WRITING THESIS AND TECHNICAL PAPER

Prof. Ir. Dr. Mohd. Hanim Osman

Research Methodology
Presentation Outline

• Presentation & publication of research finding
• Writing a research paper
• Writing dissertation
• Writing skill
• Writing Technical paper
• Writing Test Report
Why You Must Publish?

• To benchmark our research findings
• To get response from others
• To disseminate new findings / knowledge
• To get good reputation
• To get better promotion
• To pass Ph.D./D.Eng./D.Sc. program
• To satisfy academic interest
• To develop intellectual tradition
• PhD students
• Conversion of thesis to papers
• The future funding of research
Which Publication?

- Unpublished research report
- Specialized magazine
- Dissertation / Thesis
- Monograph
- Seminar proceeding
- Refereed journal
- Book
Writing a Research Paper

• Basic considerations
• Finding a good topic
• Finding suitable literature materials
• Evaluating literature
• Presenting research methodology
• Compiling experimental data
• Analysis & discussion
• Formatting & illustrations
• A sample of research paper
Criteria of a Good Research Paper

• Published in a flagship refereed journal
• Subject on frontier of knowledge
• Research findings are original
• Significant area of study
• Published at the right timing
• Minimum mistakes
• Methodologically sound
• Analytically sound
• Grammatically sound
• Clear diagram
• References are up-to-date & significant
• Correctly formatted
Finding a Good Topic

• Steps to a good topic:

1. Choosing a topic that interests you
2. Doing preliminary research
3. Narrowing your topic
4. Deciding which type of research paper
Step 1
Choosing a topic that interests you

“Membrane bioreactor for wastewater treatment”
Step 3
Narrowing your topic

“Molecular detection of microbial community using PCR, DGGE and FISH in sludge from membrane bioreactor”
Presenting Research Methodology

- Precise.
- Normally not more than 1 page.
- Refer to other articles or books for details.
- E.g. “Water quality analysis in this study is based on the *Standard Methods* (1999).
- Describe:
  - How to do it (method)
  - Equipment & materials
  - Process & flow chart
  - Duration
Compiling Experimental Data

Data can be presented in various forms:

• Graph
• Table
• Photo
• etc.
Analysis & Discussion

- Should be 50% of the paper
- Relate to the theoretical part
- Supported by graphs, tables, photo etc.
- Formula can be written
- But no calculation be shown
- Analysis on experimental data:
  - Compare with theory
  - Compare with numerical results
  - Compare with other works

- State the importance of the findings
Formatting & Illustrations

- Follow the guideline prepared by the publisher

- Principles:
  - To help to clarify your written explanation
  - Simple presentation
  - Easy to understand
  - Related to the theoretical derivation
  - < 10 (graph + table etc.)
SAMPLE

Excellent research paper
Writing A Dissertation

- Level of dissertations
- Dissertation vs Research paper
- Formatting
- Examples of a good and a bad dissertation
Level of Dissertations

• Undergraduate dissertation
• Masters dissertation
• Doctoral dissertation

Important Message
Undergraduate Dissertation

• Training basis
• No significant academic contribution
• Evaluation on:
  ✓ Writing skill
  ✓ Presentation
  ✓ Sequence and formatting
  ✓ Data analysis
# Dissertation vs Research Paper

<table>
<thead>
<tr>
<th>Items</th>
<th>Dissertation</th>
<th>Research Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>± 200 pp</td>
<td>± 8 pp</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>Whole research</td>
<td>Portion of research</td>
</tr>
<tr>
<td></td>
<td>1 Ph.D. = 4 research papers</td>
<td>4 research papers</td>
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<tr>
<td></td>
<td>1 M.Sc. = 2 research papers</td>
<td>2 research papers</td>
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<tr>
<td></td>
<td>1 B.Sc. = 1 research paper</td>
<td>1 research paper</td>
</tr>
<tr>
<td><strong>Writer</strong></td>
<td>Amateur</td>
<td>Professional</td>
</tr>
<tr>
<td><strong>Writing</strong></td>
<td>Relatively easy</td>
<td>Difficult</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>Full research data</td>
<td>Simplified &amp; selected</td>
</tr>
<tr>
<td><strong>Format</strong></td>
<td>University-based</td>
<td>Journal-based</td>
</tr>
<tr>
<td><strong>Publication</strong></td>
<td>Unpublished</td>
<td>Published</td>
</tr>
</tbody>
</table>
Formatting & Illustration

- Follow the university’s guideline
- Sequence of chapters
- Font, size, spacing, etc.
- Figure head
- Table head
- References
- Appendix
## Sequence of Chapters

<table>
<thead>
<tr>
<th>Model A</th>
<th>Model B</th>
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</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Introduction</td>
</tr>
<tr>
<td>Literature review</td>
<td>Aim &amp; Objectives</td>
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<tr>
<td>Aim &amp; objectives</td>
<td>Literature review</td>
</tr>
<tr>
<td>Methodology</td>
<td>Methods &amp; Materials</td>
</tr>
<tr>
<td>Results</td>
<td>Results &amp; Discussion</td>
</tr>
<tr>
<td>Analysis &amp; Discussion</td>
<td>Conclusion</td>
</tr>
<tr>
<td>Conclusion &amp; Recommendation</td>
<td></td>
</tr>
</tbody>
</table>
References


Thank you
THES criteria

- Peer review
- Staff-student ratio
- Citation
- Employers review
- International faculty
- International students
Thesis and journal paper

• Similarities
• Differences
What do we look for in a thesis

- Is there a clear understanding of the problem?
- Are the objectives clear?
- Has the student carried out a paper literature survey? Is it a scholarly effort?
- Are the experiments carried out systematically? Design of experiment, range, etc.
- Are the results presented methodically?
- Are the results analyzed with scientific rigour?
- Does the student understand the applicability of the results?
- Is there an attempt to generalize the results?
- Does the student show analytical and/or numerical ability?
- Do the conclusions relate to the results presented and address the objectives set out in the introduction?
- And importantly, the presentation (this is the only record of the studies): structure, language, figures, tables, references.
Why PhD?

