

Laboratory Reports

Purpose

Laboratory reports are a vital part of the scientific process. Lab reports should communicate the important work you have done in lab so that someone who was not there can understand and replicate your results. They also propose future studies and experiments or suggest alterations to pre-existing methods.

Lab reports should be written for someone who is familiar with the scientific field of study but has not performed this experiment.



Organization

Lab reports are commonly organized into 7 sections:

- Abstract
- Introduction
- Material and Methods (or Procedures)
- Results
- Discussion
- Conclusion
- References

This structure is general and can be changed depending on your instructor's preferences.

Abstract

The abstract serves as a synopsis or summary of the experiment. It is concise, often around 250 words, and briefly summarizes the experiment, results, and significance of the study. In general, an abstract would include a sentence or two for each of the following points:

- 1 Background/Objective
- 2 Hypothesis/Aim
- 3 Methods
- 4 Results/Discussion
- 5 Conclusion

For more help on this section, see the Writing Center's handout on abstracts.

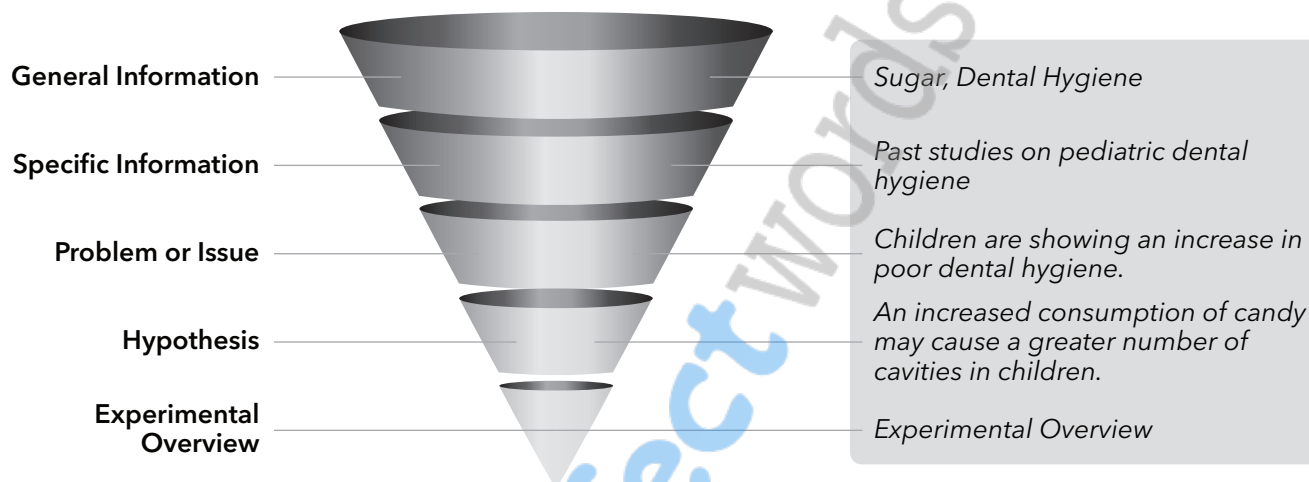
Abstract

1 Accuracy and precision are important scientific concepts, and understanding the difference between the two is imperative for the budding student. Additionally, different pieces of scientific glassware have varying degrees of precision and accuracy. 2 Here, the aim is to determine which method of measuring liquids is most precise. Based upon knowledge from previous studies, the prediction is that burets will be the most precise. 3 This will be determined by taking the mass of water delivered by each instrument and using density to determine the precise volume. 4 Upon completion of the experiment, it was determined that volumetric pipets were the most precise, delivering $10.00\text{ml} \pm .01\text{ ml}$. 5 This information will be key in deciding which glassware to use for future experiments.

