

THESIS WRITING

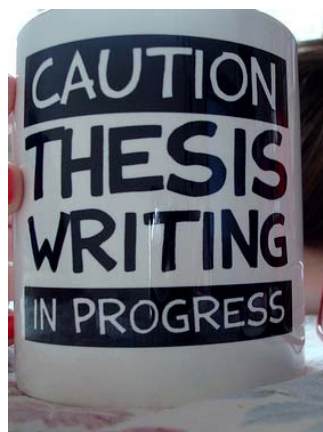
FOR
UTM POSTGRADUATE CHEMICAL
ENGINEERING STUDENTS

*Tips for Organizing and Writing
Your Thesis*

Mohd. Kamaruddin bin Abd. Hamid, PhD
UTM Chemical Engineering



Faculty of Chemical Engineering
Universiti Teknologi Malaysia
www.cheme.utm.my



www.cheme.utm.my innovative • entrepreneurial • global

Thesis Writing for UTM Postgraduate ChemE Students

Outline of this talk.

- 1 What is a Thesis
- 2 General aspects and philosophy
- 3 Organization
- 4 Writing style and form
- 5 Getting started, keeping going

www.cheme.utm.my



innovative • entrepreneurial • global

2

Thesis Writing for UTM Postgraduate ChemE Students

What is a Dissertation/Thesis



A dissertation or thesis is a document submitted in support of candidature for an academic degree or professional qualification presenting **the author's research and findings**

Model-Based Integrated Process Design and Controller Design of Chemical Processes



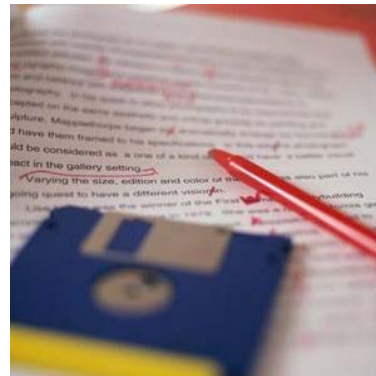
Mohd. Kamaruddin bin Abd. Hamid
Ph.D. Thesis
January 2011

DTU Chemical Engineering
Department of Chemical and Biochemical Engineering

Thesis Writing for UTM Postgraduate ChemE Students

What a Thesis creates

- What I did in the lab over the last 2 to 3 years
 - I first read the background material
 - I then implemented an algorithm
 - I did some practical work
 - I
- A thesis is a logical reconstruction
 - Not a historical narrative



Thesis Writing for UTM Postgraduate ChemE Students

General philosophy: hierarchy of importance

- Content
 - the message given
- Style
 - the way that message is presented (structure, language, and illustration)
- Form
 - the appearance of the message (grammar, punctuation, usage, spelling, and format)

Thesis Writing for UTM Postgraduate ChemE Students

Differences between under- and post-graduate theses

- The difference is one of *degree* rather than *kind*.
- They share a common structure and need for logical rigour.
- An undergraduate thesis is graded on the *quality of research*, the *significance of the contributions*, and the *style of presentation*.
- Undergraduate thesis is judged on a similar basis to the postgraduate one.
- Three most commonly cited qualities that earn an undergraduate thesis the first grade are *originality*, *independence*, and *mastery*.

Thesis Writing for UTM Postgraduate ChemE Students

General philosophy

- A research paper (or thesis) is an attempt to persuade.
- The key to persuasion is organization.
- A picture is worth a thousand words.
- Do not use a thousand words where five hundred will do.
- If at first you do not succeed, try, try, try, try, try, try, try, try, try, again



Thesis Writing for UTM Postgraduate ChemE Students

A thesis is an original contribution to knowledge

- A supervisor will expect that:
 - You have identified a worthwhile problem or question which has not been previously answered.
 - You have solved the problem or answered the question.



Thesis Writing for UTM Postgraduate ChemE Students

A thesis is an attempt to persuade

- A reader/reviewer will ask:
 - what is the research question?
 - is it a good question? (has it been answered before?
is it a useful question to work on?)
 - did the author convince me that the question was adequately answered?
 - has the author made an adequate contribution to knowledge?