- To get training on various aspect of research
- To become a critical thinker
- To develop into an independent research worker
- To extend the frontier of research subject
- To become a research engineer
- To become a better teacher
Technical paper

• The must be originality in the paper. This is the fundamental criterion
• The objective should be clearly defined and the completed studies should be reported in full
• A technical paper normally makes 2 or 3 important points (these points should appear three times in the paper)
• Should be clear, concise, logical, precise, accurate and readable
• Throw away superfluous material and areas of ambiguity. Should be ruthless in choosing only relevant material from a vast body of data.
• Paper as a detective story
• Paper is not a piece of literature but a readable prose
• Follow the guideline of the journal
Writing thesis and technical paper

• A well written thesis under an exacting supervisor and the first paper published from it are the starter

• First paper published in a reputed journal is a major step, giving all the importance confidence
Choice of journal

• To inform others of the work you have carried in the best way possible

• The paper may be:
  • Theoretical and experimental both
  • An application to design practice
  • Case studies of an interesting project in which something is different from the established practice
Typical contents of technical paper

• The paper should capture non-experts and impress experts
• Typically the paper contains the following
  • Title: what is the paper about?
  • Summary: the condense version of the whole paper
  • Introduction: what is your objective?
  • Numerical simulation/theory: what did you do with mathematics?
  • Experimental details: what did you do by experimentation?
Typical contents of technical paper

• Experimental results etc are included to provide necessary facts and evidences to fulfil the objectives. They are used to bring out new ideas from deduction or induction

• Results : what did you find?
• Discussion : what do the results mean?
• Conclusion : What the ending ?
• References
• acknowledgment
Paragraphs

• Do not jumble up too many ideas, especially unrelated, in one paragraph. One idea per paragraph,
• Write simple sentences readable in logical sequence,
• Get the paragraphs in right order,
• Avoid repetition
• Check the logic, continuity, etc.
• Check for inclusion of all relevant points
• Keep an eye on the paragraph length
• The structure in the finished product can be different from the initial outline
(i) Summary

• Perhaps the last section to write. The reader wants a quick outline of the paper.
• The summary must be self-supporting. It should not contain references and should include:
  • What is the paper about?
  • How did you do the research?
  • What is the scope of the research?
  • What are the main findings?
  • What are the important conclusions?
  • Are there any applications?
(ii) Introduction

- Introduce the topic
- Brief description of related studies
- State clearly the problem that has been studied and how it is related to previous studies
- Describe briefly the method of study and the scope of your work
- You should be able to capture the non-experts among the readers with the introduction)
(iii) Details of experimental investigation

- A neat diagram. Refer it in the text as the apparatus is described
- Salient features of the experimental apparatus (for details reference may be given to the thesis or to previously published work)
- Highly novelty of experimentation
- Experimental conditions including range of various parameters
- The instruments used, their limitations and their accuracy
(iv) Theoretical analysis

- Perhaps slightly easier to write
- Keep the reader informed, briefly, what the theory is about
- Write the important assumptions first followed by those the second order importance
- Number the equationns
- Do not include every step of manipulation of equations
- Write the important results derived from the theory
- Follow convention in graphical presentation of theoretical results
- If the theory predicts well, do not be overjoyed
- When comparing with experimental results, express the limitations of theory and experiments
(v) Results

• The hardest part to write you must clear of what points you want to convey the reader
• Interpretation of results
• Logical steps
• Establish your new ideas
• Concentrate on key facts and figures
• Ensure to include all important facts
• Include relevant figures
• Refer to all figures and tables
Results

• Describe and discuss critically the significance of the figures
• Assess the validity of the results
• Make comparisons with other investigations and with theory
• Analyse discrepancies of the results obtained
• Critically review what has been achieved
• Be careful of generalisations
• Write sound conclusions from deduction or induction or both
(vi) Graph

- Graphs and tables should complement your writing making the text clear
- Is it numbered?
- Does it have a title?
- Is it referred to in the text?
- Is it explained / discussed in the text?
- Is it clear?
- Are the variables on the correct axes?
- Are the variables labelled with names and units?
- Are the different data points on the graph distinguishable?
- Are the legends inside the figure clear?
- Are the curves drawn sensible?
(vii) Table

- Is it numbered?
- Does it have a title?
- Is it referred to in the text?
- Is it explained / discussed in the text?
- Is it clear?
- Does it have unambiguous heading/units?
(viii) Conclusions

• Should be based on your research
• Point form is preferable
• No speculation is allowed
• Do not write as conclusion if it has not been discussed in the thesis
• Conclusions should be in present tense
Reference

- Author’s name
- Title of the paper
- Publishing journal
- Volume number
- Part
- Year
- pages
Thesis
What do we look for in thesis

- Is there clear understanding of the problem?
- Are the objective clear?
- Has the student carried out paper literature survey? Is it a scholarly effort?
- Are the experiment carried out systematically? Design of experiment, range, etc.
- Are the results presented methodically?
- Are the results analysed with scientific rigour?
- Does the student understand the applicability of the results?
- Is there an attempt to generalise the results?
- Does the student show analytical and/or numerical ability?
- Do the conclusions relate to the results presented and address the objectives set out in the introduction?
- And importantly the presentation (this is the only record of the studies): structure, language, figures, tables, references.
Project Report / Dissertation / Thesis

• Title Page
• Student’s Declaration
• Dedication and Acknowledgement (optional)
• Abstract (in Malay and English)
• Table of Contents
• List of Tables
• List of Figures and Plates
• List of Symbols and Abbreviations
• List of Appendices
• Chapters (main texts)
• References and Bibliography (optional)
• Appendices
Abstract

• Background (including the purpose of the study)
• Methods
• Results
• Conclusion
Chapter for Introduction

• Introduction and background of the study
• Problem Statement
• Hypotheses or research questions (optional)
• Aim and objectives
• Scope and limitation
• Importance of the study
• General outline of research methodology (optional)
• Outline of the report (optional)
Introduction

• the background to the work (in relation to significant issues, problems, ideas)
• the objectives of the research
• key definitions and concepts to be used
• optionally, an overview of the report (mapping out its contents)
Problem Statement

