

# Science and Engineering Dissertation 1: Intro, Lit Review, Methods, & Results

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*Ryerson University sits on the  
Traditional Territory of the  
Mississauga's of New Credit  
First Nation. We are  
honoured to be a part of this  
community of our Indigenous  
colleagues and students.*

*- Chi Miigwetch*



Based on *Writing for Science and Engineering*  
by Silyn Roberts

# Dissertation Structure

Title page

Abstract

Acknowledgements

Contents page(s)

Introduction

Materials and methods or Literature review

Results or Sources and Methods

Discussion or Findings

Conclusions

References

Appendices

# Ryerson Dissertation, Thesis and MRP Submission

## [Ryerson Submission Guidelines](#)

Embodying the results of your research program

Preparation and submission requirements

General guidelines

Submission deadlines

For specific requirements, contact your program administrator

# Introduction

# Purpose

Clearly state purpose

Give background

Indicate key authorities and their chief contributions

Show correlations, contradictions, gaps

Outline your approach

Give a context for a discussion of results

Describe the structure of the document



# Difficulties

How much background?

How technical?

Informative enough?

How many references?

A good first sentence?

Verb tense?



# Common Mistakes

Main purpose is not clear

Inadequate literature review

Too long, rambling, unstructured

Too short, too general

The approach is not clear

Specialist terms are not defined

# Does the Introduction..

Adequately review other people's work?

Show correlations, contributions, gaps?

Give a historical account if appropriate?

Put the study into a context of other work?

Clearly state the purpose?

Summarize the approach?

Describe the structure?

# Literature Review

# Purpose

Give a clear presentation of related literature

Give the history of the topic

Show your knowledge of the relevant works and researchers

Show agreements, contradictions, gaps

Show weaknesses in other studies

Summarize techniques and materials

Show the originality of your own work.

# Difficulties

Quantity of literature

Lack of literature

Getting started

How broad or narrow?

What should be discarded?

Re-reading for improved understanding

# How to Make a Good Review

Show the relevant facts

Show what has been done

Show what is being done

Show agreements, disagreements, gaps

Show the conflicting 'camps'

Show that you understand the issue

Make your view clear and relevant

# A Literature Review Will Suffer If You..

avoid commenting on the issues

act as a neutral observer

don't understand the topic well



# Research & Writing

Be systematic

Go beyond books and articles

Be selective. Don't try to read everything

As you research, improve your ability to be selective.

# Step 1

Use the experts: librarians

Learn which databases are relevant

Learn efficient search techniques

## Step 2

Keep systematic records of citations

Keep copies of all key documents

Note full details of each citation

## Step 3

Try to find a book that gives an overview of the topic and mentions the major researchers in the field

## Step 4

Find and read a few review articles by authorities in the field

The most frequently cited authors and papers are the most important

Use this information as a framework for building your review

# Step 5

Choose the key papers

These are the most frequently cited papers and authors

The titles are most relevant to your field

Begin with the most recent ones

Use this information to expand your framework

# Step 6

## Questions to be answered:

- How does your topic fit the research area?
- Why is it important?
- What is known about it?
- What is not known or in question?
- Why do the gaps need to be filled?
- Which gap(s) will you attempt to fill? Why? How?



# Step 7

Write some possible topic headings for the review

Keep them specific

Not: “Issues associated with...”

Better: “Methods for investigating...”, “Historical background”, “Standard techniques”, “Current technology”, and so on (Silyn-Roberts, p. 87)

Make separate files for each heading

# Step 8

Arrange your information according to your topic headings

Some information may fit under more than one heading. Put it in both files and decide later where it belongs

As you learn more from the research, you may change some of your headings

# Step 9

Look at the fringe papers

These are the ones by less prominent authors

Look at methods, results, and interpretations

# Step 10

Read the relevant sections of the fringe papers, take notes, and classify the information under the headings that you have established.

# Step 11

Re-read the original review papers

Determine how your knowledge of the topic has changed

Review steps 7, 8, 9, and 10 to determine if you want to make any adjustments

# Step 12

Look at your notes and headings. Re-sort your information if necessary

Make sub-headings for each heading

Make connections among the information for each topic, and write the review

Connect everything under headings and sub-headings

Keep revising until it is coherent

Write the reference list

# Common Errors

Writing the review before you have a thorough understanding of the issues

Giving a superficial account of research articles

Not coherent

Not pointing out gaps, contradictions, ambiguities

Referencing errors



# Checklist

Did you give the history of the topic?

