

So You Need to Write A Lab Report?

A Concise Guide to Technical Report Writing

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The following is a brief guide to writing a technical lab report; primarily, it focuses on the content of sections. This is not complete by any means but should serve as a solid reference when writing. Each section is divided into two parts: *What the Author Needs to Know* and *How to Write It*. Although *Author* is singular here, the same ideas apply to group reports.

Abstract:

- What the Author Needs to Know:
 - Write this last; it is a condensed form of the paper (How is something supposed to be summarized if it does not exist yet?).
 - Pretend there will be a test about the paper; if someone reads *only* the abstract, they should be able to pass, but not ace, that test.
 - Gets a page to itself.
- How to Write It:
 - For each section of the paper (Introduction, Experimental Procedure, ... Conclusion):
 - Summarize the whole section into one paragraph.
 - Edit that paragraph to be no greater than half the size it started as.
 - Now combine the paragraph-fragments into either one or two paragraphs; total length should be less than half a page.
 - Read the whole thing over to make sure it makes sense; edit as needed.
 - Finished.

Introduction:

- What the Author Needs to Know:
 - Write this as a whole second to last (How is something supposed to be introduced if it does not exist yet?).
 - Introduces *the point* of the experiment (what relations or values were attempted to be quantified?).
 - Needs to encompass *all* theory that the reader needs to understand the purpose, methods, and results of the report.
- How to Write It:
 - Answer this question: *What was the point of this experiment; what relations or values were attempted to be quantified experimentally?* at the top of the section. Now write the rest of the report.
 - While writing other sections and when the author realizes that their current section needs background information:
 - Write that background information here.
 - Do not worry about the flow of the Introduction until the rest of the paper has been written.
 - Once the rest of the paper is written, then come back and organize this section; add transitions as needed to make sure it flows.
 - Finished.

Experimental Procedure (Methods):

- What the Author Needs to Know:
 - o Write a horrible version of this during lab (i.e., jot-down bullet points of what is happening as it happens).
 - o This is the first section written during the actual *paper-writing-process*.
 - o Answers the question *What was done?* (**NOT:** *What needs to happen? What should've happened? What will happen?* Etc.,); Best if answered in chronological order.
 - o Good practice to include Figures of the experimental set-up or Tables of testing parameters as appropriate.
- How to Write It:
 - o Change the bullet points recorded in lab into complete thoughts, sentences, and paragraphs.
 - o Read-through and compare to the lab manual; edit as needed.
 - o Finished.

Results:

- What the Author Needs to Know:
 - o Write this after the Experimental Procedure (Methods)
 - o This is part of the report and therefore requires complete thoughts, sentences, paragraphs, etc.
 - o Responds (quantitatively) to *the point* of the lab posed in the Introduction.
 - o Results of calculations are presented here; sample calculations in the Appendix are referred to here.
 - o Summaries (either as plots or tables) of data are presented here; non-truncated forms of data in the Appendix are referred to here.
- How to Write It:
 - o Provide the quantitative answers to *the point* as Tables or Figures.
 - o For each Figure:
 - In the text, introduce the Figure by number and dictate what is shown at a high level.
 - Show the Figure. (If a plot, be sure to have appropriate axis titles with units, plot title, and legend labels; title should not be a repeat of axis labels.)
 - Write the caption; should draw attention to the relation of interest or explain what is going on (should not be a repeat of the title).
 - Back in the text, discuss the meaning of what was shown.
 - o For each Table:
 - In the text, introduce the Table by number and dictate what is shown at a high level.
 - Write the caption; should draw attention to the relation of interest.
 - Show the Table; be sure not to have dead cells.
 - Back in the text, discuss the meaning of what was shown.
 - o Finished.

Discussion:

- What the Author Needs to Know:
 - o Write this in tandem with or after the Results section.
 - o Provides a concise, objective, and quantitative analysis of the results.
 - o This is *the most important* section; without it, the rest of the report is meaningless.
 - o Quantitatively answers the question *What did the results "mean"?* (i.e., what was the physical interpretation of the data collected, how did the experimental results compare to theory/literature?).
- How to Write It:
 - o For each value (or set of values) presented in the results:
 - Quantitatively compare it (or them) to its (or their) theoretical or literature counterpart.

- Discuss the meaning of this discrepancy; this must be done after the differences have been quantified; i.e., analysis first, conclusions second (this is engineering, not politics).
- Answer any questions posed in the lab manual not already answered.
- Finished.

Conclusion:

- What the Author Needs to Know:
 - Write this after both the Results and Discussion are completed.
 - Will sound repetitive to a point (do not worry too much about this).
- How to Write It:
 - Reiterate *the point* along with a succinct summary of the Experimental Procedure (Methods).
 - Quantitatively summarize the Results and Discussion together.
 - Discuss possible systematic errors (i.e., errors with the lab methods themselves, not mistakes made by the experimenters) and how these error would affect the Results.
 - Finished.

References:

- What the Author Needs to Know:
 - IEEE format is used for all technical journals; there are only a few exceptions.
 - Automated-reference software-services are good but can make mistakes; watch for these.
 - Gets its own page
- How to Write It:
 - Build alongside the report; assign numbering once the report is otherwise completed.
 - Finished.

Appendix:

- What the Author Needs to Know:
 - This is not the miscellaneous catch-all of the report; every item must have a purpose and be mentioned by Appendix title in the body of the report (e.g., "... sample calculations are shown in Appendix P.>").
 - Figures and Tables in the Appendix do not get captions; instead the sub-Appendix containing the Figure(s) or Table(s) has a descriptive title that acts as a caption for all items in it.
- How to Write It:
 - Build alongside the report.
 - Finished.

Overall:

- What the Author Needs to Know:
 - Make objective, concise, and quantifiable statements.
 - Avoid subjective adverbs (e.g., *mostly*, *many*, *better*, *worse*... etc.,).
 - Write everything in past tense; the only exceptions are referring to Figures, Tables, and Equations.
 - Unless noted otherwise, sections are printed directly after the predecessor (i.e., on the same page).