• The formulation of a research encompasses the background of the issue or problem relevant to the topic. It should describe the development of the problem and provide the focus of the research.
Aim and Objective

- The aim is a general statement to explain the overall goal of the project. It can be in a measurable or non-measurable form.
- Objectives are specific goals that are arrived in undertaking the project to achieve the aim.
- Each of the objectives should be quantifiable or measurable. The way in which a project is carried out is usually guided by the specific objective(s) of the study.
THESIS

– Thesis format and Structure
– How to start writing a thesis
– Planning and timeline for writing a thesis
– Role of student and supervisor in thesis preparation
– Submission regulation
– Assessment of thesis
– Viva-voce Preparation of thesis
– Ethics and codes of Publication
– Plagiarism
– Referencing
Project Report / Dissertation / Thesis

- Title Page
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- List of Symbols and Abbreviations
- List of Appendices
- Chapters (main texts)
- References and Bibliography (optional)
- Appendices
Chapter for Literature Review

• A review of the material that already exists on the topic in question. The current research should build on existing knowledge, not “re-invent the wheel”.

• The literature review should demonstrate how the research being reported relates to previous research and, if possible, how it gives rise to particular issues, problems and idea that the current research addresses.

• Some project reports have more than one chapter dedicated to literature review. However the exact number of chapters required should be agreed upon by the project supervisor. Wherever necessary, each chapter should have its own title which reflects the contents of the chapter.
Chapters for Research Methodology

These chapters describe in detail the methodology adopted. Depending on the nature and scope of the project, it describe:

- Type of data used
- Instrumentation / equipment / apparatus
- Method of sampling / model set up
- Description of sample / model / population
- Technique of laboratory experimental work
- Technique of data collection, processing, and analysis
- Questionnaire design etc.
Chapters for Data Collection, Results (and Analysis)

- Detail description on collection and analysis of the data (using appropriate statistical tool, if applicable).
- The sources of the data must be clearly specified (e.g., traceability to the specimen’s identification).
- Large data sets and raw data are commonly placed in the appendices while a typical set may be presented in this chapter.
- The results of the analysis are normally presented in graphical or tabular format.
- Relevant findings and observation before going ahead with the analysis and implications toward the issues, problems or ideas that prompted the research.

In other words, let's see what we have found.
Chapter for Discussion of Results (Analysis and Discussion)

• Use the result of the analysis to make inferences in order to support the arguments.
• The discussion must be confined within the scope and objectives of the project.
• A critical appraisal of the results is required to assess how each of the objectives has been achieved, and how the questions have been answered.
• Comparison with other studies
• All arguments must be supported by evidences from various data from the study.
Chapter for Conclusions and Recommendations

• Must be clearly stated with reference to the objectives and questions in the introduction.
• Reflect exceptional understanding and insight.
• To summarise the conclusion of each previous chapters in new final concluding remarks.
• Problem encountered during the course of the research
• Suggestion for improvement and new directions for further research
• An evaluation of the research and its contribution, and concluding remarks
Abstract

• Background and Purpose
• Methods
• Results
• Conclusion
Appendices

The place for materials which are too bulky for the main body of the text.

• Extensive tables of data
• Questionnaires used in the survey
• Extracts from interview transcript
• Technical and standard specification
References and Bibliography

• References – provide direct reference to original sources whenever possible
• Bibliography – provide other sources consulted, must be given for a good report.
Organizing your chapters using pocket file

Based on research methodology:

Chapter 1 ??
Chapter 2 ??
Chapter 3 ??
Chapter 4 ??
Chapter 5 ??
Chapter 6 ??

Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
When do you plan to graduate??

Time table

Months

0 6 12 18 24 30 36

- Proposal
- Progress
- Oral examination (Viva voce)
- Early Submission
- Start writing

0 30 24 18 6 12 36

When do you plan to graduate??

www.utm.my

innovative ● entrepreneurial ● global
The tenses in scientific reporting

<table>
<thead>
<tr>
<th>Section / Context in a report</th>
<th>Appropriate tense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>Past tense</td>
</tr>
<tr>
<td>Introduction</td>
<td>Mostly present tense</td>
</tr>
<tr>
<td>Methodology</td>
<td>Past tense</td>
</tr>
<tr>
<td>Methods, materials used</td>
<td>Past tense</td>
</tr>
<tr>
<td>Results</td>
<td>Past tense</td>
</tr>
<tr>
<td>Discussion</td>
<td>Mix of past and present tense, some times future tense</td>
</tr>
<tr>
<td>Description of tables and figures</td>
<td>Present tense</td>
</tr>
<tr>
<td>Attribution</td>
<td>Past tense</td>
</tr>
</tbody>
</table>
Terima kasih
RESEARCH METHODOLOGY AND DESIGN

• Relationship between methodology & design
• Purpose of research design
• Developing Conceptual and operational framework
• Types of research design (Theory building/testing/extension; Inductive/deductive)
• Steps in Research Design
• Variables measurements
• Selecting and developing research instruments
• Quantitative vs. qualitative research design and method
• Evaluation of Research Methodology and design
• Gantt Chart and milestone
DATA COLLECTION

• What is data collection?
• Types of data:
  • primary vs secondary
  • qualitative and quantitative
• Selecting your data: sampling techniques and design
• Methods, tools and techniques for data collection
DATA ANALYSIS

• Types of Data Analysis
• Steps in Data Analysis
• Connecting research objective to data analysis
• Mathematical/statistical
• Data verification and validity
• Parametric/non-parametric analysis
• Survey to experimentation and data analysis
• Quantitative analysis
• Qualitative analysis
Project Report / Dissertation / Thesis

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- List of Appendices
- Chapters (main texts)
- References and Bibliography (optional)
- Appendices
Chapters writing vs Actual Work

Chapters Writing

Abstract
Table of contents
Chapter 1 – Introduction
Chapter 2 – Literature Review
Chapter 3,4 – Methodology chapters (+result)
Chapter 5 – Results / Analysis / Discussion
Chapter 6 – Conclusion