Did you mention the current issues?

Did you show the agreements, correlations, ambiguities, and gaps?

Did you show the conflicts between the research 'camps'?

Did you make it clear that you understand the issues?

Did you cite reviews, key papers, fringe papers?

# Materials & Methods (Procedure)

# Purpose

Describe the steps in your experiment.

Give enough detail for an expert to replicate the work.

Describe the design of the experiment.

Enable readers to assess the validity of your results based on your procedure.

# Difficulties

There are few difficulties with this section. For this reason, many writers prefer to begin by writing the methods section.

# How to Write It

Provide a rationale for your work. Why did you proceed in this way?

Do not include any results. Those will appear in another section.

(An exception to this would be if you need the results of one experiment in order to justify a procedure.)

# Structure

Chronological order is often used here. But be sure that information is presented logically. It should not just be a list of steps.

Well known or established techniques should not be described in detail.

Give a detailed account of novel or little-known techniques and procedures.

## Structure (continued)

Tables may be used to clarify procedures. However, they should not contain information that belongs in the Results section.

If possible, use headings and subheadings that mirror the headings and subheadings that will appear in the Results section. This enables the reader to correlate between steps in the process and the results from a particular step.



# Tense and Voice

Occasional use of we is generally considered acceptable. Do not use I. Passive voice is usually preferred.

Use the past tense to describe the steps in the process. Use present tense for scientific facts.

If a citation is needed, give sufficient detail so that the reader can understand the technique being referred to.

# Common Errors

Not enough critical detail

Too much unimportant detail

Using detailed text where a visual would be clearer

Confusion caused by attempting to describe several procedures together

References to the literature without enough descriptive information

Introducing some results

# Checklist

It is detailed enough for a colleague to replicate the procedure.

There is sufficient detail about the equipment used.

Standard equipment and techniques are not over-described.

Sufficient details of modifications, new techniques, and sufficient details of materials, organisms, or treatments are given.

# Results

# Purpose

Present results without discussion.

Give enough data so that readers can draw their own conclusions.

# Main Difficulty

How much detail should be included?

Otherwise, this is usually the second-easiest section to write, after the Procedure (Methods) section and should probably be written immediately after it.

# How to Write it

This is the core section of your thesis.

State results clearly and simply.

Present it as a story. Do not let irrelevant or overly detailed information interrupt the flow.

Use visuals, especially tables, to present data clearly.



# Compiling Data

Clearly refer to tables, etc. and provide guidance to the reader, leading the reader through the information.

Stress the important results.

Judge which data are worth presenting.

Do not show repetitive data. Select representative data.

Complete data tables may be given in an appendix

# Compiling Data

Avoid using the text to repeat what is clearly shown in a table or graph. Use the text to draw the reader's attention to the most important outcomes.

Include results that do not support the thesis.

If possible, match subheadings with those in the Methods section.

# Compiling Data (continued)

Illustrate your main points through the careful selection of visuals.

Give a clear title and caption to each visual and refer to the visual nearby in the text.

Results and discussion should be separate. Avoid discussing results in this section, if possible. If your work contains several experiments, give each experiment a separate results and discussion section.

# Common Mistakes

Not enough description. Trends are not clearly shown. Too dependent on the visuals.

Too much detail. The main trends are lost in the detail.

Unclear illustrations. Poor captions.

Too much repetition in the text of what is shown in the visuals.

Textual references to the visuals are too wordy.

# Tense and Voice

Past tense and passive voice are normally used in this section.

Part 2 of this workshop will take place on

Tuesday, November 4th, 3-5  
in this room

# Results Checklist

Visuals are well chosen, well presented, and clear.

Explanation of main results and trends is given.

Explanations are not lost in detail.

Only representative data are given.

Results are not discussed.

Contrary results are given.

Referenced information does not appear



# Graduate Student Support

- One-on-one tutorial sessions to help students with writing and referencing during any stage of the process.
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