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 *(preformed 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
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.
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.
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

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