

2.672: Writing a technical paper

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Elements of a technical paper

- Title
- Abstract
- Introduction
- Theoretical background
- Apparatus and procedure
- Results and discussion
- Conclusions
- Nomenclature (optional)
- References
- Appendices (optional)

2.672 writing

- Individual reporting
 - You share ideas, data and results with your group members. You need to write your own project report though.
- Writing style
 - Avoid subjective comments, and use of personal pronouns; use passive voice instead
 - Write directly, avoid words that are not useful such as:
 - “In order to”
 - “the purpose of this experiment is to”
 - No. of significant figures in numbers should reflect accuracy of measurement

Paper versus report

- Report
 - Usually for internal use
 - Document details of the project for archival purpose
 - Include details: drawings, computer programs
- Paper
 - For external audience
 - Succinct and to the point
 - Do not need to write about routine details such as calibration procedure etc.
 - Do not put computer program listing in a paper

Title

- The title is what draws reader to your work
 - Reveal the topic of the paper
 - Should include key words about the project
- Make the title interesting and attractive

Abstract

- Brief condensation of the paper
 - 150 – 200 words
 - Do **not** explain why the study is done in the abstract
- What was done?
- How was it done?
- What are the significant results

Introduction

- Introduces subject
 - Background and context
 - Articulate the need for the study
 - Clearly define the problem (purpose of the investigation)
 - Briefly outline overall approach

Theoretical background

(Should use a more meaningful heading than theoretical background)

- Physical explanation of the phenomena involved
- Develop governing equations
 - Assumptions: support them quantitatively
 - e.g. laminar flow — give Re
 - Describe model development
 - Give the key equations only; put details in the appendix
- Connect your theory to your project
 - What theoretical values are to be compared to experimental results?

Apparatus and procedure

- Overview of operation
 - Refer to a schematic to explain the operation
 - Give dimension of apparatus
 - Relationship between the laboratory device and the real device
 - What are being measured?
 - Do not need to give details about transducers if they are common devices
- Experimental matrix
 - What are the variables and what range has been covered?

Results and discussion

Results

- Use figures
- Describe the direct observation first (e.g. pressure vs. time)
 - Point out the features and the physics behind them
- Show how do the results change when you change the variables of the experiment
 - Magnitude (up or down; by how much?)
 - Trends and scaling laws
 - linear, exponential, ...

Results and discussion

Discussion

- Does theory produce the same features as the observations?
- Plot theoretical values on the same graph as the experimental results
 - Explain the differences
- Make the results (theory and experiment) **useful**

Conclusions

- Summary of your finding
- Pronounce your judgment
 - What are the key parameters?
 - How are the results related to these parameters
 - How good is your model? What does it capture?
 - How does your study contribute to the objective stated in your introduction?

Appendices

- Details that your reader may not need to follow the overall picture but are required to support your work
- Need have narrative to describe any equation, table, or graph in the appendix

Further remark: graphs

- Caption should be short but informative and comprehensive
- Axes should be labeled
 - For dimensional quantities, units are required
 - Use symbols for data points and lines for theoretical values
 - For multiple curves, mark each curve clearly