Actual work sequence

• Literature Review
• Problem statement & Objective
• Methodology (execution)
• Results / Analysis / Discussion
• Conclusion
• Introduction
• Table of contents
• Abstract
Chapters

• Chapter 1 – Introduction
• Chapter 2 – Literature Review
• Chapter 3,4 – Methodology chapters (+result)
• Chapter 5 – Results / Analysis / Discussion
• Chapter 6 – Conclusion
1.1 Introduction and background

• It’s not a literature review! It should be a summary of existing evidence that motivates your specific, proposed work.
• Start broad (e.g. construction delay, need for guideline, etc.), become increasingly specific
• End with a review, and broaden out to discuss potential applications (importance) of the proposed work
• Topics to be addressed: what’s been done; what hasn’t; what is needed and why; indicate your part or contribution (scoping your domain)
• Intro should contain some statements of objectives, purposes, and hypothesis.
Placement is flexible, though, and these could be in separate sections between Intro and Methods, or even part of the Methods. Depending on the specifics, not all of these (objective, purposes, and hypotheses) will always been relevant. More important that it be clear and readable.

How long should it be? Long enough to satisfy the above goals. Typically 10-30 pages for an MS, longer for a PhD proposal.

When summarizing existing literature, it is not enough just to describe what authors X, Y, and Z did. Results should be interpreted, in the context of the overall review and study objectives.

In particular, discuss contrasting evidence, possible sources for discrepancies (experimental design, lack of controls, sensitivity of measures, etc.), and the importance of resolving the differences.
1.2 Problem Statement / Questions to be answered

- The formulation of a research encompasses the background of the issue or problem relevant to the topic. It should describe the development of the problem and provide the focus of the research.

- Question to be answered is more focus towards the measurable subject matter to be solved at the end of the research, which is needed in order to achieve the objective.
1.3 Aim and Objectives

• The aim is a general statement to explain the overall goal of the project. It can be in a measurable or non-measurable form.
• Objectives are specific goals that are arrived in undertaking the project to achieve the aim.
• Each of the objectives should be quantifiable or measurable. The way in which a project is carried out is usually guided by the specific objective(s) of the study.
• specific and clearly filling some hole/need addressed in the Introduction.
2.0 Literature Review

• A review of the material that already exists on the topic in question. The current research should build on existing knowledge, not “re-invent the wheel”.

• The literature review should demonstrate how the research being reported relates to previous research and, if possible, how it gives rise to particular issues, problems and idea that the current research addresses.

• Some project reports have more than one chapter dedicated to literature review. Wherever necessary, each chapter should have its own title which reflects the contents of the chapter.
Research Methodology (Chapter 3,4,...)

These chapters describe in detail the methodology adopted. Depending on the nature and scope of the project, it describe:

- Type of data used
- Instrumentation / equipment / apparatus
- Method of sampling / model set up
- Description of sample / model / population
- Technique of laboratory experimental work
- Technique of data collection, processing, and analysis
- Questionnaire design etc.
Research Methodology (Chapter 3,4,...)

a) What will be done, how, and why? In particularly “why” (why this IV, why these levels, why this measure, …)

b) With respect to how and why, there is typically more than one way to do something, and you must explain (and sometimes justify) your choice.

c) The methods should have clear connections to the hypotheses.

d) In general, proceed from broad to specific, but also ensure that a context is provided before specific details.
d) For example, don’t describe specific test method before you’ve even explained the overall approach and the different independent and dependent variables.

e) For widely-used and generally accepted approaches, just summarize with reference to the literature. For other approaches, more explanation and justification needed.
a) Subsections are often used such as: Overview; Participants; Procedures; Instrumentation; Experimental Design; Data Reduction; Analysis (stats)

b) Somewhere (typically in Experimental Design), there should be an explicit statement of the independent and dependent variables (or factors, or measures)
Some general tips

- Each paragraph proceeds from general to specific.
- Some have suggested that reading the first sentence of every paragraph in the document should convey the essential meaning of the whole.
- Vary the structure of your sentences and paragraphs.
- Use transitions between paragraphs (either the last sentence of the proceeding one or the first sentence of the subsequent one, should tie the two together).
- Avoid one-sentence paragraphs (generally at least 3 sentences comprise a paragraph)
- Consider optional presentation methods. Often the same thing can be conveyed by text, graphs, tables, diagrams, etc. Pick what is the most effective, but avoid duplication.
Some common mistakes to avoid:

• Repetitive sentence structure (The… The… The… or However, … Additionally, … Therefore, …)

• Avoid complex words, where simpler ones will convey the information (like utilize vs. use; cognizant vs. aware; though personal style always has a role).

• There is no advantage to be gained by making something obscure. The scientific value is not enhanced by complicated words and prose, and to someone that
Data Collection, Results (and Analysis) (Chapter 5,...)

- Detail description on collection and analysis of the data (using appropriate statistical tool, if applicable).
- The sources of the data must be clearly specified (eg. traceability to the specimen’s identification).
- Large data sets and raw data are commonly placed in the appendices while a typical set may be presented in this chapter.
- The results of the analysis are normally presented in graphical or tabular format.
- Relevant findings and observation before going ahead with the analysis and implications toward the issues, problems or ideas that prompted the research.
- In other words, let’s see what we have found.
Chapter for Discussion of Results (Analysis and Discussion)

• Use the result of the analysis to make inferences in order to support the arguments.
• The discussion must be confined within the scope and objectives of the project.
• A critical appraisal of the results is required to assess how each of the objectives has been achieved, and how the questions have been answered.
• Comparison with other studies
• All arguments must be supported by evidences from various data from the study.
Discussion

• Start with a few sentences that summarize the most important results. The discussion section should be a brief essay in itself, answering the following questions and caveats:

1) What are the major patterns in the observations?

2) What are the relationships, trends and generalizations among the results?

3) What are the exceptions to these patterns or generalizations?
1) Is there agreement or disagreement with previous work?

2) Interpret results in terms of background laid out in the introduction - what is the relationship of the present results to the original question?

