EFFECTIVE WRITING FOR FIRST YEAR SCIENCE STUDENTS
WHY WRITE LAB REPORTS?

- To accurately report the methods and findings of an experiment (experiment should be repeatable)
- To learn how to communicate effectively in a particular discipline
- To demonstrate understanding of theories, procedures and results related to an experiment
- “To discuss results in an analytical and professional manner” (BIOL 103 lab manual)
Writing to *communicate* is:

FIRST,
THINKING through a page or a keyboard to determine your response to the ideas you encounter …
Editing *while you write* is like pulling a shirt out of the washing machine, folding it, and putting it back in.
WHAT YOUR READERS ARE LOOKING FOR:

- Your observations, ideas and insights
- Links, insights, patterns, and analysis
- Coherent and logical organization, as well as …

CLARITY & CONCISIION
THE PARAGRAPH: NOT JUST A RECTANGULAR BLOCK OF TEXT!

1. What is the point of this paragraph?
2. Do these sentences back up my point?
3. Why does this point matter, in relation to the purpose of my report?


Bcdefg. Hijklmnopq rstuv. Wxzz!
We think of communication as an essentially human practice, but it’s is a survival activity among most forms of life on this planet. The dance patterns of bees in their hive help to point the way to distant flower fields or announce successful foraging. Male stickleback fish regularly swim upside-down to indicate outrage in a courtship contest. Male deer and lemurs mark territorial ownership by rubbing their own body secretions on boundary stones or trees. And frightened dogs often place their tails between their legs and run in panic.

--Adapted from Olivia Vlahos, Human Beginnings
“(1) The product we are attempting to design is not currently found in the market. (2) For this reason there is not, currently, any direct competition for our product. (3) For this reason the final price for the device will not be as critical as it would be for a product that the market is already saturated with. (4) What will be more important than the price of our product is safety. (5) A traditional prosthetic leg requires no surgery post amputation. (6) Our new prosthetic leg requires minimally invasive surgery, but any surgery comes with risk. (7) If the product with required surgery yields a considerable chance of, death, infection, or injury, patients will likely opt for the more traditional prosthetic system.”
<table>
<thead>
<tr>
<th>Section</th>
<th>Purpose</th>
<th>Answers these questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td>Explain central question</td>
<td>What did you do and why?</td>
</tr>
<tr>
<td></td>
<td>Give context for the investigation</td>
<td>Who else has done related work?</td>
</tr>
<tr>
<td></td>
<td>State primary results</td>
<td>How did you do it?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What happened?</td>
</tr>
<tr>
<td><strong>MATERIALS AND</strong></td>
<td>Detail the experimental procedure step by step</td>
<td>How could someone else replicate your experiment?</td>
</tr>
<tr>
<td><strong>METHODS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RESULTS</strong></td>
<td>Reports, in detail, the results of the investigation</td>
<td>What actually happened?</td>
</tr>
<tr>
<td><strong>DISCUSSION</strong></td>
<td>Show the significance of the results, and suggest refinements, applications</td>
<td>Did the experiment do what you expected it to? Why or why not?</td>
</tr>
<tr>
<td></td>
<td>Offers possibilities for further study</td>
<td>How might the experiment be improved or adapted? What next?</td>
</tr>
</tbody>
</table>
Wolverine (Gulo gulo) hunting behaviour in the Claire Lake watershed, Yukon Territory  
(includes main objective, species involved, and location)

Heart Mountain and South Fork fault systems: architecture and evolution of the collapse of an  
Eocene volcanic system, northwest Wyoming  
(includes location, geological feature, and age)
No-one has yet researched which wavelengths of light are most effective in promoting photosynthesis in the aquatic plant Elodea Canadensis. We determined the rate of photosynthesis at 25°C, using wavelengths of 400, 450, 500, 550, 600, 650, and 700 nm, measuring the rate of oxygen production for 1-hr periods at each wavelength. We estimated oxygen production from the rate of bubble production by the submerged plant. We tested 4 plants at each wavelength. The rate of oxygen production at 450 nm (approximately 2.5 ml O2/mg wet weight of plant/h) was nearly 1.5x greater than that at any other wavelength tested, suggesting that light of this wavelength (blue) is most readily absorbed by the chlorophyll pigments. In contrast, light of 550 nm (green) produced no detectable photosynthesis, suggesting that light of this wavelength is reflected rather than absorbed by the chlorophyll.

