

Writing science laboratory reports

The main purpose of a lab report is to describe an experiment you have carried out in the lab and to communicate the results. Writing lab reports is part of learning to be a scientist, and provides you with experience in writing in a scientific style similar to that used in articles published in scientific journals. Because different departments might have different requirements, you should always check with your lecturer or demonstrator regarding any particular style and structure requirements they might have. However, reports that communicate the results of an experiment generally follow the format known as the 'IMRAD' format: **I**ntroduction, **M**ethod, **R**esults, (**A**nd) **D**iscussion. Each of these sections has a specific purpose and contains different information.

Introduction

The introduction provides an overview of the experiment and informs the reader about what to expect in the report. It should include the following information:

- Background information to put the experiment into context
 - What have you investigated?
 - Why is it worth investigating? (Significance)
 - What have previous studies found in this area?
- The aims of the experiment
- The hypothesis (this may be in your laboratory manual)

Method

In this section you explain to the reader how you carried out the experiment. It explains what you did and how you did it. It should be written in the past tense and include enough detail to enable a reader to replicate the experiment. This means that you need to be specific (e.g. detail the concentration of solution used, the time that the experiment sat in the water bath, the temperature of the oven). If necessary the method section can be divided into subheadings, such as



subjects, apparatus (or materials), and procedure. It should include the following information:

- The materials, subjects, and equipment (e.g. chemicals, experimental animals, apparatus) you used
- The steps you took (in chronological order) in carrying out the experiment

Results

This is a very important section of your lab report because it is where you present your findings. You need to present all relevant findings in a clear, concise, and accurate way that is easy for the reader to follow and understand. Never falsify your findings. Even if your findings do not support the hypothesis, they are *your* findings and should be reported.

You might find it useful to present some of your findings using a table or a figure. A figure is anything other than a table (e.g. graph, diagram, drawing, photo, map). Sometimes your lecturer will advise you which to use, but if you have to make this decision yourself, think about the most effective way to present your findings in a clear visual form. For example:

- Tables are useful for presenting summarised data in rows and columns
- Pie charts are useful for communicating findings expressed as different percentages of a whole
- Graphs for demonstrating a numerical difference or trends

It is important that the tables and figures you use summarise or enhance the information you present in the text of the report rather than merely repeating it. Tables and figures should be labeled and numbered separately as they appear in the report, so it is possible to have both Table 1 and Figure 1 in the same report. The number and label should be provided at the *top* of a table, and at the *bottom* of a figure. You must always refer to a table or figure in the text of your report, and when doing so, try to point out to the reader what it is you want them to notice. For example, '*As shown in Figure 1, almost all of the energy consumed (95%) was produced using non-renewable sources*'.

There are some things you should not include in the results section. You do not discuss your results here. Any discussion of your results occurs in the discussion section of the report. Raw data (i.e., data that hasn't been analysed or evaluated) should also not be included here but should appear in an appendix.

Discussion

This section of the report requires the most thinking. It is where you analyse what your findings mean and discuss them within the context of the information you have presented in your introduction. Your discussion should be clearly linked with the introduction and might include:

- Whether or not your findings support the hypothesis. If not, can you suggest any reasons why?
- The extent to which your findings agree with previous studies in the area. If not, can you suggest any reasons why?
- Whether there was anything you could have done differently in terms of methodology and procedures.

The final paragraph of the discussion section should be a concluding paragraph that states the significance of your findings. You should indicate the extent to which your findings are useful or conclusive, indicate the possible direction of further research, and discuss what improvements could be made to the methodology for future studies.

Other sections of lab reports

References

You will need to include a list of references at the end of your report. This list must contain all the references you have cited in the report (e.g. textbooks, journals, lab manuals, web sites). If you have read a reference but haven't cited it in the report, you do not need to include it. (However, if you are asked to provide a *bibliography*, you include everything you read, whether you cite it or not.) You need to check with your lecturer or demonstrator regarding the referencing style requirements in your department. For further information about referencing, see the LLSU pamphlet, *Referencing essentials*.

Appendices

You won't always have to have an appendix in your report, but if you have some detailed information or raw data that you want to include, you can include this at the very end of the report (following the references). Appendices should be numbered (e.g., Appendix 1, Appendix 2) and have a clear heading. When you want to refer the reader to information that is in an appendix you need to indicate where this can be found. For example, '*Detailed figures can be found in Appendix 1*'.

Abstract

Some departments may require you to write an abstract as part of your lab report. The abstract is positioned at the very beginning of the report (before the introduction) and summarises the whole report. It is usually brief (around 5% of the total word count) and written in a single paragraph. The information in the abstract should be presented in the same order as it appears in the report, and should include: the aims of the experiment, an overview of the method, a summary of the main findings, and your conclusions. The abstract can be difficult to write and is best left until last when you know exactly what your findings and conclusions are.

Writing style in lab reports

When writing a lab report it is important you use a scientific writing style. This means you should aim for writing that is clear, objective, accurate, and brief.

Clear writing

It is best to use short simple sentences rather than long complicated ones that have the potential to confuse the reader. Although you will need to use specialist terms in your report, you should also use familiar non-technical terms where possible. Unfamiliar, abstract technical terms that are not defined clearly can be ambiguous and confusing, as can vague qualifying words such as *rather*, *really*, and *quite*.

Objective writing

Scientific writing should be unbiased and unemotional. You should present facts or evidence for your argument rather than using emotive language, presenting only one point of view, or presenting only selective information.

Accurate writing

The information you present in your report should be accurate and complete. For example, statements such as, '*The volume increased slightly in the first experiment, but a lot more in the second*' are not accurate and do not provide the reader with accurate, unambiguous information. Similarly, if you are making comparisons, it is important that you are consistent in your use of units of measurement. Statements such as, '*The volume increased by one quarter in the first experiment, but decreased by 12% in the second*' can be difficult for the reader to follow.

Brief writing

It is important that every word you write in your lab report counts, and that you don't waste words repeating ideas or using complicated language. Sometimes you might be tempted to use complicated, fancy language to make a small amount of information go a long way. However, the person marking your lab report wants clear writing that is easy to understand, and this means using brief rather than complicated ways of presenting information. For example, rather than writing *not unlikely*, use *likely*, and rather than repeating ideas, as in *exact duplicate*, use *duplicate* or *copy*.

Note: The information presented in this pamphlet was adapted from Rhoden, C. & Starkey, R. (1998). *Studying science at university: Everything you need to know*. St Leonards, NSW: Allen & Unwin.