Writing the Dissertation Prospectus in Science and Engineering

Professional Development Workshop

Friday, February 7, 2014

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What is the dissertation prospectus (= dissertation proposal) based on?

→ Your research

What qualifies as dissertation research?

• original
• significant
• publishable
When is the dissertation proposal typically written?

This is program dependent. Please consult with your graduate advisor.
Biology: 2\textsuperscript{nd} – 3\textsuperscript{rd} year
Chemistry: 3\textsuperscript{rd} year

Who is the dissertation proposal submitted to?

To your dissertation committee.

In addition to the written proposal, students typically prepare a power point presentation that is presented to their dissertation committee and the public.

Check what is customary in your program.
The dissertation proposal is similar to a dissertation.

What is the difference?

Your research project is not completed yet.

Even though you should already have tested/optimized some of your methodologies, and should have some results, there are still proposed experiments that need to be carried out and analyzed in the future. Also, these data still need to be evaluated, written up, and published.
Who can help you with your dissertation proposal?

→ Your research advisor and your dissertation committee.

Different types of Research Advisors
Some are very hands-off. In this case you have to have a lot of self-motivation and initiative. You need a good dissertation committee so that you can still get help and guidance when your research advisor is unavailable. Your dissertation committee should have at least one professor besides your research advisor, who is knowledgeable in your field.
Record Keeping of your research data

- It is critical that you keep a proper laboratory notebook for recording your research data.

- Every day your notebook should have dated entries with experiment descriptions, analysis, conclusions, ideas, and literature references.

- Your notebook is property of the university and should not be taken home.

- It can be come a legal document, e.g. in a scientific fraud investigation.

- Never remove pages, never use white-out, never erase any content. You can cross things out if you need to make corrections.

- Don’t write in pencil, but use a permanent pen.

- You need your notebook for writing a dissertation proposal, since all Experiments done so far are described in it.
Upon successfully defending your dissertation proposal, i.e. your committee is fully satisfied with your oral presentation, the questioning part, and the written proposal, you will have reached an important milestone.

**Ph.D. candidacy**

This requires the signatures of your committee on the Dissertation Proposal Defense Form. (download from Graduate School homepage)
How should the dissertation proposal be constructed?  
*(Try to avoid writing in the first person)*

1. **Title**
   - informative, clear, catchy, accurate, interesting, not too long (if possible no more than one or two lines)

2. **Abstract**
   - Typically 200 – 400 words. Check if an abstract should be included.

3. **Goals/Aims/Objectives** (~ 1 page)
   - Typically, one goal with several sub-aims, or two or three smaller goals. Don’t be overly ambitious, goals must be realistic.
Most science research is hypothesis driven, but non-hypothesis driven research also exists.

4. Hypothesis

2-3 sentences long.
(= a short paragraph)

A proposed explanation for a phenomenon. For a hypothesis to be a scientific hypothesis, the scientific method requires that one can test it. Scientists generally base scientific hypotheses on previous observations that cannot satisfactorily be explained with the available scientific theories.
5. Background and Significance (~ 3-5 pages)

- Why is this research important?
- What is the current status and understanding of the field?
- Why is an improvement/advancement needed?
- What implications does this research have?
- Support all statements, particularly the work already done by others or your group with the proper references in consecutive order. (Use a referencing program, don’t mix different styles in your bibliography.
- Use illustrations/tables/graphs when appropriate
- Use numbers and captions, and refer to them in the narrative.
- Do not plagiarize.
6. Approach/Methods & Experiments (~ 5 pages)

- The experiments must be designed in such a way that they can clearly test the hypothesis. Is the hypothesis correct or incorrect?
- What experiments are proposed?
- What methods will be applied/developed?
- What analyses will be performed?
- Provide numbered illustrations/tables/graphs. Use captions, and refer to them in the narrative.
- What is the innovation of this approach?
- What could be potential pitfalls, and what alternative experiments/methods will be used?
- In other words, if Plan A fails, what will be Plan B and Plan C?
- If you are working on this project jointly with a colleague, make clear what each person’s contributions/responsibilities are.
7. **Preliminary Data** (2-5 pages)
   - These are data already obtained pertaining to the project. This section is less detailed than the experimental section. Focus on the result, not on how exactly the experiments were carried out.
   - Which data did you obtain, and which were obtained by a colleague (if any)?

8. **Conclusions** (0.5 page)
   - Can some conclusions already be drawn? Do you already have indications whether your hypothesis is acceptable?

9. **Future experiments** (2-3 pages)
   - Summarize what experiments/analysis/method development still need to be carried out to complete the project.
10. Experimental Data

• This section has detailed experimental data of experiments already carried out. (For example, if a polymer was synthesized, in what container, how many grams and moles of starting material was used, what solvent, catalyst, and what temperature? How was the reaction worked up, what analysis was performed? Was the product pure, or was a purification necessary? How was the polymer characterized, etc.)

• Add spectra, images, and other analytical data

• Ask your research advisor how detailed the experimental part of the dissertation proposal should be.
11. Bibliography (References) (1-2 pages)

- Make sure the references are accurate.
- Do not mix different styles.
- Your research advisor may want the references in a specific style, e.g., references can be listed with or without article titles; the page numbers may be inclusive, or only the first page may be provided, etc.
Workshop Tasks

1. Populate certain sections of the dissertation proposal outline (next slide) with one or two sentences.

2. Form groups of four and present your outlines to each other. Discuss hurdles and help each other improve your outlines.

3. Select one proposal outline of your group to be presented to the class.

4. Class tries to understand and may make suggestions.
Outline for dissertation proposal (miniature version)

1. Title (one or two lines)
2. Abstract (skip)
3. Goals (State one or two goals)
4. Hypothesis if applicable (one sentence)
5. Background and Significance
   a) State the problem. (one sentence)
   b) What is the current status of this research area? (one sentence)
   c) If the research were successful, what impact would it have? (one sentence)
6. Approach
   a) What experiments are proposed to test the hypothesis? (one sentence)
   b) What is innovative about your approach (one sentence)
7. Preliminary data (skip)
8. Conclusions (skip)
9. Future Experiments (skip)
10. Experimental (skip)
11. References (skip)