From Jan A. Pechenik’s A Short Guide to Writing about Biology, 2004.
THE INTRODUCTION:

- Introduces the topic and your point
- Provides a short review of relevant, current research (theoretical background)
- States purpose
- Is sometimes understood as a mini literature review
- Begins only as generally as necessary to provide essential context for the report.

Plants can use sunlight as an energy source for carbon fixation (Ellmore and Reed, 1993). However, all wavelengths of light are not necessarily equally effective in promoting photosynthesis. The green coloration of most leaves suggests that wavelengths of approximately 550 nm are reflected rather than absorbed, so this wavelength would not be expected to produce much carbon fixation by green plants.
This section includes several sentences that summarize the results of the study (simple description of trends) and figures, graphs and/or tables.

**Tips**

- Remember axis labels and units
- Use past tense
- Avoid redundancy – in the text, do not write exactly what is in each graph; graphs and figures present their own information. Contextualize only.
The Discussion is the most important part of your report, because here, you show that you understand the experiment beyond the simple level of completing it.

**Explain. Analyse. INTERPRET.**

Some people like to think of this as the "subjective" part of the report, referring to what is not readily observable. This part of the lab focuses on a question of understanding "What is the significance or meaning of the results?" To answer this question, focus your discussion with strategies like those on the next slide:
<table>
<thead>
<tr>
<th>Analysis</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do the results indicate clearly?</td>
<td>What is the significance of the results? What ambiguities exist? What questions might we raise? Find logical explanations for problems in the data:</td>
</tr>
<tr>
<td>What have you found?</td>
<td></td>
</tr>
<tr>
<td>Explain what you know with certainty based on your results and draw conclusions:</td>
<td></td>
</tr>
<tr>
<td>Since none of the samples reacted to the Silver foil test, therefore sulfide, if present at all, does not exceed a concentration of approximately 0.025 g/l. It is therefore unlikely that the water main pipe break was the result of sulfide-induced corrosion.</td>
<td>Although we received the water samples were received on 14 August 2000, we could not test until 10 September 2000. It is normally desirable to test as quickly as possible after sampling in order to avoid potential sample contamination. We do not know the impact of the delay.</td>
</tr>
</tbody>
</table>
Compare expected results with those obtained.
How can you account for any differences? Be specific; for example, the instruments could not measure precisely, the sample was impure or contaminated, or calculated values did not take account of friction.

Analyze experimental error.
Was it avoidable? Was it a result of equipment? If an experiment was within the tolerances, you can still account for the difference from the ideal. Explain how the design might be improved.

Explain your results in terms of theoretical issues.
Often undergraduate labs are intended to illustrate important physical laws, such as Kirchhoff’s voltage law, or the Müller-Lyer illusion. In this section move from the results to the theory. How well has the theory been illustrated?

Relate results to your experimental objective(s).
If you set out to identify an unknown metal by finding its lattice parameter and its atomic structure, you'd better know the metal and its attributes.
The small number of species represented in our sample is surprising, since the pond is fed by several streams that might be expected to introduce a variety of different species into it, assuming that the streams are not polluted.

It appears that the conditions in the pond at the time of our sampling were especially suitable for one species in particular out of all those that are most likely to have access to it.

Perhaps the physical nature of the pond is such that the number of niches is small, in which case competition would become very keen; only one species can occupy a given niche at any one time (Ricklefs and Miller, 2000). The reproductive pattern of the fishes might also contribute to the observed results. Possibly *Lepomis macrochirus*, the dominant species, lays more eggs than the others, or perhaps the young of this species survive better, or prey on the young of other species.
To support your analysis and interpretation of results, you should use the findings of other related studies. To integrate sources effectively, be sure that the studies you are using are relevant to your experiment. Place information from sources in the context of your discussion of your experiment. Use citations, not quotations, when you are referring to others’ research.

This section may or may not be included in the report. The conclusion provides an answer to the problem raised in the introduction and concisely restates the result.
At The Sentence Level: Clarity

- Passive Voice
- Frontload sentences
- Doubling Up
- Abstract vs. Concrete
- Concision

For the love of God! There are just too many words and not enough time!
PASSIVE vs ACTIVE VOICE

In passive voice, the subject of the sentence is invisible, or deferred. The reader cannot ‘see’ who’s doing what.

“The front driver’s-side wheel on my car, which was being backed up in your driveway yesterday, can accurately be held responsible for the sudden demise that was experienced by Biggles.”

“Yesterday, I accidentally hit Biggles, who died”.

How can a zombie help me activate passive voice?

