

# Bio 301L MWF 9-10am Dr. Reichler Experiment Guide Sheet, Spring 2010

Remember your overall goal is to practice designing and carrying out experiments. I want your inquiries to be interesting yet simple, safe, and doable.

For this project you will work by yourself to develop, carry out, and analyze an experiment. Your experiment should not involve the use of chemicals or advanced data collecting equipment. You should be able to collect your data simply. Other than that, you are free to design an experiment to your liking. The written proposal is due in class on F 2/11. (Do not collect any data until your proposal has been returned to you and approved.) A mid-semester update on your experiment is due in class on F 3/25, and your final report is due in class on F 4/15. This project is worth 20% of your course grade: 5% for the proposal, 5% for the mid-semester report, and 10% for the final report.

Coming up with an original idea and then actually carrying out some experiments can be intimidating. Of course it may also be exhilarating because you can be as creative and imaginative as your mind will take you. Start with a question you would like to answer. Then imagine some hypotheses and think about what data would allow you to disprove these hypotheses. If everything seems too complicated or needs very complex data collection, simplify your question, and try again. Once you get to a workable idea: plan when you can collect your data, where you will collect your data, and how you will collect your data. Your plan will not go perfectly. Leave sufficient time and have a back-up plan.

You may want or need to search online to help with forming a question, developing hypotheses, and/or figuring out how to test your hypotheses.

Consider these points before you design your experiment:

1. Is your proposal safe?
  - a. For you?
  - b. For your subjects?

\*\*You cannot question or do experiments on strangers. (You may safely observe strangers.)

\*\*You cannot experiment on animals, although you may safely observe any type of organism.

2. Is your proposal appropriate?

Does it involve or imply racism, sexism, etc? Is it derogatory to a specific group?

3. Can your data be collected AND can you finish writing up your results in time? Will you have time to collect the data?

4. Are your question, hypotheses, and experiments related and relevant to each other?

5. Is it possible for you to get meaningful data that can be used to answer your question?

6. Are you trying to prove a hypothesis, or do you have multiple hypotheses? Are you making a good faith effort to disprove all of your hypotheses?

It is possible to use proof with multiple hypotheses. If the experiments are set up to disprove some hypotheses, but not test others, this is similar to using proof.

**Proposal Format** (Print your proposal and bring it to class on F 2/11 for approval. It will take few days for the proposals to be vetted and approved. Do not collect any data until your proposal has been returned and approved.):

At the top of the page please include your name and class time. A cover sheet, etc., is not necessary.

### **Question**

State succinctly and clearly the question you will try to answer.

### **Hypotheses**

Give all of the reasonable hypotheses that you can think of. This may require some research.

### **Experiment**

a. Describe how you will collect data. What data will you collect? Where, when, and how will you collect the data?

b. Include how your data will allow you to eliminate your hypotheses.

### **References**

If you used any references to develop your question, hypotheses, and/or experiment(s), be certain that you cite them. Remember, when doing research, using other's ideas is fine and necessary, but using someone else's idea without citing them is plagiarism.

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### **Written Report Format** (the report is due in class on F 4/15):

The written report for your experiment will be formatted similarly to a scientific research article. I have included the basic information that you need in each section.

Author and Title- Concisely describe your experiment.

Abstract- Summarize your work. Include your question and final conclusion. Do not exceed 250 words.

Introduction- Give background information about your question and hypotheses.

Results- Describe your results including any tables or figures that you need to explain your results along with any data analysis that you performed. Include any problems that kept you from collecting the necessary data.

Discussion- Explain your results. If you did more than one experiment, explain how the results are or are not in agreement. What is your final conclusion? Were you able to eliminate all but one hypothesis? Were the results surprising or unexpected? Are your results different from other similar studies? What future experiments might help clarify or expand on your findings?

Materials and Methods- Describe how you carried out the experiments. Include the protocols you followed and any analysis you performed. Give enough detail so that someone else could replicate your results.

References- Cite other work that you used to develop your question, hypotheses, and/or experiment(s). This information should be specifically cited in the text of your report, and then the full citation given here. The specific format is up to you, but should include: author name(s), article title, journal or book title, volume and page number, and year of publication