Thesis Writing for UTM Postgraduate ChemE Students

Keep to the point

- A concise paper or thesis requires keeping the main points in mind
 - ONLY include background information, data, discussion that is relevant to these points.
- Explain abbreviations, unusual terms
- CLEAR writing
- Explain assumptions, limitations



Thesis Writing for UTM Postgraduate ChemE Students

Organization: the key to persuasion

- Start by writing down the single most important concept.
- Outline the critical observations and reasoning that support that concept
- Test your organization by careful evaluation of the outline
- Expand the outline to greater detail, then test it again
- Write the body of the text : methods first, observations next, interpretations last.
- Write the contextual elements: conclusion first, introduction next, abstract last.
- Insert carefully composed transitional sections, paragraphs, and sentences.

Thesis Writing for UTM Postgraduate ChemE Students

The outline is the necessary framework

- Draft your thesis outline first
- Show the draft to your supervisor for the comments
- Revised the outline from time to time



Thesis Writing for UTM Postgraduate ChemE Students

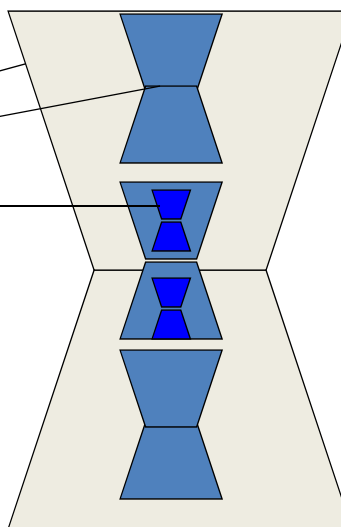
Organization of the thesis

- Abstract
 - Introduction
 - Problem statement/research question
 - Literature review
 - Methodology
 - Results and Discussion
 - Data presentation
 - Interpretation
 - Discussion
 - Conclusions and Future work
 - References
- **Different types of writing might have more/less emphasis on each of these elements

Thesis Writing for UTM Postgraduate ChemE Students

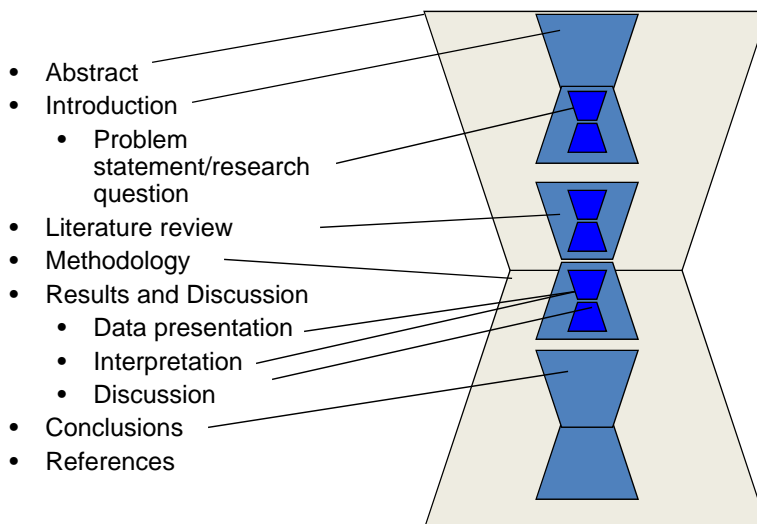
Nested hourglass model

- The whole thesis
- Each section, subsection
- Most paragraphs
- Broad focus at beginning, end; specifics/narrow focus in middle



Thesis Writing for UTM Postgraduate ChemE Students

Organization of the thesis



Thesis Writing for UTM Postgraduate ChemE Students

Rational for structure

- It is simply that a thesis must tell a story clearly and convincingly.

Introduction/Aim	<i>What did you do and why?</i>
Materials and Methods	<i>How did you do it?</i>
Observations/Results	<i>What did you find?</i>
Discussion	<i>What do your results mean to you and why?</i>
Conclusions	<i>What new knowledge have you extracted from your experiment?</i>

- Thus, the structure of the thesis is designed to enforce logical and scientific rigour and make it easy to read.

Thesis Writing for UTM Postgraduate ChemE Students

Abstract

- Write this LAST!
- Abstracts should be one page (not exceed 300 words) and should be self-contained
- Model after a paper in your field
- Written to attract readers to your article or thesis, gives a good initial impression
- Summary of the contents of the thesis
- Brief but contains sufficient detail
 - motivation for the work (problem statement)
 - project objectives
 - techniques employed
 - main results and conclusions

Thesis Writing for UTM Postgraduate ChemE Students

Introduction

- Write this second to last!
- This is a *general* introduction to what the thesis is all about -- it is *not* just a description of the contents of each section.
- Briefly *summarize* the question (you will be stating the question in detail later), some of the reasons why it is a worthwhile question

Thesis Writing for UTM Postgraduate ChemE Students

Introduction (cont.)

