bodies are. **I wish** you had measured their heartbeats for 60 seconds instead of measuring for 10 seconds and multiplying it by 6 to see if that affects accuracy. **I wonder** what other animals are totally transparent.”
- **Be empathetic - we’re still learning at every stage of our lives**
  - Something totally obvious to you may not be totally obvious to someone else
  - Something that’s easy for someone else may have been something you’ve been really struggling with
- **Follow up on the feedback you’ve given and any changes your peer(s) made**
  - Reinforce what they have done well and ask about any further changes they are hoping to make