3) What is the implication of the present results for other unanswered questions in earth sciences, ecology, environmental policy, etc....?
1) Avoid bandwagons: A special case of the above. Avoid jumping a currently fashionable point of view unless your results really do strongly support them.

2) What are the things we now know or understand that we didn't know or understand before the present work?

3) Include the evidence or line of reasoning supporting each interpretation.
Conclusions and Recommendations (Chapter 6)

- Must be clearly stated with reference to the objectives and questions in the introduction.
- Reflect exceptional understanding and insight.
- To summarise the conclusion of each previous chapter in new final concluding remarks.
- Problem encountered during the course of the research
- Suggestion for improvement and new directions for further research
- An evaluation of the research and its contribution, and concluding remarks
Conclusions

• What is the strongest and most important statement that you can make from your observations?

• If you met the reader at a meeting six months from now, what do you want them to remember about your paper?

• Refer back to problem posed, and describe the conclusions that you reached from carrying out this investigation, summarize new observations, new interpretations, and new insights that have resulted from the present work.
• cite double-author references by the surnames of both authors (followed by date of the publication in parenthesis)
  – e.g. Simpson and Hays (1994)
• cite more than double-author references by the surname of the first author followed by et al. and then the date of the publication
  – e.g. Pfirman, Simpson and Hays would be:
    – Pfirman et al. (1994)
• list all references cited in the text in alphabetical order.
ABSTRACT
Types of abstract:

Abstract is required summary of:

- publications and research studies.
- presentations,
- posters,
- general audience
- Abstract for review articles
- Abstract for case reports

The focus of all abstracts is not the same, but the goal of literally abstracting the structured highlights of the overall study are fairly universal.
Structure of abstract

- Introduction / Background
- Purpose
- Method
- Results
- Discussion / Conclusion
A good abstract should address the five following questions:

1. "Why did you start?" – Introduction or background
2. "What did you try to do?" – Aims and objectives
3. "What did you do?" – Methods
4. "What did you find?" – Results
5. "What does it mean?" – Conclusions
Advice for a good abstract writing

• Use simple sentences
• Good abstracts are easy to ready, clear and concise.

• Ask your colleagues to check …..
The language of abstract Writing

1. Often uses the third person
   \textit{eg: he/she/it/they, NOT I,we/you}

2. Often uses passive voice verbs to describe the researchers’ own actions
   \textit{eg: “It was found that…” NOT “We found that…”}.

However: Active voice is used to describe phenomena in the study.
\textit{e.g: “The mice grew …”, “Patients responded …”, “Water evaporated ….”}
3. Negative results and conclusions not included.

* e.g: “Z was not found …”
* “It was not possible to test Y ..”

4. Avoid abbreviation, jargon, other language shortcuts that may lead to confusion.

If you use abbreviation, write out the meaning, unless if you absolutely certain that readers will understand.
The language of abstract Writing

5. Avoid repetition
   *It becomes more difficult to read.*

6. Avoids meaningless expressions
   *e.g.*  “Results are provided…”
   “Discussion follows…. ”

7. Avoid superlatives
   *e.g.*  Instead of using words like “very” and “extremely”, try to choose stronger nouns and verbs.
Avoiding Ambiguity in Concise Writing

• *Concise*: expressing much with few words, clear

• *Ambiguity*: more than one way of understanding is possible

• It is a problem when we try to be brief, we don't always express ideas clearly.

• However, in science writing, it is critical to avoid ambiguity as much as possible.
The tenses in scientific reporting

<table>
<thead>
<tr>
<th>Section / Context in a report</th>
<th>Appropriate tense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>Past tense</td>
</tr>
<tr>
<td>Introduction</td>
<td>Mostly present tense</td>
</tr>
<tr>
<td>Methodology</td>
<td>Past tense</td>
</tr>
<tr>
<td>Methods, materials used</td>
<td>Past tense</td>
</tr>
<tr>
<td>Results</td>
<td>Past tense</td>
</tr>
<tr>
<td>Discussion</td>
<td>Mix of past and present tense, some times future tense</td>
</tr>
<tr>
<td>Description of tables and figures</td>
<td>Present tense</td>
</tr>
<tr>
<td>Attribution</td>
<td>Past tense</td>
</tr>
</tbody>
</table>
Thank You
More tips …

• Any figure, table, plate, appendix presented must be fully captioned and described in the text.
• All items in the figures should be addressed.
• Each conclusion written in the conclusion chapter should have been explained in the earlier chapters.
• Do not write too long sentences
• Do not repeating paragraphs in the discussion
• Introduction - What are your writing strategies
• Academic writing in English – word choice and writing styles
• Writing academic abstract
• Managing and reviewing literature – organising the literature
• Citing and referencing sources – reporting verbs, use of tenses
• Borrowing texts of others – summarizing and paraphrasing, quoting and generalization, plagiarism
• Positioning your results – commenting on your data, reporting on results
• Engaging your readers – making qualifying claims, using hedges, boosters and attitude markers
• The language of conclusion
• Writing presentation
Evaluation Process

• how well the student is able to integrate into the project what he has learned in the course subjects,
• how much the completed project meets the objectives, and how well it meets the course objectives
• These factors are evaluated in an oral examination and the written report.
• Although the oral examination constitutes 30% of the overall mark, the panel of assessors have the right to fail the student if the work presented is not satisfactory and if the student failed to demonstrate their profoundness in the subject matter and ability to solve problem.
THE BODY OF A RESEARCH REPORT

The body of the report follows the preliminary information. It contains four logical divisions:

1. Introduction
2. Methodology
3. Presentation and Analysis of Data
4. Summary, Conclusion, and Recommendations
THE BODY OF A RESEARCH REPORT

1. INTRODUCTION

• Statement of the Problem
• Review of Related Literature
• Statement of Hypotheses or Research Questions
• Limitations
• Definition of Terms
THE BODY OF A RESEARCH REPORT

2. METHODOLOGY
   Procedures for Collection and Treatment of Data

3. PRESENTATION AND ANALYSIS OF DATA
   Presentation of Data
   Analysis of Data

4. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS
   Summary
   Conclusions
   Recommendations
Writing of Abstract

Assoc.Prof. Ir. Dr. Mohd.Hanim Osman
Deputy Dean (Postgraduate Studies and Research)
Faculty of Civil Engineering

3 Oct, 2012
Types of abstract:

Abstract is required summary of:

1) *publications and research* studies.
2) presentations,
3) posters,
4) general audience
5) Abstract for review articles
6) Abstract for case reports

The focus of all abstracts is not the same, but the goal of literally abstracting the structured highlights of the overall
Abstract for submission to journal / conference prior to the full paper

Is a shortened version of the first draft of a paper.

