

Math 363 Case Study Proposal Guidelines

Adapted from the Mayfield Handbook of Technical & Scientific Writing¹ and the Massachusetts Institute of Technology 6.021J proposal handout. There is a specific underlying context (amphibian neurophysiology), but the ideas here are entirely generalizable.

Goals

Proposals develop a plan of action in response to a specific need or problem. In content, successful proposals demonstrate that you understand the scope of the problem and that you have developed a valid and well-focused approach for reaching proposed objectives. The goal in writing proposals is to effectively communicate a plan of action in concise, specific language.

- Think through your research project before writing. Exactly what are you testing? Why? How?
- Avoid universal words like "all" and "every" as well as vague words like "some" and "a few."
- Also, make sure you understand the technical meaning of words like "control" before suggesting that an initial measurement will be your "control."
- A good rule of thumb when writing a proposal is the "peer test" – i.e. based on your written proposal, can your colleague, friend, or roommate understand exactly what you are doing? Can they restate your research project in one sentence?

Format

- Single-spaced
- One page

Organization

Most proposals share a general structure, including title, objective, background, and proposed research plan. See the Mayfield Handbook of Scientific and Technical Writing (Section 2.6) for a description of elements found in professional proposals.

For your proposal, **your submitted proposal need not have all the elements of a professional proposal**. However, your proposal does need to include certain basic elements:

¹<http://www.mhhe.com/mayfieldpub/tsw/home.htm>

- **Title**

Often the title is the only basis on which readers decide if your work will be useful to them. Make your title descriptive enough to give a specific idea of what is covered in the proposal.

WEAK: Effects of Alcohol on a Frog Sciatic Nerve

What kind of effects? What exactly is this proposal suggesting to research?

BETTER: The Relationship Between Amplitude of the Compound Action Potential and Diameter of the Frog Sciatic Nerve

- **Name**

Your name and the name of your partner (with your email addresses)

- **Central Idea/Hypothesis**

The 363 case study is designed to be somewhat open-ended and exploratory. However, you want to go in with some central idea(s) to provide focus. Better yet, one should be able to develop a testable hypothesis². The hypothesis should state – in one sentence – exactly what you are testing. That statement should be answerable with “yes” or “no”

WEAK: We predict that the speed and amplitude of the compound action potential of the frog sciatic nerve will both change with temperature

This hypothesis cannot be answered “yes” or “no.” In addition, it is not clear what kind of response the researchers are studying, as the wording “change with temperature” is too vague.

BETTER: Decreasing temperature will decrease the velocity of the compound action potential of the frog sciatic nerve

- **Background**

The background statement should explain the motivating problem or rationale for pursuing a research project. The background statement should clearly articulate the reasoning behind your hypothesis.

WEAK: The speed of a chemical reaction depends on temperature. Therefore, we expect the speed of the compound action potential to depend on temperature. Also, the duration will depend on temperature. Finally, the amplitude of the compound action potential should depend on temperature.

This statement is too general. What do the researchers mean when they write “depend on”? How do these three expectations lead the researchers to the hypothesis?

BETTER: Decreasing temperature decreases the rates at which many chemical reactions proceed. Therefore, it seems plausible that the speed of neural conduction would decrease as temperature decreases.

- **Procedure**

The procedure should present your method for reaching your stated hypothesis. What kind of data will you collect? How will that data be analyzed? Even the most promising research will fall flat if you cannot design a scientifically valid way to investigate it.

WEAK: We will measure the compound action potential as described in the Laboratory Manual but at a variety of temperatures. We will record action potentials for all conditions and compare them.

²Depending upon your specific project and approach, you may or may not be able to develop a testable hypothesis.

This procedure does not clearly outline the research method. The researchers are unclear about how they will conduct their study and what they will do with their data. Where will action potentials be recorded? What will be compared and how? How will these measurements help test the hypothesis?

BETTER: After dissecting the sciatic nerve from a frog, we will stimulate the nerve and measure the responses as outlined in the lab manual. The velocity of the compound action potential will be determined by dividing the distance between the stimulating and recording electrodes by the time to the first negative peak of the response potential. The distance between the stimulus and the response electrodes will be made as large as possible (using R11 and R12 if the nerve is long enough) to improve the accuracy of the velocity measures (by minimizing the effects of small errors in measuring times and distances). After determining the velocity at room temperature, we will chill the nerve by applying chilled Ringer's solution. We will then measure and record the compound action potential. We will then apply room-temperature Ringer's solution to see if the effects of chilling are reversible. We will then repeat this procedure at least 3 times to make sure that the effects are, in fact, due to the chilling.