EEE6480

EEE660X
COM6910

Research techniques & thesis preparation

Dissertation and scientific writing

Contents

1. Technical writing
2. Structure of dissertation

Scientific articles/reports

- Which questions asked?
- Which experiments performed?
- Which data collected and how?
- What conclusions drawn?
- Any suggestions for further research?

- Research demands accuracy and precision – as does writing!

Thesis/dissertation is:

- Formal piece of substantial stand alone writing, presenting original data in support of a particular supposition
- Thorough analysis and interpretation of results
- Every statement is supported by citing the literature or your own original work
- Every statement correct and defensible in logical/scientific sense
- Designed for the reader

Thesis/dissertation is not:

- A diary of your days in lab.

Good technical writing

IS

- Efficient communication of ideas
- Clear and simple
- Interesting and engaging

IS NOT

- Ambiguous/flowery
- Filled with jargon
- Boring

Good technical writing

1. Write for the benefit of the reader
2. Use plain English

- Use short sentences, not too many commas or conjunctions (and, but, yet)
- Use bullet points where possible
- Use simplest words possible, avoid jargon
- Avoid unnecessary words (e.g. “after specification we *were in a position to* begin a detailed design”)

Good technical writing

- Don’t convert verbs into nouns

  (e.g. “ESD accounts for the destruction of components” → “electrical overstress destroys components”
- Personal is OK sometimes

  (e.g. I show…, we (you and the reader) see that…
- Avoid grammatical errors

Good technical writing

3. Use appropriate structure (see later)
4. Use appropriate formatting
   - Section numbering (sections at same level should be approx. equal length). Use sub-sections and sub-sub-sections.
5. Get feedback – on structure, peer review

Dissertation structure

- Abstract ← Front sheet
- Acknowledgements
- Contents ← Plagiarism declaration
- Introduction
- Background
- Research methods (materials/methods)
- Results
- Discussion
- Conclusions
- References

Dissertation structure

- **Title** for maximum impact
- **Abstract** – one paragraph self-contained summary of work (it is not an introduction)
  - Purpose of study, statement of methods, results, conclusions
  - High quality
  - Write it last
  - Don’t describe all results.

- **Introduction -**
- Put work into context, include background, describe broader perspective/relevance
- Explain why and which questions you're answering
- Previous related research in field
- Aims and objectives
- Overview of report

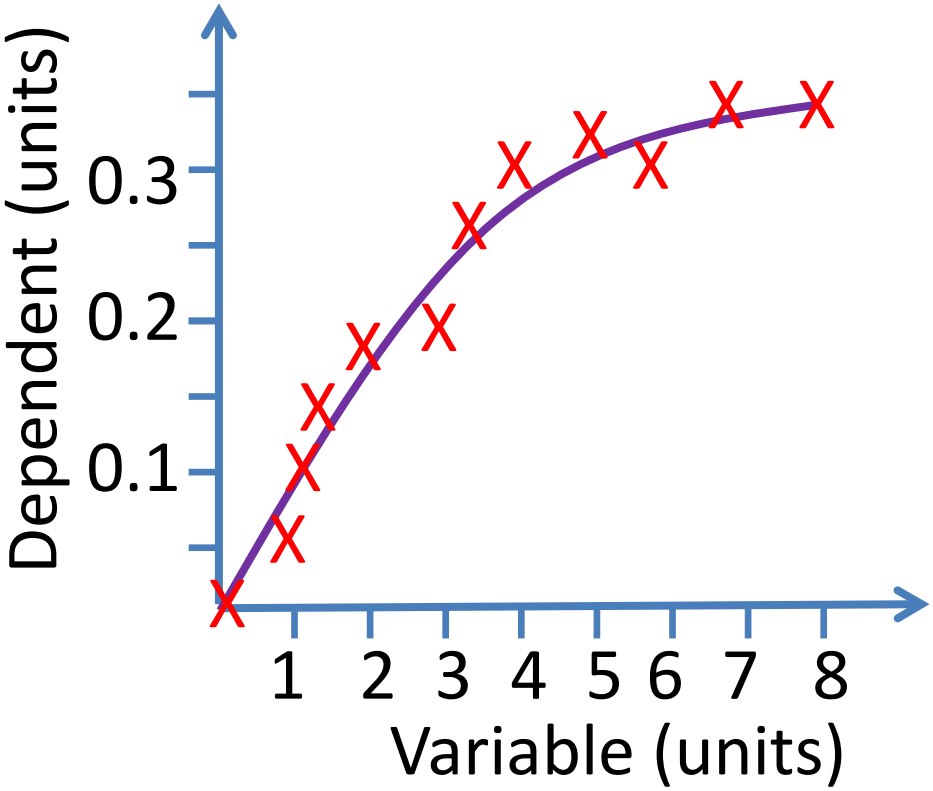
- **Research methods –**
- Detailed description of what did and how
- Be accurate with details
- Experimental set-up, brand, calibration
- Sufficient to allow others to duplicate
- Use passive voice (e.g. “the sample was”, not “I did”)
- Must match results section

- **Results –**
- Analyzed data (not raw results)
- Graphical or tabulated (ease of interpretation)

- Figures:
  - Save words
  - Stand alone
  - Refer to figure in text
  - Number by section in thesis

- Tables:
  - Don’t need table *and* graph
  - Number and caption

- Graphs:
  - Independent variable on x-axis, dependent on y-axis
  - Label both axes and provide units
  - Suitable scale, starting value
  - Same scale/range for comparisons (side-by side)
  - Be careful with lines (not dot-to-dot)



- Maths
  - Use *italics* for maths (esp. in text)
  - If longer than $x + y = z$ put on separate line
  - Number every equation referred to in text
  - Punctuate
  - Use maths objects (e.g. MS Equation, or LaTeX)

- **Discussion –**
- Explains meaning of results
- Back up analysis with solid evidence
- Don’t include data not included in results
- Results = data, discussion = explanation
- Answer questions posed in intro.
  - did you discover what you thought you would?
  - Did experiments prove or disprove hypothesis?
  - Were results different from expected?
  - What have you learnt from your analysis?
  - How does your work relate to other work in the field?
  - What kinds of conclusions can you draw from results?
  - Suggest ideas for future work (or have a separate section)

- **Conclusions –**
- Overall conclusions, reflect on progress against each objective, demonstrate what learnt, future avenues for research.

- **References –**
- in the usual style

After writing

- Writer to editor (read, re-read, spell-check)
- Only submit thoroughly reviewed work.
- Let supervisor check (suggestions, not corrections)

Design and research based projects

Design:

- Justification of design choices crucial
- Critically assess performance against specification

Research:

- Describe, justify, assess experimental methods
- Interpret results
- Compare with theory

- Nb. Mark sheets will include features to reflect different emphases of design and research