- It provides the first chance for you to announce and cite the preliminary findings of your study;
- It allows you to communicate your findings to your colleagues and get their feedback;
- It is the starting point for achieving the ultimate aim of a research project, the writing and publishing of a full paper in peer-reviewed literature.
- The abstract provides a glimpse of the author’s work and attention to detail.
The optimal structure of an abstract

**TITLE**

• The title should be an **accurate** promise of the **abstract's contents**. It should explain as much as possible about the context and the aims of the study.

• Ideally, the title should be about 10–12 words long, and should include the **scope** of the investigation, the study design and the goal.

• In general, it is preferable to make the title a description of **what was investigated** rather than a statement of the results or conclusions.

• The abstract's title should be easy for the reader to **understand** and should not include jargon or unfamiliar acronyms or abbreviations.
The optimal structure of an abstract

Authors

• The list of authors should be restricted to those individuals who carried out the study, conceived it, designed it, gathered the data, analysed the numbers and wrote the abstract.

• The author who will present the abstract should be listed first.

• Every listed author should read and approve the abstract before it is submitted.
A good abstract should address the five following questions:

1. "Why did you start?" – Introduction or background
2. "What did you try to do?" – Aims and objectives
3. "What did you do?" – Methods
4. "What did you find?" – Results
5. "What does it mean?" – Conclusions
1. "Why did you start?" – Introduction or background

• You should summarise, preferably in one sentence, the current knowledge, or state-of-the-art, specifically in relation to the work you are presenting.

• Research problem.

• Gap of research in the field
Background

• No more than 5 sentences here, explaining why this study is important, what it will add to the science, or why your project matters. You may cite a critical reference here if crucial to substantiating the significance of this work.

• Content in this section should relate directly to the purpose/aims/question.
2. "What did you try to do?" – Aims and objectives

• Here, you should state the **aim of the study**, and ideally include a short statement of the study's hypothesis.

• A legitimate scientific study is not done "to prove that something is true" but rather "**to find out whether it is true.**"

• The difference may seem small, but it makes a huge difference. A formal hypothesis shows that you were **objective**.
Purpose/aims/research question:

Begin like this:

• “The purpose / aim of this (study/project/investigation) is to…” or
• “The question guiding this study/project/investigation) is…” or,
• You get the picture. Three sentences at most should cover this.
3. "What did you do?" – Methods

- In an abstract, the description of the methods has to be concise, and much of the details of what was done must be omitted.
- However, in a few short sentences, you can give the reader a good idea of the design of the study, the context in which it was done, and the types of measurements that were included.
Methods

• **For a research study**, it should include the design, the setting, the sample, the measurement tools, and the analysis approach.

• For a project, should include the setting, the composition of your team, the participants you worked with, your project intervention, and your evaluation strategy.

• These should be appropriate to the purpose/aims/questions.
4. "What did you find?" – Results

• Give the main results of the study, **not just in subjective terms** ("We found device X to be superior to device Y") but also in the form of some **real data**.

• You will need to choose which findings to report here: it should be the **most important data** in your study, and the findings on which your conclusions will be based.

• **Do not** include a table or figure unless you need it to show your results.
Results

• Here you state just the facts.
• If a research study, include simplified demographics, primary results.
• If a project, what was done and what did the evaluation show.
• This should flow directly from the methods and be consistent with the purpose/ aims/questions.
Discussion:

• **Relate your results directly back to your purpose/aims/research question.** This is critical.

• **Did you achieve** your purpose, either in your research or project? If not, why not? How was your question answered?

• **Is the answer** is what you **expected**? Why or why not? What were the major limitations of the study or project (every study/project has them, so don’t leave this out).
5. "What does it mean?" – Conclusions

• Here, space limitations generally limit you to a single sentence of why you think your findings are important, and their potential implications.

• Keep your conclusions reasonable and supportable by the findings of your study.

• Remember that if your study was restricted to certain case or a specific device, its results may not extend beyond these restrictions.

• Recommendation / implication
Advice for a good abstract writing

• Use simple sentences
• Ask your colleagues

• Good abstracts are easy to ready, clear and concise.
Use simple sentences

• Unless they are basic, universally accepted abbreviations, like E, RM10, acronyms and abbreviations should be spelled out the first time they are used in the abstract.

• Similarly, local expressions and jargon should be kept out of the abstract.
Ask your colleagues

• Before the abstract is submitted, it should be **double-checked for accuracy**, not only of the data reported but of the description of the methods and all other details.

• Having one or more **colleagues (who were not involved in the study)** read the abstract and offer constructive criticism can be extremely helpful.

• **PROOF READ YOUR WORK!** Avoid **grammatical** errors and typos. Ask someone you trust and respect to read it and give you feedback.
Check Yourself

• Because your thinking may have evolved as you wrote the abstract take time to be sure the entire abstract evolves from your stated purpose/aim/question.

• The background discussion should be narrowly focused; the methods have to be right for the purpose/aim/question; and the discussion should use the same words as found in the statement of purpose, etc.
Example of abstract

- EMS Treatment of CHF: How Well Do We Do?

