Your MSc Thesis Proposal

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Overview

You are working through your course requirements and the actual thesis work is looming. Where do you start? The essential requirements for a thesis (formal departmental policy) are:

- a scholarly work where scholarly refers to:
  1. a precise statement of objectives;
  2. a thorough overview and analysis of the literature;
  3. an objective analysis and presentation of the facts;
  4. a conclusion that follows logically from the analysis.
- it needs to incorporate a scientific method or approach to finding answers to questions, or incorporate scientific facts or data into the analysis and conclusions.
- the expectation is that the thesis research should be of potentially publishable quality.

The basic steps involved in this process are:

1. An issue is identified.
2. Other people's work on the topic is collected and evaluated.
3. Data necessary to solve the problem are either collected by the student, or obtained independently.
4. Data are analyzed using techniques appropriate to the data set.
5. Results of the analysis are reported and are interpreted in light of the initial issue.
6. Recommendations are proposed that would lead to a deeper understanding.

The Proposal

The first step toward a great thesis is a great thesis proposal. You should meet with your thesis supervisor to identify a research topic, and formulate the details of the project. The thesis proposal will help you to gain an understanding of the background of your project, develop or adapt appropriate methods, and summarize the state of your project. The goal here is to progress as far as possible with the elements listed before embarking on time-consuming (and possibly expensive) data collection and analysis. The more you can accomplish in the proposal, the further you can drive the project in the end, and hopefully the easier life will be when you are in "thesis mode" (for both you and us!)
The purpose of writing a thesis proposal is to demonstrate that:

1. the thesis topic addresses a significant problem;
2. an organized plan is in place for collecting or obtaining data to help solve the problem;
3. methods of data analysis have been identified and are appropriate to the data set.
4. the proposal exists as a contract between you and your supervisor. It sets out what needs to be done, defines the limit of the project, and gives you a clear route to achieve the goal of finishing it on time.

If you can outline these points clearly in a proposal, then you will be able to focus on a research topic and finish it in a timely fashion. A secondary purpose of the proposal is to give you experience in the art of proposal writing. Any future career in Earth or Environmental Science, whether it be in industry or academia will require these skills in some form.

We are well aware that the best laid out research plans may go awry, and that the best completed theses sometimes bear only little resemblance to the thesis planned during the proposal. Therefore, when evaluating a thesis proposal, we are not trying to assure ourselves that you have clearly described a sure-fire research project with 0% risk of failure. If there was no risk of failure, it wouldn't be research.

Instead, what we're interested in seeing is if you have a clear handle on the process and structure of research as it is practised by our discipline. If you can present a clear and reasonable thesis idea, if you can clearly relate it to other relevant literature, if you can justify its significance, if you can describe a method for investigating it, and if you can decompose it into a sequence of steps that lead toward a reasonable conclusion, then the thesis proposal is a success regardless of whether you modify or even scrap the actual idea down the line and start off in a different direction. What a successful thesis proposal demonstrates is that, regardless of the eventual idea you pursue, you know the steps involved in turning it into a thesis.

**Structure of a thesis proposal**

Your thesis proposal should have the following elements in this order.

- Title page
- Abstract
- Table of contents
- Introduction
- Thesis statement
- Evidence of serious consideration of the literature
- Approach/methods
- Preliminary results and discussion
- Work plan including time table
- Implications of research
- List of references
- Signatures

The structure is very similar to that of a thesis or a scientific paper. You will be able to use a large fraction of the material of the thesis proposal in your final thesis.

**Title page**

- a short, descriptive title of the proposed thesis project (should be fairly self-explanatory)
- author, institution, department, supervisor(s), and date of delivery
Abstract

- the abstract is a brief summary of your thesis proposal
- its length should not exceed ~200 words
- it should present a brief introduction to the issue
- make the key statement of your thesis
- give a summary of how you want to address the issue
- refer to the principal techniques used to address the issue
- include a possible implication of your work, if successfully completed

Table of contents

- list all headings and subheadings with page numbers
- indent subheadings

Introduction

- this section sets the context for your proposed project and must capture the reader’s interest
- explain the background of your study starting from a broad picture narrowing in on your research question
- the introduction should be at a level that makes it easy to understand for readers with a general science background, for example your classmates

Thesis statement

- in a couple of sentences, state your thesis
- this statement can take the form of a hypothesis, research question, project statement, or goal statement
- the thesis statement should capture the essence of your intended project and also help to put boundaries around it

Literature overview

- review what is known about your research topic as far as it is relevant to your thesis
- cite relevant references
- some theses will require a substantial review of the literature, which may extend to several pages. This section can usually be used directly in the thesis.

