Problem Statement, Research Question, and Hypothesis

This document helps you design and write your problem statement, research question, and hypothesis. Each of these pieces will help you design a hypothesis that will be testable and based off the work that you have been doing up to this point.

This document also serves to help you organize all the work you have done so far.

Ideas based on Article Analysis, I Wonder, and anything else you have done. ● In the space below, type the things that are interesting you, what you are thinking about, what you want to know about. Refer to previous assignments to help you.
Problem Statement ● What is the problem or need? ● Who has the problem or need? ● Why is it important to solve?
What is your problem statement? One to two sentences that identify your problem. *Problem Statement:*

Research Question

Once you have chosen a topic of interest, you will need to create a related scientific question. Without a good question, your whole science project will be much harder, if not impossible! It is important to select a question that is going to be interesting to work on for at least a few weeks and that is specific enough to allow you to find the answer with a simple experiment. A scientific question usually starts with: How, What, When, Who, Which, Why, or Where. Here are some characteristics of a good science fair project question:

- The question should be interesting enough to read about, then work on for the next few weeks.
- There should be at least three sources of written information on the subject. You want to be able to build on the experience of others!
- The question should contain one factor (variable) that you can change in your experiment and at least one factor (variable) that you can measure.

Now, for something like a science fair project, it is important to think ahead. This will save you a lot of stress and unhappiness later. Visualize the experiment you might perform to answer your question. How does that possible experiment stack up against the following issues?

- The experiment should measure changes to the important factors (variables) using a number that represents a quantity such as a count, percentage, length, width, weight, voltage, velocity, energy, time, etcetera. Or, just as good might be an experiment that measures a factor (variable) that is simply present or not present. For example, lights *on* in one trial, then lights *off* in another trial, or *use* fertilizer in one trial, then *do not use* fertilizer in another trial. If you cannot observe or measure the results of your experiment, you are not doing science!
- You must be able to control other factors that might influence your experiment, so that you can do a fair test. A "fair test" occurs when you change only one factor (variable) and keep all other conditions the same.
- Is your experiment safe to perform?
- Do you have all the materials and equipment you need for your science fair project, or will you be able to obtain them in a reasonable amount of time at a cost that is okay for your family?
- Do you have enough time to do your experiment before the science fair? For example, most plants take weeks to grow. If you want to do a project on plants, you need to start very early! For most experiments you will want to allow enough time to do a practice run in order to work out any problems in your procedures.
- Have you avoided the bad science fair projects listed in the Science Fair Topics to Avoid table in this project guide?

From: https://www.sciencebuddies.org/science-fair-projects/science-fair/science-fair-project-question

What is your research question? One question that you will be attempting to answer by doing your research project.

Research Question:

Hypothesis

Our staff scientists offer the following tips for thinking about and writing good hypotheses.

- **The question comes first.** Before you make a hypothesis, you have to clearly identify the question you are interested in studying.
- **A hypothesis is a statement, not a question.** Your hypothesis is not the scientific question in your project. The hypothesis is an educated, testable prediction about what will happen.
- **Make it clear.** A good hypothesis is written in clear and simple language. Reading your hypothesis should tell a teacher or judge exactly what you thought was going to happen when you started your project.
- **Keep the variables in mind.** A good hypothesis defines the variables in easy-to-measure terms, like who the participants are, what changes during the testing, and what the effect of the changes will be. (For more information about identifying variables, see: Variables in Your Science Fair Project.)
- **Make sure your hypothesis is "testable."** To prove or disprove your hypothesis, you need to be able to do an experiment and take measurements or make observations to see how two things (your variables) are related. You should also be able to repeat your experiment repeatedly, if necessary.
  To create a "testable" hypothesis make sure you have done all of these things:
  - Think about what experiments you will need to carry out to do the test.
  - Identified the variables in the project.
  - Included the independent and dependent variables in the hypothesis statement. (This helps ensure that your statement is *specific* enough.
- **Do your research.** You may find many studies similar to yours have already been conducted. What you learn from available research and data can help you shape your project and hypothesis.
- **Don't bite off more than you can chew!** Answering some scientific questions can involve more than one experiment, each with its own hypothesis. **Make sure your hypothesis is a specific statement relating to a single experiment.**

From: https://www.sciencebuddies.org/blog/a-strong-hypothesis

What is your hypothesis? Use the information above and gathered through your prior assignments to build your hypothesis.

Hypothesis: