



**The College of
Engineering
Writing &
Communication
Resource Center**



“If you want to change the world, pick up your pen and write.”

Martin Luther King Jr.



**Writing for Success:
MS Thesis/Project Workshop
Introduction by Maryam Qudrat, Ph.D.**

The CoE Writing & Communication Resource Center (WCRC)

is here to assist you!

WRC works with MS students to instruct, guide and assist throughout each stage of the thesis/project drafting process.

The center offers the following resources:

- **A three part seminar about developing a Master's Thesis and Master's Project**
 - (thesis/project, literature review, research methodology and how to address the writing components of the document as a whole). This seminar will be launched in the spring. Certificates of completion will be issued by WRC and these will be **required** for advancement to candidacy.
- **Informational monthly workshops**

Learning Outcomes

Student Learning Outcomes (SLO) – Used to measure the learning objectives.

Purpose for Writing: Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.

Content Development: Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveys the writer's understanding, and shapes the whole work.

Disciplinary Conventions: Demonstrates detailed attention to and successful execution of a wide range of conventions particular to a specific discipline and/or writing task(s) including organization, content, presentation, and formatting.

Evidence: Demonstrates skillful use of sources to develop ideas.

Syntax and Mechanics: Uses graceful language that communicates meaning to readers with clarity and fluency, and is error-free.

Writing Requires Strong Content!

It is critical to the success of graduate students that they work closely with their respective advisers and with the WRC integrally. The engineering concepts and vision for the project will not be managed by the WRC.

Therefore, it is essential to the success of each thesis/project that adequate advising is integrated.



The Abstract:

What? An abstract is a summary of your thesis, so it must include the most important elements of your thesis, such as *why, how, what*.

Why? Abstracts are important because they inform prospective readers the main points of your work. Because of this, it is important to write your abstract for a wide audience.

Within your abstract, it is important to include the following:

Background

Methods and Results

Conclusion

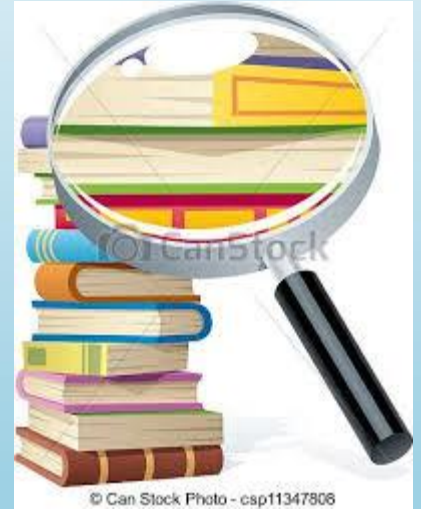
The Abstract

Must Include:

Well-developed paragraphs

An introduction, body, conclusion structure

The chronological order of your report



Abstract: Background or “Introduction”

This section is an introduction of the study. It should include the goals of your project and background information that your reader should know. In your intro, you need the following:

A hook: catches the reader’s attention

Background info: informs the reader of your topic



Example: Background

“The photocatalytic phenomenon has been integrated as a developing technology for various applications, such as air and water remediation and self-cleaning surfaces. The photocatalysis is an emerging pathway of heterogeneous photocatalysis and physical chemistry. In heterogeneous photocatalysis, semiconductor compounds, mainly TiO_2 , ZnO , CdS , and WO_3 , have been utilized for water treatment and contaminated degradation. So, various pollutants, such as aromatic compounds, dyes and surface active agents, are degraded with photocatalytic techniques. Ultraviolet light and visible light are the most important sources of radiation to conduct photocatalytic reactions.”

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The Abstract: **Methods and Results** or “Body”

For the body you will write about what you have discovered or claim to have discovered. In this section you will explain the methods you used in the order that they appear in your report. In the body, you will need the following:

Methods: specific techniques taken

Results: what you discovered



Example: Methods and Results or “Body”

“In this study, we have developed a combined method using microfluidics and photocatalysis for water treatment. This technique represents a promising solution for contaminant degradation that has advantages such as using a continuous system, large surface area to volume ratio, rapid response, and fine flow control. The experiment was conducted by exposing sample with methylene blue as the model pollutant and titanium dioxide (TiO₂) as the catalyst to UV light. The degradation of methylene blue was monitored with spectrophotometry. Then, the effects of variables, such as residence time, chip thickness and intensity have been investigated. The photocatalytic degradation has determined to be a pseudo-first-order reaction with a rate constant related to catalyst concentration.”

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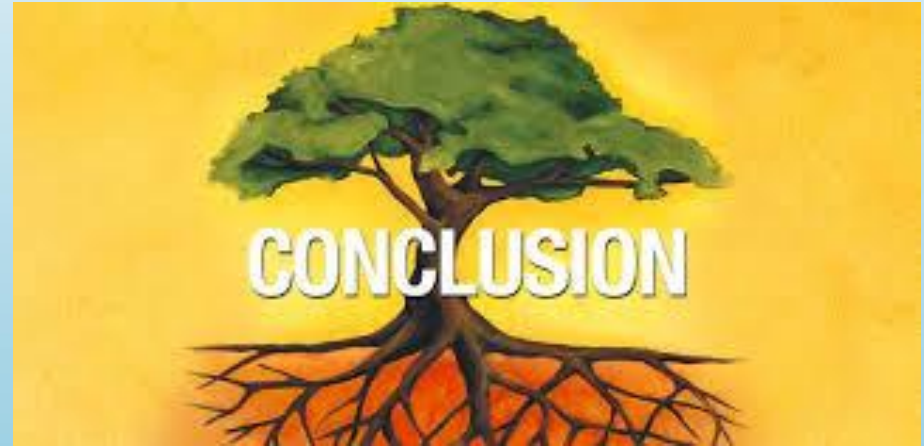
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The Abstract: **Conclusion**

The conclusion is a quick summary about what your abstract has already claimed. It should be as clear and concise as possible. In your conclusion, you should include the following:

Conclusion: summarizes what you found or claim to have found in your general topic.



Example: **Conclusion**

“Our study concludes that photocatalytic reaction is the best solution to economically treat a wide range of contaminated water. By using the microfluidic technology, limitations of the photocatalysis process is improved upon and resolved. As a result of the study, photocatalytic microreactors prove to be an efficient remedy in wastewater treatment.”

Example: Conclusion

“**Our study concludes** that photocatalytic reaction is the best solution to economically treat a wide range of contaminated water. By using the microfluidic technology, limitations of the photocatalysis process are improved upon and resolved. **As a result of the study**, photocatalytic microreactors prove to be an efficient remedy in wastewater treatment.”

The Abstract: **What to Avoid**

referencing or citing other works

the passive voice

adding new information

longer than 400 words



and most of all. . .

Forgetting to visit the Writing Center for help!!!

What is a Literature Review?

A Literature Review is the crucial first step to writing your thesis/proposal. It . . .

- Focuses on a particular area of research and question/issue you wish to address.
- Narrows in on content to concentrate only on truly relevant materials.
- Contains a thesis or statement of purpose. . .



What is a Literature Review?

It also...

- Describes the existing or relevant literature on a topic and reflects a critical analysis of this research. It is *not* a comprehensive list of books and articles pertaining to a particular discipline or field of inquiry.
- Demonstrates that you've read extensively in your field, have a thorough comprehension of your field, and are capable of intelligently and knowledgeably critiquing others' work.

Why is a Literature Review Necessary?

A Literature review....

- Places your area of research in the academic context by showing that there are gaps in knowledge in your field that merit a closer investigation.
- Demonstrates your work hasn't been previously done, ensuring your intellectual contribution is indeed original - the white space.
- Demonstrates a critical approach to scholarship. Show you have analyzed and critiqued the theories or methodologies in the field and that you know the main arguments related to your topic.

What does a Literature Review Do?

- The review traditionally provides a historical overview of the theory and the research literature, with a special emphasis on the literature specific to the thesis topic. It serves as well to support the argument/proposition behind your thesis, using evidence drawn from authorities or experts in your research field.
- **Your review of the literature may be**
 - stand-alone, or
 - embedded in the discussion, or
 - segmented into a series of chapters on several topics
- For this, discuss with your advisor which method would best suit your topic and your argument.
- It is possible that you will use a combination of both in order to accurately and persuasively communicate your thesis.

What does a Literature Review Do?

- The review must be shaped by a focus on key areas of interest, including research which provides a background to the topic.
- It should also **be selective**. A common mistake in writing the review is to comment on everything you have read regardless of its relevance.
- In your writing it is useful to **think of the review as a funnel** - start wide with the overview and then quickly narrow into discussing the research that relates to your specific topic.

How Do I Perform A Literature Review?

1. Create a Working Bibliography/Literature search

- **Determine the available materials (what is out there?)**
 - The most effective way to do this is to first see Hema, the engineering librarian.
 - Then, utilize the search engines in the library's engineering databases and search the key terms related to your topic.
- **Prepare a preliminary list of books and articles to research**
- **Create a working bibliography where you will record the information which is most relevant to your topic.**

How Do I Perform A Literature Review?

2. Obtain the materials and read them carefully

During the review process, these key questions will help shape your argument:

- What is the current state of the field?
- What have others done/published?
- Is the material from a primary or secondary source? (issues on objectivity, bias)
- What is missing from the literature?
- What are the strengths and weaknesses of evidence obtained from the literature?

How Do I Perform A Literature Review?

- Did the author clearly state the research question?
- What are the key components of the research design?
- Did the author(s) use the methods and techniques appropriately?
- Could other research designs have been used to study the same question? Would they have been better? How would the evidence be different?
- What did the results show? Did it contribute towards the improvement of engineering practice?

How Do I Perform A Literature Review?

3. Select appropriate method to answer research question

- Based on the research you have gathered and the areas you have identified as lacking, that will enable you to develop your methodology/approach to your research.



What is a methodology?

- Deals with a set or set of rules, methods, and/or procedures used to obtain your stated methods. Your methodology is not quite the same as your methods.
- Your methodology should link back to your literature review and explain why you chose your specific methods and the basis of your choice.
- Do not include your data (questionnaires, lab results) here. Put them in your appendices.
- Method appropriateness depends on your research question(s) or problem statement(s).
- The methodology should be a plan to set out what you want to do.

Methods vs Methodology



Methods:

- Questionnaires
- Interviews
- Lab experimentation
- Photo/video documentation
- Remote sensing
- Simulations

Methodology:

- Qualitative, quantitative, or mix of both.
- Through a literature survey
- Data collection and sampling
- Data analysis

Methodology: Qualitative and Quantitative

Qualitative: more descriptive approach that is investigative, ethnographic (people/culture), or anthropological. Can lead to new insights or understandings of a subject. It is performed with decision trees and comparative analysis. Usually time consuming, and not very common in scientific fields (engineering).

Quantitative: deals with numerical methods, statistics, numerical models, and cost/benefit analyses. It is usually more challenging, especially, if a new method is being used for the analysis. The methodology is more objective with hard data.



Methodology: Examples

Qualitative:

In Dubinsky and Hazzan (2003) we presented a framework for coaching student projects in computer science capstone courses. This research was based on a retrospective process of four coaches who coached and guided students in the development of software projects within the framework of Extreme Programming. The retrospective data were collected using qualitative research tools that included open questionnaires and a series of interviews. The analysis of this gathered data was aimed at eliciting the meaning attributed by the coaches to a new situation, whereby they were required to guide their students in software development processes.

Framework/concept

Approach summary

Reference methods

Summarize approach

Methodology: Examples

Quantitative:

This analysis utilizes interview data collected by the National Opinion Research Center (NORC) in the 1994 General Social Survey (hereafter GSS). The GSS, a nationwide annual survey, offers the advantage of multi-stage probability sampling and can be considered representative of English-speaking, adults (18 years of age and older) living in U.S. households. This examination of the relationships between x, y, and z relies on a subset of 958 of the 2992 original respondents. This provides the researcher with a continuous set of questions with a lower number of missing cases; however, the trade-off is the lower number of total cases.

Framework/concept

Credibility from source

Approach summary

Study's Strength & Weakness

Conclusion



General and specific

The conclusion synthesizes the introduction and body paragraphs by “sandwiching” both general points examined and specific points explored in the body paragraphs. The conclusion re-states, in summary, all of the main points.

Reinforce salient points

No new information should be introduced in the conclusion since this is the forum designed to re-capitulate the body paragraphs after all discussion is complete. Avoid general afterthoughts or “fluff.” You should reinforce ideas expressed in the paper and leave the reader(s) with a clear idea of what the paper discussed. Include key ideas the audience should do or take away.

Conclusion: Structure

Start with your main point. If you stated it in the introduction, restate the main point more fully. Do not restate word-for-word.

Add a new significance or application. After stating your point, say why it's significant. Imagine the reader asking, *So what?* or *Why should anybody care?*

Synthesize, don't summarize your most salient points. Don't repeat the same points over again, but rather show how the points you made fit with your examples or data you collected to lead to your insights.

Provide recommendations or areas for further study. Give out recommendations or suggestions for the reader to do if they want to follow-up on your research. Highlight your study's limitations and provide direction for further research. *Is there further need for research, and if so, how?*



Conclusion: Example

Early hypotheses on DBS mechanisms proposed that stimulation inhibited neuronal activity at the stimulation site, imitating the effects of surgical ablation. Recent studies have challenged that view and suggested that while somatic activity near the DBS electrode may be suppressed, the suprathreshold currents spreading into the compromised fibers may contribute to the effects of DBS. This theory, however, does not entirely explain why therapeutic latencies differ between motor symptoms among patients. Further research is needed to understand these processes. This is important if we are to reach the full potential of DBS as a surgical therapy and will undoubtedly lead us to technological and clinical advancements in treatment of other disorders.

Restate main point

Synthesize points

Further research & recommendations

Formatting: Current Engineering Style Guides

Civil—ASCE; <http://www.asce.org/Audience/Authors,--Editors/Books/General-Book-Information/Quick-Guide-to-Common-Types-of-Referenced-Material/>

Computer Science—IEEE Computer Society; <http://www.computer.org/portal/web/publications/styleguide>

Electrical—IEEE; http://www.ieee.org/documents/style_manual.pdf

Mechanical & Aerospace—ASME; https://www.asme.org/shop/proceedings/conference-publications/references?cm_re=Author%20Guidelines-_-Left%20Navigation-_-References

Formatting: Font Requirements

Font Style

Times Roman

Times New Roman

Courier

Courier New

Font Size = 12 point

Exceptions:

Within a table, font style must match text but font size may be 10 to 12 point

Within a figure, font style is unrestricted and font size must be legible

Within the appendices, font style and font size are unrestricted



Formatting: Margin Requirements

1 ½ inch left margin is used throughout the manuscript

1 inch bottom and right margins are used throughout the manuscript

1 inch top margin is used for most pages of the manuscript

2 inch top margin is used for the first page of the sections listed on the right

The easiest way to create a 2 inch top margin is to space down from the existing 1 inch top margin. Hit ENTER key 3 times (using double line spacing) or 5 times (using single line spacing) for the extra inch of blank space

Formatting: Spacing Within the Text Requirements

Within the text of the abstract, acknowledgements and all chapters, use two (2) spaces after punctuation at the end of sentences; commonly this is a period, but it could be a question mark or exclamation mark

Also, two (2) spaces are required after colons in text, titles or subheads

This rule does not apply to citations in footnotes or references list



Formatting: Paragraph Format Requirements

All text should be formatted as paragraphs with consistent indentation for the first line and left justification only

Bullet points are not allowed

Numbered items use paragraph format with NO uniform left indentation

FORMAT NUMBERED ITEMS LIKE PARAGRAPHS

1. Microsoft Word automatically formats numbered items with uniform left indentation.
2. The University Guidelines Manual requires paragraph format.
3. University Guidelines Manual wins! Indent the first line of each item, including the number, like a paragraph, and start all other lines at the left margin.

Formatting: Uniform Double Line Requirements

Uniform spacing between lines of text with no extra blank space between paragraphs or before and after titles and subheads.

To create uniform double line spacing, select text above and below the gap in the text.

Then click on the Page Layout tab and click on the little arrow underneath the spacing settings to bring up the Paragraph dialog box. (Figure 1)

- In the Paragraph dialog box, set Line spacing to “Double” and set the Spacing boxes (marked Before and After) to “0 pt”. (Figure 2)

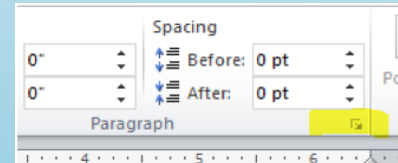


Figure 1: Paragraph Dialog Box

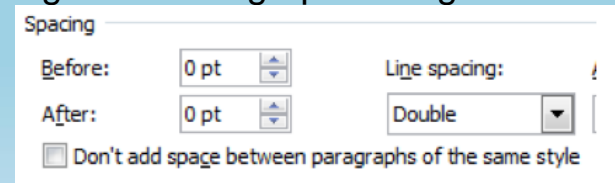


Figure 2: Line Spacing Box

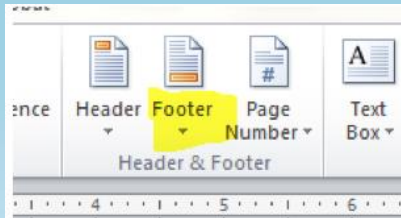
Formatting: Page Number Requirements

Page numbers are centered at the bottom of the page and positioned just above the one inch bottom margin.

To change the position of page numbers, go to the Insert tab and click on Footer.

Then click on Edit Footer near the bottom of the dialog box.

- A new menu bar, “Header & Footer Tools,” will appear at the top of the screen. Look for the Footer from Bottom setting and change setting to 0.9 inch.



Common Formatting Errors

Each department has a difference citation style. For example Civil Engineers use ASCE and Electrical Engineers use IEEE. (Links found on handout).

A page with text must be full of text. A blank space cannot be left at the bottom of a page of text because a figure or table is too big to fit in that space. Instead, text that follows the table or figure should be moved up to fill that empty space.



Common Formatting Errors

When using numbers in brackets to cite sources, the citations are numbered in the order that that source is first cited. That is, [1] should be the first bracketed number in the text.

The bracketed numbers cannot be used as if they are words in the sentence. For example:

An important discovery was made by [1]. INCORRECT

An important discovery was made by Watts [1].

CORRECT

Need More Help?

Contact the Writing Resource Center

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