WORKSHOP DESCRIPTION:

In this workshop, we will discuss challenges faced by students writing at the graduate level, and we will learn various ways to energize and organize your writing. Discover techniques to give your project momentum and motivate writing during this phase of your graduate work.
GENERATING

Journal, read, brainstorm
STARTING YOUR THESIS:

How do you start writing?
Writing makes thinking happen

“How can I know what I mean until I see what I say?”

—E.M. Forster

Writing process:
- Drafts
- Feedback
- Revision

There are no shortcuts writing a thesis.
WRITE DAILY

Keep an informal journal with daily entries.

- Entries become a collection of starting points.
- Re-reading your own thoughts can help with brainstorming.
- Daily writing—no matter the quality—makes you five to ten times more productive (Socolofsky, 2004, 13).

Read previous theses and dissertations from your department or area of research. (Start with the library’s collection here.)

Read your advisor’s publications.

Read recent conference proceedings and journal articles from your field.

Read outside of your field: news articles, book and movie reviews, and even novels expand your thinking even as you work on a thesis or dissertation.
BRAINSTORM

- Write down 3-5 aspects of your research that your readers would need to know.

- Can they be connected? Can you leave something out?

- What is the story of your research?
Types of Brainstorming

- Idea 1
  - Web
  - Idea 2
  - Idea 3

- Bad idea list

- Reverse Brainstorming

- Word association

- List
  - Subcategory 1
  - Subcategory 2
  - Subcategory 3
ORGANIZING

Research, outline, structure
Keep detailed research notes with identifiers (page #, paragraph #).

Make your notes searchable.

Highlight and color-code important concepts so that you can browse for ideas.

Copy quotations and information directly from notes to your draft.

After copying or paraphrasing information, cite immediately.
THESIS STRUCTURE

1. **Introduction**: provides background and context for the objectives of your research and/or experiments. Proposes hypotheses and/or provides an outline of following sections.

2. **Literature Review**: offers a brief review of current knowledge and describes any gap in current knowledge that your research aims to fill.

3. **Methods**: details step-by-step records of how you achieved your results.

4. **Results and Discussion**: asserts and discusses the significance of your data.

5. **Conclusion**: clarifies and analyzes whether objectives were achieved, and where future research might lead.

6. **Abstract**: Condenses your thesis (appears first but is written last).
THESIS STRUCTURE CONTINUED

Abstract

Literature Review

Discussion

Introduction

Methods

Results

Conclusions

Source: University of New South Wales Sydney
OUTLINE

- Keep a working outline with each part of the structure as a heading.
- Note what belongs where: a piece of data, a quotation from your research, the results of a test, etc.
- Ideas, data, and quotations can be moved easily.

**Literature Review**
- Article by X
- Article by Y

**Methods**
- Description of experiment
- Method of data aggregation

**Results / Discussion**
- Quotation from article X
- Data point 1
- Data point 2 (draw relationship)
STAGES IN THE INTRODUCTION:

1. State the general topic and give background
2. Provide a review of the literature related to the topic
3. Define the terms and scope of the topic
4. Outline the current situation
5. Evaluate the current situation and identify the gap
6. Identify the importance of the proposed research
7. State the research problem/questions
8. State the research aims and/or objectives
9. State the hypotheses
10. Outline the order of information
11. Outline the methodology
# Example: Stages of the Introduction

<table>
<thead>
<tr>
<th>Stage</th>
<th>Sample Sentence Extracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Give background about topic</td>
<td>P-type layers are commonly used in solar cells as they offer a wide range of applications such as a back surface field.</td>
</tr>
<tr>
<td>4. Outline current methods</td>
<td>Currently in the PV industry aluminum-silicon alloying using screen-printed aluminum and belt furnace firing is the prevalent method of forming p-type layers.</td>
</tr>
<tr>
<td>5. Evaluate current methods</td>
<td>The use of aluminum as p-type dopant has two major disadvantages…</td>
</tr>
<tr>
<td>6. Identify importance of proposed research</td>
<td>Given the limitations associated with using AI to form p-type diffusion, boron as a dopant for diffused layers is therefore more suitable for high-efficiency silicon solar cells.</td>
</tr>
<tr>
<td>8. State research aims</td>
<td>The goal of this thesis is to evaluate boron nitride (BN) as a potential replacement for liquid-source diffusion presently being used for p-type diffusions in the high-efficiency buried contact solar cells under development.</td>
</tr>
<tr>
<td>10. Outline order of information</td>
<td>This thesis is divided into five chapters: …Chapter 2 discusses in more detail… Chapter 3 outlines the experimental work carried out…</td>
</tr>
</tbody>
</table>
REVISING

Align, clarify, edit
SYNCHRONIZE

- Make sure that your thesis aligns with your advisor’s view of your work.
  - If it doesn’t, what is the contradiction? Is this something that can be addressed through research or analysis?

- Avoid misrepresenting or over-stating your achievements.
Clarify your word choices:

- Avoid the words some, about, approximately, almost.
- Use the active voice ("The experiment revealed that...") instead of passive voice ("It was revealed that...").
- Choose verbs deliberately (see figure, right).

<table>
<thead>
<tr>
<th>Instead of these words/phrases:</th>
<th>Substitute:</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Did, made, saw, etc.</em> <em>(weak verbs)</em></td>
<td>Collected, reported, determined, created (strong verbs)</td>
</tr>
<tr>
<td><em>Results were found</em></td>
<td>Results were observed, measured, obtained, calculated</td>
</tr>
<tr>
<td><em>A study/experiment was done</em></td>
<td>A study/experiment was conducted, performed</td>
</tr>
</tbody>
</table>
WRITE FOR YOUR READER

❖ Writing should be organized for your reader:
  ❖ Determine **who** your readers are.
  ❖ Determine **what** your reader needs to know.

❖ Meet expectations:
  ❖ **Prediction:** readers predict what they’ll read based on prior knowledge
  ❖ **Reading:** readers read a section
  ❖ **Alignment:** readers attempt to align what they read with their prediction

(Boiarsky, 2016, pp. 38-39)
ORGANIZE YOUR WRITING

- Chunk your data to create relationships
- Repeat words and make similar word choices
- Create “topic coherence”

Figure: A Coherent Document map. (Boiarsky, 2016, p. 43)
GOALS FOR THESIS

- Demonstrates control of materials:
  - precise descriptions
  - insightful analysis

- Is specific but selective:
  - Sticks to the major themes of your research
  - Does not overstate your conclusions

- Conveys a sense of the future:
  - indicates what is unique about your research
  - establishes your research as a starting point from which you or others will continue
Writing a successful thesis is a process that improves through drafts, feedback, and revision. The process of writing:

- Eliminates extraneous details.
- Demonstrates your powers of organization and analysis.
- Fosters self-confidence in further writing.
RESOURCES FOR WRITING

- University of Leicester: Develop your writing
- University of Leicester: Writing your dissertation
- University of New South Wales, Sydney: Writing in Engineering and Science
- Priya Narasimhan, Carnegie Mellon: How to Write a Good (no, Great) PhD Dissertation
QUESTIONS?

Ask anything!

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