Introduction

The introduction provides the reader with relevant background information, explains the experiment and what it aims to accomplish, and highlights its importance. Your introduction should include a purpose and hypothesis because you will return to those in your conclusion to evaluate the experiment. Good introductions cite relevant, primary sources, such as journal articles, in order to give reliable background information. **Note: Your textbook is a secondary source, not a primary source!**

Perhaps the most effective way to write an introduction is by using the funnel method. Begin with the most broad point of interest in your topic before narrowing your information down to specific details. For example, the following figure reflects a lab report about sugar and dental hygiene.



In this scenario, the first point is about sugar and dental hygiene, in general. To become more specific, the second point highlights past literature on pediatric dental hygiene. Then, a problem, such as poor dental hygiene in children, is raised. The last points include the hypothesis and a preview of content to be discussed in the remainder of the lab report.

Be sure to check with your professor for any specific instructions regarding content and formatting!

Materials and Methods

This section is important as it explains the precise way in which the experiment took place so that the reader can repeat it if desired. However, your materials and methods section should NOT look like your lab manual, and it should avoid lists. It is written in a past tense narrative form that avoids the use of the first person. Furthermore, you must assume the audience has basic knowledge of lab techniques. For example, instead of detailing the entire process of a titration, you can simply say "0.1M NaOH was titrated against an HCl solution of unknown concentration." However, if you change a standard procedure, it should be noted within this section. Also, include as much detail as possible about the materials used in your experiment (exact name of the material, concentration or mass, volume, company of origin).

Bad Example:

The following chemicals were combined into a test tube using a pipette: bovine serum albumin, NaOH, and Bradford reagent.

Good Example:

An Eppendorf tube was filled with 1 mL of 2 mg/mL bovine serum albumin (Sigma-Aldrich, Cat#XX-XXX), 3 mL of 0.15 M NaOH (Sigma-Aldrich, Cat#XX-XXX), and 1 mL Bradford reagent (Sigma-Aldrich, Cat#XX-XXX).

Results and Discussion

This is where you include all of your results and any relevant figures and tables (properly labeled). The results still utilize the narrative form found in the material and methods section. Your tables and figures should be able to explain your results without text, and your text should do the same without figures and tables. The two should parallel each other. **In chemistry, the results and discussion are written as one section. In biology, they are written separately.**

In the discussion section, use underlying theories to explain how you achieved your results as well as what they might imply. Include any errors and how they may have affected your data. **Note: Do not just report results, but analyze them.** This means discussing trends, shapes of graphs, any outliers, implications of the data, and comparisons to known values or theories. Also, a discussion regarding the certainty of your results is important. Pay attention to what your instructor requires for this section.



Conclusion

This is different from the results/discussion as the conclusion explains the results from the perspective of the entire experiment. Here, return to the original objective or hypothesis of the experiment. This is a good place to reference back to the introduction and past studies regarding this topic. Does this experiment contribute to or further the current research? If not, give reasons why. Include suggestions for further studies in this section. **Note: This section can be omitted in shorter lab reports. Refer to your instructor's preferences on this.**

References

Make sure to include any citations in the documentation style your professor prefers. Reference managers, such as Mendeley, can be helpful for this section.

Quick Tips

- Writing your lab report in an order that makes sense to you may help all of your points come together. Below is a suggested order for writing your report.
 - Methods
 - Results
 - Introduction
 - Discussion
 - Conclusion
 - Abstract
 - Title
 - References
- Understand the difference between a purpose and a hypothesis.
 - Purpose = an explanation of why the experiment is useful
 - Hypothesis = what you are trying to explain through testing
- Instead of saying that one variable affects another, explain how it affects it. Are they inversely proportional? Directly proportional?
- Titles of lab reports should be descriptive and detailed.
- Properly label all figures, tables, and graphs
 - In general, a table title should be above the table and a figure title should be below the figure. Make sure to check with your professor!
- Know the difference between affect and effect.
 - Affect = verb
 - Effect = noun
- Use academic hedging—the study "suggests" not "proves."