- Topic?
 - Defines scope and limitations of study
- Importance?
- Background?
- Research question/problem statement
- Arrangement of thesis?
- You probably wrote this for your thesis proposal;
REWRITE IT AFTER body of thesis is written
- Look at examples in published literature in your field
- This section is likely to contain a lot of reference citations--put your thesis in context of existing work

Thesis Writing for UTM Postgraduate ChemE Students

Research Question or Problem Statement

1. a concise statement of the question that your thesis tackles
2. justification, by *direct* reference to previous work, that your question is previously unanswered. This is where you *analyze* the information which you presented in the “state of the art” section
3. discussion of why it is worthwhile to answer this question.
4. Highlight the section with a heading using words such as “problem” or “question”

Thesis Writing for UTM Postgraduate ChemE Students

Review of the State of the Art (Literature review)

- Limited to the state of the art *relevant to your thesis*. Again, a specific heading is appropriate; e.g., “*Previous work on the integrated process design and control*”.
- The idea is to *present* (not analyze) the major ideas in the state of the art right up to, but not including, your own personal brilliant ideas.
- You organize this section *by idea*, and not by author or by publication.
- Some supervisors do not expect a long literature review for the thesis proposal or the thesis - be sure you ask your supervisors!

Thesis Writing for UTM Postgraduate ChemE Students

Literature review

- Provides context for and details about the motivation for the project
- States why the problem is important
- Sets the scene for the work described in the thesis
- Describes what others have done and hence sets a benchmark for the current project
- Justifies the use of specific techniques or problem solving procedures

Thesis Writing for UTM Postgraduate ChemE Students

Tips for literature review

- Make it a point to keep on top of your field of study by making regular visits to the library and to the electronic journals websites.
- When reading a technical paper, jot down the key points and make a note of the journal or technical publication where the paper was published.
- Make sure that you have read and understood cited work
- Organize your content according to ideas instead of individual publications.
- DO NOT simply quote or paraphrase the contents of published articles. Weave the information into focused views. Demonstrate your deeper understanding of the topic.
- DO NOT be tempted to summarize everything you have read; only include those relevant to your main points.

Thesis Writing for UTM Postgraduate ChemE Students

Methodology/Methods/Design

- Possibly many sections to some chapters - *balance*
- Aim to show that question has been *fully* answered
- *Show relevance of work to solution*
- *Avoid detailing blind alleys* unless they contribute to showing that question is answered

Thesis Writing for UTM Postgraduate ChemE Students

Results and Discussion: Results presentation

- Draft your figures first: (A picture is worth a thousand words)
- Make captions stand alone
- Use enough figures to present the data that justifies your interpretations and conclusions. No more, no less. (Don't use 1000 words when 500 will do)
- Write your text around your figures
- Use the proper tools (for your research AND your writing)
 - Spreadsheets, analysis tools
 - Plotting programs
 - Graphics programs

Thesis Writing for UTM Postgraduate ChemE Students

Results and Discussion: Results presentation (cont.)

- Focus on one important thing in each paragraph
 - Each paragraph needs a topic sentence
 - Contents of paragraph should only relate to that topic
 - Use Outline view to see and revise this



Thesis Writing for UTM Postgraduate ChemE Students

Results and Discussion: Results interpretation

- Keep separate from data, clearly distinguished by paragraph, section, and/or words like “are interpreted to show”.
- Depending on your topic, it is often useful to subdivide interpretation into a “local” or small scale (directly flows from your data) and a “regional” or “big picture” scale, that flows from consideration of your data with that of others.
- This latter type is usually included in the “discussion” section.

