BIOE202: Tips on technical writing

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Parts adapted from Sameer Bajikar, Karin Holmberg, and Kelsie Timbie (IDEAS lab at UVA)
Reference: How to Write and Publish a Scientific Paper by Robert A. Day and Barbara Gastel

General –

- Write in the past tense when describing your results, present tense when you are discussing a current problem or a problem to solve in the future.
- Never use “I” unless you are the solo author. When necessary use “we” instead of “I”.
- All figures should have a title and caption below it.
- All tables should have a label and title above it.
- All tables and figures should always be referenced in the main body of your paper and ordered by reference.
- Labels to figures and tables should always be on the same page as that figure or table.
- Never use contractions or symbols in your document as words (i.e., in the text of your document you should not use % or #, write out the word); exceptions include in tables in which you are indicating a unit. Then %, in place of “percent” is acceptable.
- When using abbreviations be sure to describe to the reader what the abbreviation is at the first use in the text (i.e., phosphate buffered saline (PBS), fetal bovine serum (FBS), etc.)
- Scientific writing never uses the word “proves” (or any other derivative of that word); there is always room for it to not be true. Use less definitive words such as “the data suggest” or “the data indicate”.
- Avoid using a lead in such as, “in part 2 of the lab” or “in the next section of the lab”. Just state exactly what you are doing. It will flow just fine without that lead in. Scientific writing is very clear and succinct. Get to the point! Don’t lose your readers in “writing fluff”.
- Not every detail is essential to understanding the relevance of the experiment or the resulting data. Use your judgment about what to include. For example, you will not be able to show all images and/or raw data.
- Experiments/results do not always make the most sense presented chronologically; think about how the “story” you are telling makes sense.
- Be sure to cite primary literature when necessary.
- Be very careful when reviewing your report before submission to address typos or other errors. Reports should be treated like publications. You should be proud of the work that you submit.
- Be careful that the “voice” does not change between sections in the report (it is disruptive to the reader when it is obvious that different people wrote different parts of the report).
Title –
• Should convey the content of the report but not be unnecessarily long or wordy

Abstract –
• Should contain the following:
  o General statement about why you are doing this experiment (global picture)
  o Brief summary of materials and methods
  o Summary of results (include numbers). Give a reason for the reader to want to read the rest of the article.
  o Discussion/conclusions. Include specifics as well as global. (i.e., these experiments indicate….which means that….)

Introduction –
Motivate the study (why is this experiment worth doing?) and provide any background information that will help the reader understand the context and purpose of the study and the questions being addressed.

Figures –
Figures should be self-explanatory. The reader should be able to interpret the experiments that you did and the data obtained without reading the text.
• Do not use smaller than 6.5 font in figure legends/labels
• Include error bars if applicable
• Include scale bars for any microscopy images
• Include all units
• Color should only be used when it conveys information
• If you use a color scheme, be consistent from figure to figure (if there are multiple figures for the assignment or report)
• Maximize use of the figure space, no large white areas! Often several data sets can be presented together on one figure if they are logically connected.
• Be clear in how you show your data. Try several ways of presenting the same data and think critically about what would make the most sense to someone who did not do the experiment.

Tables –
• Tables should only be used when necessary (i.e. more than a few data points). If there are only a few numbers to report, consider reporting these numbers in the text.
• Tables should read down, not across (the data of one type should be in the same column, not the same row).
• Tables should always include a descriptive title displayed above the table.
• Units need to be defined.
Methods –
The Methods section should include all the information such that another researcher could duplicate your results.

• In scientific literature, scientists must report where reagents were obtained from, for example “Cell viability was measured using Trypan blue (Sigma)”. Similarly, the source of cell lines or DNA constructs must also be acknowledged (including those not commercially available), for example, “3T3-L1 cells expressing GFP were obtained from the Jensen Lab”. This is not required for BIOE202 reports and assignments unless otherwise specified.

• Details that do not affect the experiment need not be included (ie “The dilution series was performed in column 2 of a 96-well plate.”) In this example, someone could obtain the same data if they performed the dilutions in column 3, so the details are not relevant.

Results –

• Every table or figure needs to have supporting text in the main body of the results section. Supporting text can be used to describe the figure or use the figure to help clarify your text.

• Observations should be included in the results section.

• A general statement on how stats can be presented:
  o A significant difference between group A and B was observed (p≤0.05).

Discussion –

• Think critically about your results and explain any discrepancies between what you saw and what was expected.

• Interpret your results. What does the data mean? Yes, it is significantly different, but is that good, bad, or does it really matter?

• Support your arguments with literature when possible (and include in your References section). If something went wrong with your experiments, explain what you believe the problem to be and why (don’t just guess or give a laundry list of reasons) and provide possible solutions.

• If the data are inconclusive, discuss the next steps in understanding/solving the problem.

References –

Be sure to properly reference any sources you used in your assignment/report. Any figure that is not your own MUST be cited whether it is from a journal article, BIOE202 course materials, or another lab group. Use consistent formatting.

• Citation managers (EndNote, RefWorks, others) are highly recommended. They can save you a lot of time by formatting your references for you and reordering the numbers of your citations as you rewrite and revise a document. See http://www.library.illinois.edu/learn/research/citation/index.html. EndNote Web and RefWorks are free for UIUC students.
• If you use a figure or diagram that is not your own you should include the citation in the figure caption. BIOE202 students are highly discouraged from using existing figures or diagrams in their reports.
• If you base a figure or diagram off someone else’s work, you still must cite that person. Example: “Figure adapted from (5)”.
• Examples of how to cite in the text:
  o As demonstrated by Smith et al. (1)
  o Previous studies have shown that …. (1-3)

Protocols –
Similar to Methods, protocols should provide enough detail such that another researcher could duplicate your results.
• Protocols are different than methods in that they are not written in the past tense.
• Protocols give directions. For example, “Heat the agarose-TAE solution until boiling.” Instead of “The agarose-TAE solution was heated until boiling.”