Writing in the Sciences

Created by
The Writing Center and The STEM Center
What is Science Writing?

• Two types of writing:
  – Writing about scientific subject matter
  – Writing in the context of science

• Science writing: describing observations and/or results
  – Experimental or non-experimental methods
    • Classification, statistical analysis, mathematical analysis, and comparative studies

• Technical writing vs. literary writing
  – Technical: Objective, factual information
Technical Writing

• Use factual language

• Use passive voice instead of active voice
  – Active voice: I weighed the reagent and heated it to 310 degrees.
  – Passive voice: The reagent was weighed and heated to 310 degrees.

• Use an objective tone to avoid potential bias
Objective or not?

“He was a very small frog with wide, dull eyes. And just as I looked at him, he slowly crumpled and began to sag. The spirit vanished from his eyes as I snuffed” (Moriarty 1996).

“When the NMDA glutamate channel opens, it allows passage of not only sodium and potassium atoms but also an appreciable amount of calcium ions.” (Moriarty 1996).
The Basics

• Most scientific papers are composed of multiple components
  ✓ Abstract, introduction, materials and methods, results, and discussion

• *Double spaced, Times New Roman, size 12*

• CSE citation style

• Headings are *typically* bolded and centered

• Ask professor!
Order of a Paper

1. Title
2. Abstract
3. Introduction
4. Methods
5. Results
6. Discussion
Order When Writing a Paper

1. Methods
2. Results
3. Discussion
4. Introduction
5. Abstract
6. Title
Materials and Methods

• Report what you did

• Purpose: Specific & Technical
  – So others can repeat experiment

• Using subheadings
  – Use when necessary (sectioning methods)
  – Ex: Field site, embryo collection, ovary removal, data analysis
Example

Methods

Culturing PAM murine keratinocytes with high or low glucose media

PAM 212 cells were given a 37°C water bath. The medium was aspirated and 2 mL PBS rinse was added to the culture vessel. The medium was aspirated once again and 2 mL of 0.25% Trypsin/PBS was added to the cell monolayer to release the cells from the flask. After brief incubation, the culture vessel was checked to ensure no cells were attached to the flask under a dissecting microscope. **5 mL of 10% FCS was added to DMEM low glucose media** to provide androgen. It was ensured that no cell clumps remained and the cells were then relocated to a 15 mL tube and inverted several times to allow cell dispersion. 100 μL of the solution was removed and reserved for cell viability testing.

Cells were counted for viability through a simple counting exercise using a hemocytometer and microscope. **10 μL of the cell sample was diluted using 40 μL of trypan blue working solution***
Results

• Short and to the point—impartial observer
• Report the results
  – Values, figures, charts
• Cite figures chronologically (ask prof)
• No discussion/interpretation of results!
• Summarize figures/charts
  – Don’t repeat what is on them
Tables and Figures

• Ideal graphic:
  – Visually explains data better than text alone
  – Caption points out important data/trends
  – Caption should be able to stand alone

• Tables and figures:
  – End of your paper (before your references)
  – End of your results section
  – Ask your professor for their preference
**Example Table**

<table>
<thead>
<tr>
<th>Levels</th>
<th>Year</th>
<th>Total number sampled</th>
<th>Rejectors (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1987–2099\textsuperscript{a} (mean+range)</td>
<td>2,854</td>
<td>7.3 (3.9–11.3)</td>
</tr>
<tr>
<td></td>
<td>2008–2009</td>
<td>388</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>2009–2010</td>
<td>532</td>
<td>5.6</td>
</tr>
<tr>
<td>4</td>
<td>2009–2011 High</td>
<td>255</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2009–2011 Low</td>
<td>228</td>
<td>4.4</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Data from 2009–2011 not available for these levels.
Example Figure

**Figure 4:** Rank-abundance curve where North Shore Trail (NST) is shown to have both a higher species richness ($S$) and evenness ($E$) than Piedras Pintadas (PP).
Discussion

• **Interpret** the data previously stated
• **Do not** repeat data
• State if you **accept or reject** your hypothesis
  – Discuss the impacts of this
Discussion: Your Findings

• Put findings in broader context of field(s)
  – Specific to general
• Future studies
• Describe any flaws in methods that may have influenced results
Introduction

• Gives research a foundation
• Concepts—Broad to narrow (end with hypothesis)
• Summarize previous work-sets up hypothesis
• Collect references first
• Paraphrase references
• Write in past tense

Broader Concepts Being Addressed

Purpose of Experiment
Hypothesis

• Needs to be explicit—not vague
• Testable—not theoretical
• Need reasoning behind hypothesis
  – I hypothesized that ________ because ________.
  – Explanation based on info in introduction
References

• Current articles
• Stay consistent
• Ask professor
• Can use layout from published journal article
• **Hanging** indentation

Example Reference citation (CSE Format):

Reference Resources

• PubMed (Bio)
• Biological Abstracts (Bio)
• ACS.org (Chem)
• Google Scholar (Bio)
  – Get-It! @ CSUSM
• Science Librarian: Talitha Matlin
  – tmatlin@csusm.edu
  – (760)750-4342
  – STEM Center: 12-1pm every other Wednesday
Abstract

• Self-contained overview of entire paper
• Stands on its own merits
• Abstract template:
  – Sentence(s) for:
    • Intro
    • Methods
    • Results
    • Discussion
Your Title

• Informative, technical
• Minimally describe your research and tell the reader your result(s)
  – Searches based on title
    • **Good title**: Genome-wide screening of aberrant DNA methylation which associated with gene expression in mouse skin cancers
    • **Bad title**: Unusual DNA causes skin cancer