- **Background:** Reported error rates in out-of-hospital (OOH) diagnosis of CHF range from 12-40%, using ALS provider diagnosis.
- **Objectives:** To determine the error rates in OOH diagnosis for CHF based on choices of ALS treatment.
- **Methods:** Retrospective case series; convenience sample of OOH and emergency department (ED) records on patients 50 and older who received OOH care for respiratory distress. Dates: January 1, 2001 through June 30, 2002. Field intubated patients were excluded. OOH treatment for CHF defined as treatment of older patients (>=50) with complaint of respiratory distress with furosemide, nitroglycerine (NTG), or morphine sulfate (MS). ED diagnosis was defined as one of the first three ED diagnoses as CHF or pulmonary edema.
- **Results:** 310 matching charts with complete data. 70 patients were treated with one or more of the target treatments: 5 patients received MS, 46 received furosemide, and 53 received NTG. 98 patients received an ED diagnosis of CHF or pulmonary edema. Sensitivity=0.357 (35/98); Specificity= 0.835 (177/212); Treated for CHF but did not have (false positive rate) = 0.165 (35/212); Not treated for CHF but had it (false negative rate) = 0.642(63/98); agreement = 0.684 (kappa= 0.21, p<.001).
- **Conclusions:** Both over and under-treatment of CHF in older patients with respiratory distress remains a problem, even when field diagnosis is not required. Clinical decision rules may be helpful in this regard. Until the treatment accuracy can be improved, limit treatment to those in severe distress (benefits outweigh risks of erroneous treatment), or long transport times. Limitations include: retrospective cases series analysis limits generalizability; convenience sample and exclusion of patients intubated in the field may bias results; no outcome data to evaluate any benefits or risks associated with unnecessary or missed ALS treatments; relying on ED diagnosis as gold standard for presence of CHF.
Sample Abstract #2

Unit Level Nurse Workload Impacts on Patient Safety Study
Nancy E. Donaldson RN, DNSc., Principal Investigator
Director, Center for Research & Innovation in Patient Care;
Associate Clinical Professor

Diane S. Brown RN, PhD., Co-Investigator; Assistant Clinical Professor

Linda Burnes Bolton RN, Dr.PH, FAAN, Co-Investigator; Assistant Clinical Professor

Carolyn Aydin PhD., Co-Investigator; Assistant Clinical Professor

Steven Paul PhD., Co-Investigator; Senior Statistician

Research-In-Progress Abstract

The aims of this 2-year descriptive correlational study build on the established integrity and capacity of the California Nursing Outcomes Coalition (CalNOC) to engage California acute care hospitals in voluntarily using ANA nursing quality indicators for reporting standardized nurse staffing, patient safety and quality indicators in a collaborative research, repository development and benchmarking project. For the purposes of this study, it is posited that the daily unit level configuration of nurse staffing and workload may buffer patients from the effects of error and resulting injury or compromise patient safety when variance in these factors exceeds a staffs’ adaptive capacity and breaches a unit level margin of safety. The aims of this study are grounded in the knowledge that the potential to compromise patient safety through human error is inherent in nursing practice and medical care (IOM, 1999; QUIC, 2000; Reason, 1990). In collaboration with CalNOC’s statewide voluntary convenience sample of medical-surgical acute care units from 77 hospitals, this study will break new ground in tracing daily unit-level direct care nurse staffing, in 100 patient care units over a two (2) month period, to examine associations between the structure of hospital nurse staffing and patient safety and outcome indicators such as—falls, pressure ulcers, restraint prevalence and significant clinical events. In addition the effect of patient activity (turnover) and nurse staffing will be examined. The staff measures to be studied include hours of direct nursing care per patient day, nursing skill mix, percent of contracted or agency nursing staff, ratio of required to actual hours of care, and RN years of post-licensure experience. This study recognizes and quantifies the impact of patient turnover, a key factor in nurse staffing workload, and integrates it into multiple regression analyses examining associations between nurse staffing and patient care outcomes.

This project is supported by grant number RO1 HS11954 from the Agency for Healthcare Research and Quality 9/30/01-9/29/03.
Sample Abstract #3

Unit Level Nurse Workload Impacts on Patient Safety

Nancy E. Donaldson RN, DNSc., FAAN Principal Investigator
Diane S. Brown RN, PhD, FAHCQ, Co-Investigator
Linda Burns Bolton RN, Dr. PH, FAAN, Co-Investigator
Carolyn Aydin PhD, Consultant Co-Investigator Steven Paul PhD, Co-Investigator,
Senior Statistician
Bruce A. Cooper PhD, Senior Statistician
Kathleen Yule RN, MS, Project Coordinator

Abstract—Final Report (limited to 250 words)

Purpose
Study aims were to test associations between daily nurse staffing in adult medical-surgical
units and hospital acquired pressure ulcers, patient falls and other significant events. This
study integrated a measure of workload, admissions, discharges and transfers to explore
how the “pace” of patient care impacted patient safety.

Scope
This 2-year AHRQ Working Conditions and Patient Safety study built on the work of the
California Nursing Outcomes Coalition (CalNOC) to engage acute care hospitals in using
ANA nursing indicators for reporting staffing, patient safety and quality indicators in a
research, repository development and benchmarking project. In 25 acute care, not-for-profit
California hospitals participating in CalNOC, the sample included urban and rural sites with
an average daily census from 100 to 400 plus. Most patients’ principal diagnosis was
medical (66%).

Methods
A prospective, descriptive correlational design tested associations between daily unit level
nurse staffing, skill mix, hours of care, contract hours of care, workload and patient outcome
measures. Falls were “unplanned descents to the floor”.

Results
Registered Nurse (RN) Hours of Care was significantly associated with outcomes. In
addition, percent RNs with BSN or higher was associated with fewer falls. Unit activity index
and hospital complexity (measured by bed size) were also significant predictors of falls.
Percent of patients with hospital acquired pressure ulcers was significantly associated with
mean staffing ratio and with percent days with the staffing under 100% for week PRIOR to
the prevalence study. Greater percent certified RNs was associated with lower percent of
restrained patients.

Key Words
Acute care; nurse staffing, patient falls, hospital acquired pressure ulcers, patient care
safety.
SOME SILLY MISTAKE ..

• What can be easier than writing a thesis abstract?!
• Actually, thesis abstract writing can become a real problem. Here is a list of mistakes while writing thesis abstracts:
• Mistake number 1: this piece of writing did not present good thesis ideas.
Mistake No. 1 : Not representative

• This piece of writing did not present good **thesis ideas**. Students, being involved in thesis abstract writing, did not realize that short does not mean meaningless.

