How to Write the Scientific Report

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Why do we write research reports

- You did an experiment or study for your science class, and now you have to write it up for your teacher to review. You feel that you understood the background sufficiently.

✓ But how exactly do you write all that?

✓ What is your teacher/reviewer expecting to see?

- your writing will likely meet the expectations of your audience–including your teacher.

- Main points to be considered:

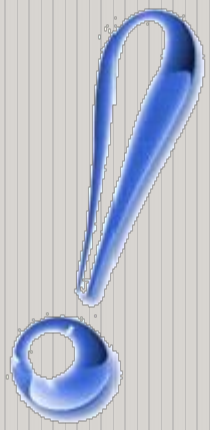
✓ Generally speaking, people investigating some scientific hypothesis have a responsibility to the rest of the scientific world to report their findings, particularly if these findings add to or contradict previous ideas.

✓ People reading such reports have two primary goals:

i. They want to gather the information presented.

ii. They want to know that the findings are legitimate.

Your job as a writer, then, is to fulfill these two goals.

HOW 

Communicate clearly and answer the key questions

- At the student level, your main goal for a lab report should be to communicate clearly to your instructor what you did and observed in your study (or experiment), as well as what the results mean.

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- Some of the key questions an instructor might ask you in determining your level of understanding include:

✓ Do you have a clearly stated objective or hypothesis?

✓ Do you present the data in a clear and concise fashion?

✓ Are you able to interpret the results of the study?

✓ Can you account for any discrepancies in your results?

✓ Do you present a thoughtful conclusion?

✓ Do you understand the overall relevance of the findings from the study?

- The lab report answers such questions in a formal and structured way.

Continue …

- You will usually follow the following sequence in actually writing your lab report, but note that the abstract (if you include it) will come first among these elements in the final report:

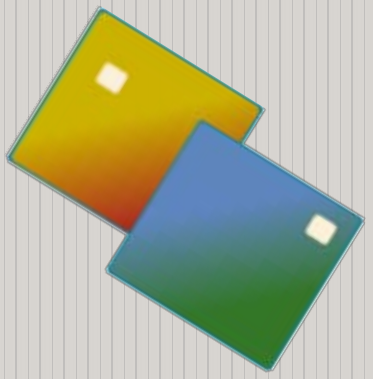
- Abstract
- Introduction
- Materials & Methods
- Results
- Discussion
- References
- Appendix

So…

- A report is a clearly structured document that presents information about an investigation that you have undertaken.
- The clear structure allows specific parts of that information to be easily located by the reader.

Is it only one type report?

Reports types



There are many different types of reports. At university, however, the most common types of report you may be asked to write are:

1. Analytical report.
2. Practical report.
3. Progress report.

Analytical reports

- ✓Focus on investigations into events, organizations, situations & issues.
- ✓ Provide the reader with information that can be used to make decisions and take further action.
- ✓ Common in the social sciences, business courses, and engineering

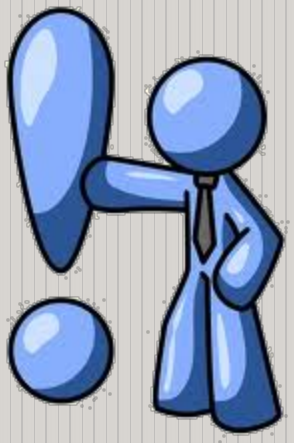
Progress reports

- ✓Assessment that takes place during a project or process, that conveys details such as what sub-goals have been accomplished, what resources have been expended, what problems have been encountered, and whether the project or process is expected to be completed on time and within budget.

Scientific reports

- ✓give an account of what has happened in a practical session or as part of an experiment.
- ✓They are common in science-based courses.

What ever report type you want to write……You have to remember!!



- The most important rule to remember when writing a paper is to follow the instructions your teacher provides.
- Teachers always have the prerogative to decide what rules, formats, or procedures they prefer for any report.
- so the teacher's guidelines for any assignment will overrule instructions you find on the Internet or in a style guide.

Continue...

- Use supporting details.
- Use your opinions wisely and appropriately.
- Avoid absolute statements.
- Do not misuse scientific terms: like "variable" and "significant result".

Lets start our trip in the report contents..

- The basic format scientists have designed for research reports:

✓ Introduction

✓ Methods and Materials

✓ Results

✓ Discussion

- This format, sometimes called "IMRAD" may take slightly different shapes depending on the discipline or audience; some ask you to include an abstract or separate section for the hypothesis, or call the Discussion section "Conclusions," or change the order of the sections
- However, the IMRAD format was devised to represent a textual version of the scientific method.

Section	Scientific method step	As well as…
Introduction	states your hypothesis	**Explains** how you derived that hypothesis and how it connects to previous research; gives the purpose of the experiment/study.
Methods	details how you tested your hypothesis	**Clarifies** why you performed your study in that particular way.
Results	provides raw (i.e., Uninterpreted) data collected	**Expresses** the data in table form, as an easy-to-read figure, or as percentages/ratios.
Discussion	considers whether the data you obtained support the hypothesis	**Explores** the implications of your finding and judges the potential limitations of your experimental design.

Table: 1 shows how each written section fits into the scientific method and what additional information it offers the reader.

What should I do before drafting the lab report?

- To make sure you know enough to write the report, complete the following steps:

✓ Read your lab manual thoroughly, well before you start to carry out the experiment.