Approach/methods

- this section contains an overall description of your approach, materials, and procedures
  - what methods will be used?
  - how will data be collected and analyzed?
  - what materials will be used?
- include calculations, techniques, procedures, equipment, and calibration graphs
- detail limitations, assumptions, and range of validity
- citations should be limited to data sources and more complete descriptions of procedures
- do not include results and discussion of results here

Preliminary results and discussion

- present any results you already have obtained
• discuss how they fit in the framework of your thesis

Work plan including timetable

• describe in detail what you plan to do until completion of your thesis project
• list the stages of your project (e.g., in a bulleted list or table format)
• indicate deadlines you have set for completing each stage of the project, including any work you have already completed
• work in possible presentations at the AGS or similar conferences
• discuss any particular challenges that need to be overcome

Implications of Research

• what new knowledge will the proposed project produce that we do not already know?
• why is it worth knowing, what are the major implications?

List of references

• cite all ideas, concepts, text, data that are not your own
• if you make a statement, back it up with your own data or a reference
• all references cited in the text must be listed, using either Canadian Journals of Science or APA format
• do not use footnotes
• list all references cited in the text in alphabetical order using the Canadian Journals of Science or APA format

Signatures

• conclude your proposal with signatures from both the student and the supervisor(s), recognising that you agree on the work to be undertaken. The proposal exists as a contract between you and your supervisor(s). This does not mean that adjustments cannot be made as work proceeds, but is a benchmark you can go back to as you consider what still needs to be done.

How to write the proposal

Proceed in the following order:

1. Meet with your supervisor(s) to discuss what you will be doing
2. Hit the library and read about it
3. Make an outline of your thesis proposal before you start writing
4. Prepare figures and tables
5. Figure captions
6. Methods
7. Discussion of your data
8. Inferences from your data
9. Introduction
10. Abstract
11. References

This order may seem backwards. However, it is difficult to write an abstract until you know your most
important results. Sometimes, it is possible to write the introduction first. Most often the introduction should be written next to last.

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**Helpful Hints**

**Figures**

- "A picture says a thousand words!" Figures serve to illustrate important aspects of the background material, sample data, and analysis techniques.
- A well chosen and well labeled figure can reduce text length, improve proposal clarity, and aid the reader in developing an image of the work proposed. Proposals often contain figures from other articles. These can be appropriate, but you should consider modifying them if the modifications will improve your point.
- The whole process of making a drawing is important for two reasons. First, it clarifies your thinking. If you don’t understand the process, you can’t draw it. Second, good drawings are very valuable. Other scientists will understand your paper better if you can make a drawing of your ideas.
- Make cartoons using a scientific drawing program. Depending upon the subject of your paper, a cartoon might incorporate the following:
  - a picture of the scientific equipment that you are using and an explanation of how it works;
  - a drawing of a cycle showing steps, feedback loops, and bifurcations: this can include chemical or mathematical equations;
  - a flow chart showing the steps in a process and the possible causes and consequences.
- Incorporate graphs in the text or on separated sheets inserted in the thesis proposal.

**Grammar/spelling**

- Poor grammar and spelling distract from the content of the proposal. The reader focuses on the grammar and spelling problems and misses keys points made in the text. Listen to your writing program when the grammar and spelling checkers identify issues.
- Read your proposal aloud - then have a friend read it aloud. If your sentences seem too long, make two or three sentences instead of one. Try to write the same way that you speak when you are explaining a concept. Most people speak more clearly than they write.
- You should have read your proposal over at least 5 times before handing it in.
- Simple wording is generally better.
- If you get comments from others that seem completely irrelevant to you, your paper is not written clearly enough.
- Never use a complex word if a simpler word will do.

**How long should it be?**

- There is no set length for your proposal - this is up to you and your supervisor. The main determinant here is the review of background literature. If your topic has extensive background literature, this section may well run to 10 or more pages - and will be used verbatim in your thesis. It is not essential to critique every paper ever written that is related to your project, but you must demonstrate you have consulted previous work thoroughly.
- Putting aside the background literature, we recommend the remainder of your proposal be no more than 10 pages in length.
What happens next?

Your thesis proposal should be reviewed by your supervisor and submitted to the graduate co-ordinator. Masters thesis proposals are then distributed to all faculty to review - this usually takes two weeks or so, and you should expect them to read it through in detail. You will likely get editorial suggestions, and possibly substantial amendments. Commonly we look at the resources required to do the work (how many analyses? who is paying?), and the timeline. Don't submit a proposal in June saying you will collect the samples in May, when we all know you didn't! Your proposal will be returned to your supervisor, who will discuss the comments received with you. If necessary you will be asked to rewrite the proposal in light of these comments, and once completed you should re-submit it to your supervisor, who then will inform the graduate coordinator that the proposal is complete. (In the event that the graduate coordinator is your supervisor, s/he will inform the head.) A copy of your revised proposal, signed by you and your supervisor will be lodged in your file. Then you get on with the thesis itself.