Look for the verbs in your sentence. If any of the verbs can be followed with “by zombies”, that sentence has passive voice in it. Where this occurs, ask yourself, “If not by zombies, then by whom or what?”

It has been made clear that suggestions offered will be considered.
If you’re the **first** to identify some **passive voice** in any of the upcoming slides, you will win a lovely and useful **PRIZE**!
Pronoun Ambiguity

I took the dog out of the crate this morning because I’m putting it in the garage sale.
When using *this, that, they, it*, etc., ensure that the word the pronoun points to is absolutely clear:

Canadian universities increasingly follow corporate fiscal models in which their internal departments have to compete with each other for funding, so they now routinely hire poorly-paid temporary contract instructors. This has created serious instability in universities across Canada.
Frontload sentences.

Although it was originally intended exclusively for those from the ruling classes, and was attended by those who would eventually govern their society in some manner, the university now educates students from every socio-economic background.

The university now educates students from every socio-economic background, although it was originally intended exclusively for those from the ruling classes, and was attended by those who would eventually govern their society in some manner.
The university is now expected to educate students from every socio-economic background, although it was originally intended exclusively for those from the ruling classes, and was attended only by those who would eventually govern their society in some manner.

39 words

The university is now for students from any background although it was originally for the elite to learn governance.

19 words
<table>
<thead>
<tr>
<th>NOT CONCISE</th>
<th>CONCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. am of the opinion that</td>
<td>1. believe</td>
</tr>
<tr>
<td>2. at a later date</td>
<td>2. later</td>
</tr>
<tr>
<td>3. at this point in time</td>
<td>3. now</td>
</tr>
<tr>
<td>4. despite the fact that</td>
<td>4. although</td>
</tr>
<tr>
<td>5. due to the fact that</td>
<td>5. because, since</td>
</tr>
<tr>
<td>6. during the course of</td>
<td>6. during</td>
</tr>
<tr>
<td>7. for the purpose of</td>
<td>7. to</td>
</tr>
<tr>
<td>8. for the reason that</td>
<td>8. because, since</td>
</tr>
<tr>
<td>9. has the potential to</td>
<td>9. could</td>
</tr>
<tr>
<td>10. in addition to the above</td>
<td>10. also</td>
</tr>
<tr>
<td>11. in the event that</td>
<td>11. if</td>
</tr>
<tr>
<td>12. it is probable that</td>
<td>12. probably</td>
</tr>
<tr>
<td>13. the question as to whether</td>
<td>13. whether</td>
</tr>
<tr>
<td>14. with the exception of</td>
<td>14. except for</td>
</tr>
</tbody>
</table>
touch base!
raise the bar!
ducks in a row!
pick your brain!
value-added!
core competencies!
drop the ball!
push the envelope!
with all due respect!
at the end of the day!
par for the course!
at this point in time!
thinking outside the box!
Bandwidth!

client-centered!
service-oriented!
solutions-focused!
low-hanging fruit!
win-win solutions!

change agent!
leverage!
cutting edge!
synergy!
paradigm shift!
going forward!
best practices!
Abstract vs Concrete Language

At this point in time, it would behoove us to re-envision the committee structure in the interests of scaffolding for maximum efficiency.

The committee’s work is taking longer than it should; we need to form deadline-driven sub-groups within the committee itself.

In my current role, a great deal of initiative has been shown.

My supervisor at Gargantuan Enterprises promoted me to Senior Accounts within two months because I found a way to manage customer accounts using Pinterest.
Many writers use two terms to emphasize a point. Pick one.

A toxic work environment profoundly impacts an instructor’s ability to inspire students.

Tip: It’s worth doing a find/replace with the word ‘and’ (as you would with pronouns ‘this’, ‘these’ and ‘it’) to see if what’s on one side of the ‘and’ can be deleted.)
The university is now expected to educate students from every socio-economic background, although it was originally intended exclusively for those from the elite or ruling class, and attended only by those who would eventually govern their society in some manner.

40 words

The university is for everyone, although it was once just for the elite to learn governance.

16 words
MAKE USE OF ALL YOUR EDITORS

• **Your eyes:** Print out a final draft in a **new font** and read it.

• **Your ears and mouth:** Read the document aloud, ideally to someone else.

• **A second set of eyes:** your classmate, friend, the Writing Centre…
IF YOU WANT TO MAKE YOUR WRITING BETTER THAN IT ALREADY IS, BOOK AN APPOINTMENT ONLINE AT

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