✓ Make use of your lab supervisor as you perform the lab.

✓ Plan the steps of the experiment carefully.

✓ Record the data carefully so you get them right.

✓ Consider your audience, and think beyond the lab/classroom.

- Once you've completed these steps as you perform the experiment, you'll be in a good position to draft an effective lab report.

Title:

- ✓ A title should be short and concise but comprehensive.
- ✓ You can use a title while working on the report but choose the final title when the work is ready.
- ✓ A good title is brief but informative, and says exactly what your paper is about.
- ✓ You can choose 3-4 key words and construct a headline containing those words.

Abstract:

- You should present a summary of the most important results.
- Normally nothing is mentioned about localities or methods in the abstract and absolutely no discussion but one sentence on how the results are interpreted.
- It should be short around 150 words.
- A reader should be able to grasp the full scope and significance of the work reported without having to read the entire report.

- Too much background or methods information
- Figures or images
- References to other literature, figures or images
- Abbreviations or acronyms

Introduction:

The introduction should contain four basic elements:

- ✓ The purpose (objective).
- ✓ The scientific literature relevant to the subject (background).
- ✓ The hypothesis.
- ✓ The reasons you believed your hypothesis viable.

So, the introduction should answer these questions:

- What is the nature of the study?
- What is the objective of the study?
- What background information is necessary for the reader?
- What particular method was used to conduct the study? Why?

- Too much or not enough information.
- Unclear purpose.
- Confusing structure.

How do I write a strong Materials and Methods section?

- The methods section should fulfills the readers' expectations.

✓ **How much detail?** Be precise in providing details, but stay relevant.

✓ **Rationale:** Be sure that as you're relating your actions during the experiment, you explain your rationale for the protocol you developed.

✓ **Control:** Most experiments will include a control, which is a means of comparing experimental results.

Two things are especially important in writing about the control:

1. Identify the control as a control.
2. Explain what you're controlling for.

Results:

- Your Materials and Methods section shows how you obtained the results, and your Discussion section explores the significance of the results, so clearly the Results section forms the backbone of the lab report.

- This section provides the most critical information about your experiment. But it doesn't provide anything else, which explains why this section is generally shorter than the others.

- Most Results sections feature three distinct parts: text, tables, and figures.

How to Design Effective Tables and Figures

Remember
Tables should have relevant data and variables but not experimental conditions in the column.

- **Tables:**

✓ An effective way to present repetitive results is to use Tables and Figures.

✓ An effective table allows the reader to grasp the information clear enough to make the meaning of the results understandable without reference to a text.

✓ A table may be useful in presenting operating conditions in the Materials and Methods section. This is effective because it is clearer to read from a table than from the text.

✓ A table may be useful for presenting properties for chemicals or reagents used in your experiment

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- **Figures:**

✓ Figures are used when clarity and conciseness are required and because certain types of data are more effective if they are presented in figures, such as graphs.

✓ Figure is effective for the Materials and Methods section to describe a the principle of a new instruments.

✓ Figures is effective for the Materials and Methods section to make a flow diagrams of the work plan.

- Raw data
- Redundancy
- Discussion and interpretation of data
- No figures or tables
- Methods/materials reported

How do I write a strong Discussion section

- Basically, the Discussion contains several parts, in no particular order, but roughly moving from specific (i.e., related to your experiment only) to general (how your findings fit in the larger scientific community).
- **In this section, you will, as a rule, need to:**

✓ Explain whether the data support your hypothesis.

✓ Acknowledge any anomalous data or deviations from what you expected.

✓ Derive conclusions, based on your findings, about the process you're studying.

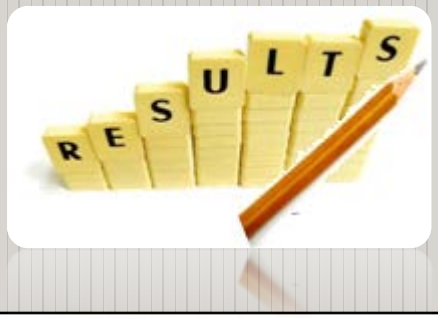
✓ Relate your findings to earlier work in the same area (if you can).

✓ Explore the theoretical and/or practical implications of your findings.

✓ Suggestions for improvement and future research?

References:

- List of works used to write the lab report.
- References are generally arranged in alphabetical order by the authors' last names, but this will depend on which citation style your teacher wants you to use.



Format

- Certain general rules are commonly followed in scientific writing.

✓ **Flow:** Readers interpret prose more easily when it flows smoothly, from background to rationale to conclusion. Don't force the reader to figure out your logic.

✓ **Abbreviations:** Use standard abbreviations (hr, min, sec, etc) instead of writing complete words. Define all other abbreviations the first time they are used, then subsequently use the abbreviation.

- **As a general rule,** do not use an abbreviation unless a term is used at least three times in the manuscript.

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- ✓ **Past, present, and future tense:**
  - Results described in your report should be described in past tense (you've done these experiments, but your results are not yet accepted "facts").
  - Results from published papers should be described in the present tense (based upon the assumption that published results are "facts").
  - Only experiments that you plan to do in the future should be described in the future tense.
- ✓ **Proofreading:** Always spell-check your report and carefully proofread it before submission.

"Write with precision, clarity and economy. Every sentence should convey the exact truth as simply as possible."

Instructions to Authors

Ecology 1964


Thank you