Module 6.1: Learn - Biology

Overview

In this section, we will focus on the results and discussion. These are the main elements of a research paper. They describe and detail what work was done, what resources were used and created, and describe what is still needed or should come up next in the field.

Citing Papers

Before we begin, one thing we want to emphasize is to write in your own words and always give credit where credit is due! When faced with the task of scientific writing, it is tempting to use sentences from papers you have read as background as an explanation or justification for your own results, but to quote Mando, this is not the way. Instead, before you start writing, set up citation manager software so that you can easily cite results and tools made by others and then you are free to continue on detailing your own results from your own work.

Popular citation managers include: 1) Endnote (there's a basic version available for free), 2) Zotero (free), and 3) Paperpile (free trial). All of these allow you to import citations for papers and insert them in the correct format as you write your own paper. You can refer back to the papers that we have read for examples of how this is done.

Here is a video that introduces citation managers if you have never used one before:

Video. What are citation managers?

This video will show you how to use two popular citation managers,
Zotero and Mendeley.

View transcript. (https://canvas.asu.edu/courses/122165/files/55663054?wrap=1)
(https://canvas.asu.edu/courses/122165/files/55663054/download?download_frd=1)

If you don't do this, it's plagiarism and trust us when we tell you that people can tell when you are talking about th
though you had done them (it's not a good look). No one expects that you came up with everything from scratch·
clear and confident about the work you did and the ideas you contributed to the project.

Storyboard of figures to writing the Results section

Ok, with that out of the way, let's get to writing. In the previous module, you will have started to plan out the figur
include and what order you will have them in. Revisit that storyboard to make sure you can easily follow the logic
next and that this logical order addresses the concept you are writing about.

The Sacred Heart University Library contains a **nice guide on how to write the results for an academic resea (https://library.sacredheart.edu/c.php?g=29803&p=185931)** .

To summarize, each result paragraph should have:

1. An introduction sentence that tells the reader the main idea of the result you are going to present
2. A description of the results (figures, tables, etc) that points the reader to the parts that are important to notice
3. A conclusion sentence that states what you can understand based on the results described in that paragraph

If you have storyboarded your figures well, you can literally go in order with one Results paragraph for each figur that this is how the Results section in publications typically are organized– related figures are put together in figu about in the order that they appear.

In the Results section, you are clearly stating your results and directly stating how those figures address the ques You are not speculating about what they could mean or commenting on your experiences doing the work (save th Discussion section next).

More pro tips:

1. **Don't try to use flowery language.** Aim to be clear, accurate, and easy to understand
2. **Be detailed in how you describe figures**. For example, "Genes are expressed differently in females and ma as good as "Differential expression analysis of normalized gene expression values shows that 13 genes are s upregulated in female term placentas and 10 genes are significantly upregulated in male term placentas (Figu
3. **Write out all the results in simple words first so you can make sure it all makes sense together before** you don't spend all your time obsessing over one thing at the beginning when you end up cutting it by the enc
4. **Don't hesitate to ask someone else to read something if you are not sure it makes sense the way you** Slack channel is a great way to do this.

Figure Legends

Now that you have described your results in the Results section, go through each figure and write a detailed lege

Go through each figure and come up with:

1. Brief title stating the main conclusion of the figure (ex: Genes are differentially expressed by sex in term place

2. What specific details of the figure mean: what all the colors, axes, abbreviations, symbols, etc refer to (ex: Re expression in female samples, blue points for male samples.)
3. Relevant methods and statistics if necessary (ex: Student's t-test p-values show significant pairwise comparis

Additional examples for figure legends. (https://www.thesavvyscientist.com/how-to-write-a-figure-legend/)

Speculations and future directions in the Discussion section

The Results section should be all business; the Discussion section is for you to talk about the big picture.

The Discussion can include:

1. Higher level interpretations that involve multiple figures in your work
2. What broader impacts or implications your work has in the field (gaps your research is filling)
3. Other applications for this work
4. What you see as sensible follow-up studies, including data that should be validated in other studies or the ne answering the research question
5. Any limitations of the current study that need to be considered for any follow up studies, or studies where ano your approaches to answer their own research questions
6. Unexpected results or ways your study is breaking from what is usually done or thought by other researchers

Here is a **guide to help you write the Discussion section (https://library.sacredheart.edu/c.php?g=29803&p=**

Editing the Abstract

In the last module, you drafted the Abstract to help you list out the main ideas you want to write about. Now that through the results, figures, and discussion, revisit the abstract and make sure that you:

1. Add in any main ideas you have figured out along the way to fill out holes in your logic
2. Make sure that your final order of results is reflected in the abstract
3. Add detail to make your statements more clear and accurate knowing what figures you have in your paper

Introduction and title

By this point you will have clearly described the work that you have done, good job! The last sections written wh scientific paper are the introduction and title. Many would argue that this is the most difficult part because you ha what you want to include as ***relevant*** background for your work and make your title catch the eye of as many res The Introduction section typically includes an explanation of the system being studied (placenta), results of key p lay the ground work for what you are studying (trimming software paper, placenta sex differences paper), and des that your study addresses (how trimming affects differential gene expression results). The title should be as shor while having enough keywords to capture your main results.

Since we do not yet know what results will be included in the final manuscript, you will not be responsible for writi will proceed as though a version of the learning materials for this class will be written up as introductory material you are interested in working on the research and full manuscript after this course, please reach out to the instruc to have you on board. We encourage you to continue to follow the manuscript we are writing based on our resear does trimming affect sex differences in gene expression in the human placenta?"
(https://urldefense.com/v3/__https://docs.google.com/document/d/1H7BgKNMtk0jH_9eblCeV4fX8WEQ4SkmqR4i2XK dwAv5BmarQ!b9O3krbLfcz4hEzU06GQI2nWfrWgfpR7U2uzDYqvVfVHY59HIQSsT3swB-hasgfuVlHfR8CWF5T0jEk$)

Sex_Diff_Placenta_Parameters_Manuscript.docx
(https://urldefense.com/v3/__https://docs.google.com/document/d/1H7BgKNMtk0jH_9eblCeV4fX8WEQ4SkmqR4i2XK dwAv5BmarQ!b9O3krbLfcz4hEzU06GQI2nWfrWgfpR7U2uzDYqvVfVHY59HIQSsT3swB-hasgfuVlHfR8CWF5T0jEk$)

Module 6.1 Additional Resources

- **Famous article that discusses how to write a paper (https://intra.ece.ucr.edu/~rlake/Whitesides_writing_**
- **Ten Simple Rules for Writing Research Papers (https://urldefense.com/v3/__https://journals.plos.org/plos id=10.1371*journal.pcbi.1003453__;Lw!!IKRxdwAv5BmarQ!b9Rx0jVmLXb70aZZkZ5QIC5Gv9ZWaTtWQUB5DKTV2 vGAFwKqJYFe-JEizUE$)**
- **Ten simple rules for structuring papers (https://urldefense.com/v3/__https://journals.plos.org/ploscompbi id=10.1371*journal.pcbi.1005619__;Lw!!IKRxdwAv5BmarQ!b9Rx0jVmLXb70aZZkZ5QIC5Gv9ZWaTtWQUB5DKTV2 vGAFwKqJYFeKk8xjME$)**