

## Science Project Detailed Research Plan

**Student Name(s):**

**Date:**

**Project Title: (What is the effect of XXXX (changing variable) on YYYYY (measured endpoint)?** Choose a title that identifies the content of your project. The title can include the nature of the study, the species used, and the place of field studies. It should reflect the principal objective of the investigation.

**Hypothesis:** Based on your reading and information research, organize everything you have discovered, and then make an estimate of what will happen. Knowing certain things are true, you then predict what might happen if you change something. Your experiment, when successful, will allow you to determine if your hypothesis was correct or not.

**Materials:** List all necessary biological agents, chemicals, major instruments, and software, which will be used.

**Methods:** Describe the methods to be used, and why are you using the methods you have chosen? Why have you chosen your described controls? Examples would be spectroscopy, photometric methods, direct measurement, volume displacement, etc.

Be sure to list your measured endpoint(s)

**Experimental Procedure:** State your methods, so that others could repeat your work **exactly**. Include details, giving exact specifications and quantities. [Your procedure will describe how you plan to do your experiment, changing only one variable at a time and keeping all the other parameters the same]. You will need to describe the control so that you can compare results of your experiment with a standard for which the variable is unchanged. Make sure that you have three or more seeds/plants/animals in each of the control and experimental groups. Even better, have several experimental groups (e.g. more than one concentration of chemical you are testing, more than one time point, etc). Make measurements in metric units when possible. Repeat the test more than once to see if your results are reproducible.

**Methods of Data Collection:** If you used a published method, reference the method, but describe any changes you made to it. If you used experimental organisms, identify them by genus and species. If you used a standard instrument, it suffices merely to say so, but if you devised a new or special method, describe it completely.

**Bibliography:** List the authors and titles of five, (high school) or three (middle school) science or engineering books or articles that you have read and found useful for your research subject.  
Example: Author 's Name, Year of publication, "Quoted Title of Magazine Article (magazines only)"; Underlined *Title of Book or Magazine*, date, volume, and number of magazine issue. Page numbers read. If you use a web site: ww w.urlname.ext, name of topic from the home page, author, and date read.

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