Thesis Writing for UTM Postgraduate ChemE Students

Results and Discussion: Results discussion

- Look at discussion sections in papers in your field. See what they cover.
- Usually is a broader scale interpretation than just your data (relate to previous published results)
- Addresses the bigger problems of your research topic and how your study fits into solving those problems
- Is NOT a conclusion section

Thesis Writing for UTM Postgraduate ChemE Students

Conclusions

1. Conclusions
 2. Summary of Contributions
 3. Future Research
- Conclusions are *not* a rambling summary of the thesis: they are *short, concise* statements of the inferences that you have made because of your work.
 - It helps to organize these as short numbered paragraphs, ordered from most to least important.
 - All conclusions should be directly related to the research question stated

Thesis Writing for UTM Postgraduate ChemE Students

References

- All references cited, including those in Tables and Figure captions. No more, no less.
- Use consistent style throughout (e.g. “et al.” OR “and others”, not both)

Thesis Writing for UTM Postgraduate ChemE Students

A few words on form

- **Format: Typography, layout**
 - Follow the Grad. School and library guidelines for a thesis ([http://sps.utm.my/sps/images/academicresources/UTM Thesis Manual 2007.pdf](http://sps.utm.my/sps/images/academicresources/UTM%20Thesis%20Manual%202007.pdf))
 - Less than 200 (Masters) and 300 (PhD) pages
 - Plan ahead! (e.g. do you really need 50 *color* figures?)
- **Mechanics:**
 - Grammar
 - Usage
 - Punctuation
 - spelling

Thesis Writing for UTM Postgraduate ChemE Students

Shed light on your subject: clarity is everything



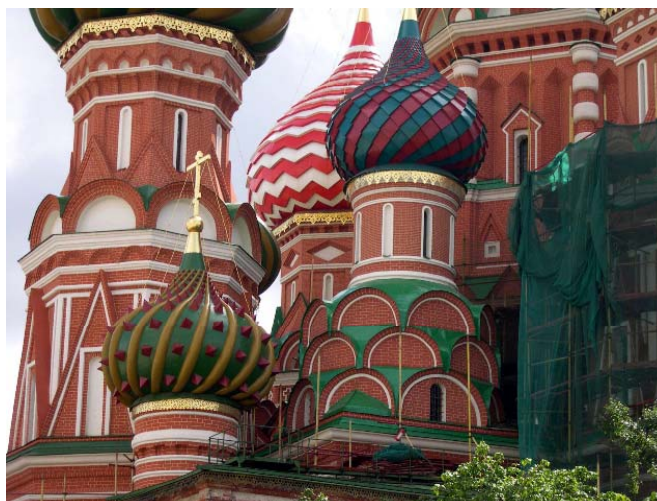
Thesis Writing for UTM Postgraduate ChemE Students

Avoid convoluted writing



Thesis Writing for UTM Postgraduate ChemE Students

Avoid ornate language, words you don't really understand (look it up!)



Thesis Writing for UTM Postgraduate ChemE Students

Getting Started

- Prepare an extended outline.
- List each section and subsection
- For each section and subsection, write a brief point-form description of the contents.
- Review with your supervisor. Look for
 - unnecessary material? Remove it.
 - missing material? Add it
 - It is much less painful and more time-efficient to make such decisions early, during the outline phase, rather than after you've already done a lot of writing which has to be thrown away.

Thesis Writing for UTM Postgraduate ChemE Students

Choose a good role model

- Papers in your field
- Author who consistently writes clear, important papers
- Note content, style, form
- Remember: this paper likely went through many drafts too!



Thesis Writing for UTM Postgraduate ChemE Students

Getting over writers block

- write something, anything and mold it afterward (BEFORE you give it to your supervisor)
- Quiet that voice in your head that says “this sucks”--just get something on paper for a start
- Have confidence that you know more about your project than anyone else does, you just need to convey that knowledge

Thesis Writing for UTM Postgraduate ChemE Students

Keeping going

- Write as you go.
- Share writing early and often with your supervisor.
- Deal with procrastination. Keep lists of tasks, broken in to small manageable pieces, including writing tasks (a few pages at a time).
- Identify a time and location where you can write with good focus and few distractions, and take advantage of it regularly -- at least weekly, possibly daily.

Thesis Writing for UTM Postgraduate ChemE Students

Giving written work to your supervisor

- It may just be a draft, but proofread it first. A spell-check is not enough.
 - Preferably proofread hours or days after you wrote the text
- Outlines are a good place to start
- If you want comments or need a reference letter, give him/her time.
- If it is a thesis proposal, check with all committee members to see what they expect should be included; resolve conflicts early

Thesis Writing for UTM Postgraduate ChemE Students



Finally: It is an uphill battle (if at first you don't succeed.....)

Thesis Writing for UTM Postgraduate ChemE Students



Thank you for your attention!

Any question?