



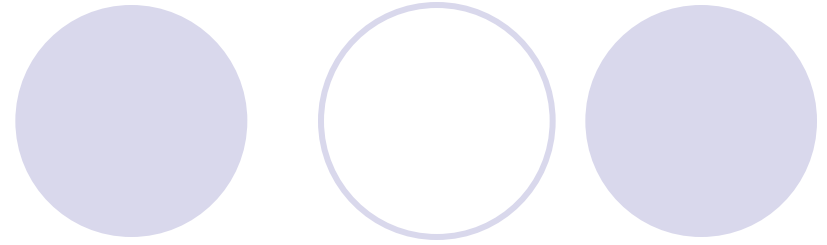
Writing Strategies for Science students

Student Learning Commons

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General technical strategies

- **GRAMMAR** counts!

- Writing that is difficult to read frustrates the audience (includes spelling, punctuation, etc)
- If the reader spends too much time trying to understand what the author is saying, the technical content becomes lost
- Spell-check may not always be reliable (*performed* instead of *performed*, *form* instead of *from*)



General technical strategies

- Be **CONCISE**.

- Since your character space is restricted, eliminate all extra/unnecessary words
- Try reading your work out loud. If you run out of breath, your sentences are too long!
- State something only once. Avoid repeating words and ideas (unless they are really important).



General technical strategies

- Being **CONCISE:**

Example

The cells were washed by adding 10ml of PBS to the coverslip and swirling it around, then removing the PBS gently with a disposable pipette. The cells were washed 3 times in this manner and the wash was removed. The secondary antibody was added to PBS to make a 1:200 dilution and then added to the cells on the coverslip. The cells were incubated with the secondary antibody for 45 minutes.

Concise version

Cells were washed 3 times with 10ml of PBS then incubated with secondary antibody (1:200 in PBS) for 45 minutes.



General technical strategies

- Be **PRECISE**.

- Avoid ambiguity – ensure that your words say exactly what you mean (using the minimal number of words)
- Get someone else to read your writing. Does it sound awkward? Do they understand what you are saying?
- A picture is worth a thousand words... (especially in lab reports!)



General technical strategies

- Be **INFORMATIVE.**

- Most often, the audience will not be as informed as the author
- It may be helpful to include a few sentences to refresh the reader's mind on a subject rather than assuming they know it: establish a background
 - If the reader needs more information, they can go to your referenced source.

Formal Lab Report



- Your lab report will show results that have been analyzed, critically evaluated, and neatly compiled
- If you copy anything directly from another source, you **MUST** use quotation marks and reference the source
- If you go to a source for information and use that information in your own words, you must always reference the source

Formal Lab Report: General Guidelines

● Title

- A lab report's title should tell the reader exactly what the paper is about – it is never general or vague. Instead of

“Isolation of beta-tubulin using immunological methods”,

it should be: “Immunoprecipitation, immunoblotting, and *in vivo* immunobiochemical localization of beta-tubulin in human A431NS cells”

* Capitalization of first letters may or may not be required

Formal Lab Report: General Guidelines

- Abstract

- Briefly describe purpose of experiment, provide *concise* and *short* summary of the experiment performed, and summarize results
- It should contain the most significant information from each section of the paper and the *final point* (final result)
- Should be between 75~150 words – include *highlights* from introduction, materials/methods, results, and discussion

Formal Lab Report: General Guidelines

- I.e. Include an introductory sentence, brief sentence about techniques, highlights of important results, and concluding remarks about significance of such results
- Note: there should not be any references in the abstract

Formal Lab Report: General Guidelines

- Introduction

- Provide background to biological molecule(s) manipulated during experiment, as well as techniques employed (approximately 1~1.5 pages)
 - Where is the molecule found? What does it do? Any significance? Why are you using this molecule?
 - Write about technique used in experiment in context of what you plan to learn about molecule(s) of interest
- There is no need to be extremely detailed about methods you are using – give overview of each technique (the principle, not the procedure)

Formal Lab Report: General Guidelines

- Example sentences from introduction:

- “Previous studies seeking to characterize cytosolic proteins have employed immunobiochemistry in the isolation and localization of such proteins...”
- “Immunoprecipitation takes advantage of specificity of antibody binding to precipitate a protein of interest out of a heterogenous mixture...”
- Information should be relevant in the context of your experimental report
- Typically concludes with a single paragraph outlining the goals of the experiment
- Think upside down triangle: going from general principles and information about the molecule, to goals of the experiment

