MWC
MULTIDISCIPLINARY WRITING CENTER
NORTHWEST VISTA COLLEGE
A WAC Initiative

Writing for Science: A Primer

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The MWC is a Writing Across the Curriculum initiative serving Northwest Vista College students, faculty, and the community through tutoring in writing skills, critical thinking, and building writing pedagogy. Effective writing is a cornerstone of education.

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Scientific Writing

Scientific writing is different from your "normal" English or History essay, but that does not mean it is any more complicated or difficult.

Structure

The first difference is the **structure** of the writing. Instead of your typical introduction, body paragraphs, and conclusion, you have a clear and delineated **procedural work**.

Scientific writing generally follows a specific format with key sections:

- an abstract
- an introduction to a particular topic
- hypotheses to be tested
- a description of methods
- key results
- a discussion that ties these results to our broader knowledge of the topic

Style

The second difference is the **style** of writing. Scientific writing is direct and to the point. Scientific writing is designed to present a problem, a hypothesis, clear and precise methods for testing the hypothesis, results, and discussion. It allows others to replicate the procedure exactly. It looks for **clarity and directness**.

Focus on **precision, clarity, and objectivity**. Avoid the first-person ("I").

The Abstract

Your abstract is a concise summary of your paper's topic, purpose, method, result, and discussion.

Consider taking one to two sentences from each of your sections and creating a single paragraph. This should include the following:

- what and why you did the procedure (whether an experiment or synthesis)
- your hypothesis
- your most important data points that accept or refute your hypothesis
- the larger scientific context of your work
- needed further investigation

The Introduction

Your introduction is short and direct. It will be less ornamental than one written for English, History, or the other Liberal Arts. You can separate this into several paragraphs, per your instructor's preferences.

The Introduction:

- presents the general topic
- notes the major points relevant to your investigation
- paraphrases selectively
- quickly narrows to your particular focus within your topic
- states what is not known that you want to know. This may be called the "knowledge gap"
- presents a hypothesis based on what is *not* known about your topic
- states your general approach or method for testing the hypothesis – this can be an actual experiment, or a synthesis of existing information. This section does *not* list your procedural method; this is only an overview that clearly and directly justifies your method to your hypothesis.

The Hypothesis/es

A major concern for scientific writing is the **hypothesis**. Your writing (or reading) assignment may have more than one. This means that **each hypothesis must be clearly addressed and tested**.

Writing a valid hypothesis largely depends on whether that hypothesis is **testable**. It must be measurable and testable, and includes as few variables as possible.

A key element to a scientific hypothesis is how it correlates to and is proven by **the scientific method**.

> Merriam-Webster (n.d.) defines scientific method as "principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses."

There are two types of scientific hypotheses: **a proximate hypothesis** and **an ultimate hypothesis**.

> To prove and properly defend a hypothesis, **a proximate hypothesis is best** for accurately arriving at a definitive conclusion. A proximate hypothesis comes with conclusive data that can be used while an **ultimate hypothesis is not** as easily testable and a resolution is more difficult to achieve.

Understanding the differences between the proximate and ultimate hypotheses are vital to your writing's success and clarity.

An **ultimate hypothesis** is "philosophical in nature and may not be testable with our current state of knowledge [and] are often defined as 'why' questions" (Kansas State University, 2000).

A **proximate hypothesis** seeks out the mechanism(s) that drive the phenomenon in question and its data can be notated and deduced. It is "often testable using the scientific method and are often defined as 'how' questions" (Kansas State University, 2000).

Be ready and willing to re-draft your hypothesis until it is the most narrow, specific, measurable, and testable it can be.

A good format is: [Event] is the result of [Action] of [Item].

<u>Transition to Materials and Methods</u>
You typically include a brief overview of your experimental or research design, about 1-2 sentences.
Keep this general. State what type of design, your system, study organism, and/or study site. Add any needed justifications or explanations.

<u>Materials and Methods</u>
For Experiments
This section is straight-forward and well, methodical. Write in the **past tense and in chronological order**.
You may find it useful to **use subsections**, demarcating site, design, and analyses conducted.

- site may include organism used and handling, and description of site
- design may include the procedure in paragraph form, preparation, controls, equipment, and measurements
- analyses may include the statistical practice conducted such as linear or nonlinear regression

Include any and all details needed to replicate your experiment ***exactly***. This includes model numbers, specifications, and measurements.

If you are using a published method, you may only state the method rather than each part of that method in detail.[1] Make sure to cite the source of your method and note any deviations to that known protocol. Justify any deviations.

For Syntheses/Reviews
For this type of writing, you will not explain a process for an experiment, but rather a process of research and synthesis.
You will answer the following questions, **using sub-sections when helpful** or appropriate:

- what was your method of article collection? What parameters did you set, what topics did you search, and what databases did you use?
- what major methods were present in the articles you included in your synthesis? Only include specifics if there was an important outlier in the group.

You are not summarizing each article. You are synthesizing or bringing together in a systematic way the major themes and methods of your articles as a group. Reference each article used.

Results
For Experiments
This section is strictly meant to report you results, not evaluate them; that is for the discussion section. Summarize each data set separately and relate them to relevant graphs, tables, or other figures.

Do not assume the reader will extract the information from the figures or statistics; describe the data. Identify trends but do not assess their significance.

For Syntheses/Reviews
This style will be largely similar to the one used for experiments. You are reporting your data, but this time the data is from your article retrieval and collation (ordering and making sense of the data within the articles).

Do not report every single detail from each article; you are *synthesizing* – identifying themes, trends, and differences. Reference each article you use. You **may use sub-sections** for each theme, trend, or difference.

Discussion and Conclusion
This section includes evaluation of results and ties them to your hypothesis and introduction. **Your results are either from your experiment or your synthesis of existing work.**

The Discussion and Conclusion:

- restates the key results
- interprets and evaluates those results, using your hypothesis as your anchor
- includes any possible interpretations of the result – present and evaluate these alternative explanations as possibilities for future research
- relates your results to the literature you reviewed in your introduction
- are your results consistent with the literature? Why or why not?
- states how your results fill/do not fill the knowledge gap you presented in your introduction
    - base this on your hypothesis – how did the results confirm/not confirm/refute your hypothesis, and how does this contribute to the knowledge gap
- states any errors or deviations from established protocol that affected those results (this would be a deviation in research methods when completing a synthesis)

[1] Your instructor may want you to actually write out a known method; check your assignment requirements.

- relates your study and results to the larger field. This is your study's significance. This is what you have accomplished with your study. Remember that refuting a hypothesis is still an accomplishment. End positively!

Succinctly, **you explain** what **your results** mean, **explain and justify conclusions** your draw from the results, and **fit those results into the larger** scientific context.

As your Introduction moved from general to specific, the Discussion and Conclusion moves from specific to general.

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