• They simply reflected general thesis ideas with no real value, so they had to rewrite theses abstracts a lot of times.
Mistake No.2: Too long

• This work was way **too long**. “Keep it short!”- many students forget this easy rule, failing to meet **thesis abstract** format and length requirements.
Mistake No.3 : Thesis statement

• Thesis abstracts were not based on a **thesis statement**. Your thesis abstract is a longer version of your thesis statement, basically. So, you need to focus on your thesis idea, adding some relevant and informative details about it.
Mistake number 4 : Therminology

• Students have used some complicated terminology in their papers. This piece is so short that you should not include any specific terms, complicated sentences. “Keep it simple”- one more rule for you to remember.
The language of abstract Writing

1. Often uses the third person
2. Often uses passive voice verbs to describe the researchers’ own actions
3. Negative results and conclusions not included
4. Avoid abbreviation, jargon, other language shortcuts that may lead to confusion
5. Avoid repetition
6. Avoids meaningless expressions
7. Avoid adjective and descriptive details
8. Avoid illustration
9. Avoid footnotes
10. Avoid preliminaries
11. Avoid superlatives
1. Often uses the third person
   eg: he/she/it/they,  NOT I,we/you
2. Often uses passive voice verbs to describe the researchers’ own actions
   eg: “It was found that…”  NOT “We found that…”.

However : Active voice is used to describe phenomena in the study.
   e.g : “The mice grew …”, “Patients responded …”, “Water evaporated …. ”
3. Negative results and conclusions not included.

   e.g: “Z was not found …”

   “It was not possible to test Y ..”

4. Avoid abbreviation, jargon, other language shortcuts that may lead to confusion.

   If you use abbreviation, write out the meaning, inless if you absolutely certain
5. Avoid repetition

_It becomes more difficult to read._

6. Avoids meaningless expressions

  _e.g: “Results are provided…”_

  “Discussion follows….”

7. Avoid adjective and descriptive details
8. Avoid preliminaries

*It includes both literal pictures as well as examples.*

9. Avoid footnotes

10. Avoid preliminaries

   *e.g: “This paper discusses three issues...”*

11. Avoid superlatives

   *e.g: Instead of using words like “very” and “extremely”, try to choose stronger nouns and verbs.*
Terima Kasih
TIPS FOR WRITING A GOOD ABSTRACT

Barry W. Hamilton, Ph.D.  Northeastern Seminary

• Take the task of writing the abstract seriously. The abstract will determine whether future researchers will read your thesis or dissertation. The abstract needs to bring out the significance of the entire document. When writing the abstract, the author should model the tone and vocabulary of the document’s conclusion. The abstract should accurately and succinctly describe the content and scope of the entire document.

•
• It is extremely important to stay within the limits defined by the institution/department. Do not exceed the stated limits, or else someone will use a chainsaw to disembowel your abstract to make it fit.

• Put your best writing into the abstract, just as you did into the conclusion. Strive for clarity with all that is within you! Make the abstract transparent for researchers in your subject field.
• Within the stated limits, **make every word count!** Reach for the knife—cut out the unnecessary. Prefer the active voice, and use action verbs when don’t contribute to the abstract’s substance. Avoid unnecessary, unusual.

• Mine the document for important keywords and phrases that directly relate to the major concepts in the paper. These terms will be related to your thesis statement and will describe concepts at the level of the whole document. Take into consideration the vocabulary of abstracts from other theses in your field (but don’t merely imitate other abstracts—use these vocabulary terms only if used in your own thesis.)
• Have a colleague read the abstract and offer criticism. Print out a hard copy and ask the colleague to mark it up. Take another hard copy with you on the bus or on the plane. Sometimes it helps if you take it on an out-of-town trip and read it in a motel room in a strange city. The new surroundings might help you read the abstract in a new light (seriously).
Avoiding Ambiguity in Concise Writing

• *Concise*: expressing much with few words, clear

• *Ambiguity*: more than one way of understanding is possible

• Word limits encourage concise writing. Concise writing is good. The problem is, when we try to be brief, we don't always express ideas clearly. There may be more than one way to interpret the same sentence.

  However, in science writing, it is critical...
Here are some examples of ambiguity and suggested corrections. Note that there are no grammar errors in any of the original texts quoted below. Nevertheless, there is more than one way to interpret them.
• **Original:** Interleukin (IL)-21 is a member of type I cytokine family, which is produced by activated CD4' T cells and regulates growth, differentiation and maturation of lymphoid lineage cells.

• **Problem:** It seems that the family, not (IL)-21, is produced.
Possible solution:

• **Interleukin (IL)-2 I.** which is produced by activated CD4 T cells and regulates growth, differentiation and maturation of lymphoid lineage cells, is a member of type I cytokine family.

• **Problem:** The emphasis is on the type I cytokine family, but this doesn't seem most important.
• Suggested solution:
• Interleukin (IL)-21, is a member of type I cytokine family, is produced by activated CD4 T cells and regulates growth, differentiation and maturation of lymphoid lineage cells.
• (delete “is”, and delete “which”)
Most importantly, joint-draining lymph nodes from IL-2R-Ig-injected mice contained significantly fewer CD4^+CD25^- cells expressing PD-1 and B7.1, B220^+[gG,' cells, and B220^-Syndecan-1' cells than those from control IgG1- administered mice.

It is unclear how the text after the highlighted "and" connects to the first part of the text.
• Possible solution: Most importantly, joint-draining lymph nodes from IL-2 IR-Ig-injected mice contained significantly fewer CD4⁺CD25' cells expressing PD-1 and B7.1, B220'IgG₁- cells, and 21 B220-Syndecan-1' cells than those from control IgG1-administered mice.
• Problem: The structure is clear, but numbering should be avoided when unnecessary. Also, the distance between "fewer" and "than" means the comparison is still hard to read. The last part looks like "B220- Syndecan-1 + cells than those from control . . .".

• Suggestion: Most importantly, joint-draining lymph nodes from IL-21 R-Ig-injected mice contained significantly fewer CD4'CD25' cells expressing both PD-1 and B7.1, fewer