Formal Lab Report: General Guidelines

- Materials and Methods:
 - Most of the time, you will be following your lab manual closely in performing experiments
 - It can be as brief as: “All materials and methods were followed as described in the XXX-XXX Spring 2008 Lab Manual, pp. xx-xx” – other times, your professor may want to see the summarized version of the protocol
 - ***For any section of the lab report, always make sure you know exactly what the professor/TA expects. When in doubt, ask: how long the abstract should be, whether or not the above quoted sentence is enough for materials and methods, amount of detail required for figure titles, citations, etc**

Formal Lab Report: General Guidelines

- **Materials and Methods**

- You may or may not list the lab manual in the references, depending on the professor: the lab manual is a secondary resource; therefore, some prefer not including it
- *Any changes to protocol should be written out.* Ex) The concentration or dilution of a particular solvent may be different from the lab manual. In this case, this should be mentioned along with “All materials and methods were followed as described in the XXX-XXX Spring 2008 Lab Manual, pp. xx-xx”
- Anyone should be able to look at your materials and methods section, and be able to know exactly what you did

Formal Lab Report: General Guidelines

- Results

- The most important section of your report!!
- Should contain results obtained from experiment *without discussion* (present your data, but do not go into details about its implications, etc), in a neat fashion (use tables and figures)
- All figures/tables must be accompanied by a descriptive text that describes *experimental flow* of the results section. Example sentence: “Since the results of the assay A revealed that fraction X contained the highest activity of Y, this fraction was selected for affinity chromatography.”

Formal Lab Report: General Guidelines

● Results

- Emphasize **patterns** revealed by your results and **significant results**, but do not go into explanations – this is for discussion. In results, simply point it out!
- All formatted figures should be clearly labeled (Figures: has title/explanation on bottom; Table: has title/explanation on top) – **MUST** be descriptive!

Formal Lab Report: General Guidelines

- Discussion

- Most interesting part of your report!!
- Discuss the results and how the results contribute to the current state of knowledge in the field
- Talk about reliability of results, experimental controls, potential errors in experiment, and significance of results obtained
- Think about why things didn't work and what that means
- Be specific! Remember that in scientific writing, every statement of fact or opinion must be backed by evidence

Formal Lab Report: General Guidelines

- References

- Your reference section should have complete scientific references: condensed or incomplete referencing format is not acceptable
- All sources cited in the references section of your lab report should be integrated in the body of the lab report using a number (in brackets) corresponding to the order of the citation in your references
- If not given a particular citation format, remember to ASK!!

Critical Review



- Writing style:

- A scientific review should be concise, precise, succinct, and object
- Stick to short, effective sentences
- Usually better to say less than to say more (but of course, include all necessary details)

Critical Review

A decorative graphic consisting of six circles arranged in two rows. The top row has three circles: a solid light purple circle, a hollow light purple circle, and a solid light purple circle. The bottom row has three circles: a solid light purple circle, a hollow light purple circle, and a solid light purple circle.

- **Scientific style:**

- Avoid regurgitation!
- Critically evaluate experiments and results, and comment on them (instead of repeating what was done in your own words)
- Be specific: if you think that another or follow-up experiment may be useful, suggest it using specific terms, i.e. what do you think should be done specifically, instead of “more experiments are needed”

Critical Review



- Avoid long-winded introductions and extensive review of literature
- Stick to the experiments, results, and discussion without going into too much background research: *focus on the paper!*
- One or two sentences should be sufficient to summarize scientific background of the paper
- Outline: VERY brief summary of the importance of the research and how it was conducted, followed by critical review of paper

Critical Review



- Some questions to answer:
 - Examine materials and methods. Do they make sense scientifically? Are there ways to set up a better experiment that will lead to better results? What about their use of controls?
 - Compare results to discussion. Are their interpretation of results reasonable? Do their results support their discussion?
 - What are some ways their experiment could be improved? (You could also point out what they did well)

References & Thanks



- Dr. I. Kovalyova

- MBB 309 professor, spring 2008
 - Lab manual & WebCT resources

- Jenny Lum

- MBB 309 technician, spring 2008
 - Lab manual

- Mark Warwas

- MBB 309 writing TA, spring 2008
 - WebCT resources