

QUICK GUIDE FOR WRITING A SCIENTIFIC PAPER

A scientific paper is normally broken down into standard sections. It begins with a **title**, followed by an **abstract**, **introduction**, **materials and methods** section, **results**, **discussion**, **acknowledgements**, and **works cited**. Remember that scientific writing is concise, and the purpose of it is to explain, clearly, the study that was performed so it can be potentially recreated by the reader.

Title

The title of a scientific paper should be specific and short, explaining the focus of the paper. The title should explain exactly what you did in your study.

Example: “Comparison of the effect of Organic and Toxic Lawn Insecticide in Freshwater on the Heart Rate of *Daphnia Magna*”

Abstract

An abstract of a scientific paper summarizes the research being presented in 100-200 words. An easy way to format this section is to think about your abstract as containing 1-2 sentences from each section of your paper. Writing this section last is the easiest way to summarize what you have already written!

Key: Introduction, Methods and

Materials, Results, Discussion

Example: Fish mislabeling has become a major problem in the United States, and across the world, leading to a concern of the safety in consuming seafood from restaurants and grocery stores, along with the concern over the over-fishing of certain fish species. A mislabel on a fish species can be dangerous to the consumer, as it may harm their health, and is illegal on the part of the company or restaurant to do so. Using DNA barcoding by the isolation of the COI gene of three samples of seafood, our goal was to successfully identify the samples from both a restaurant and grocery store, and confirm or deny a case of fish mislabeling. A DNA barcode is a string of nucleotides that is unique enough to identify species of fish, but is also common in all species of fish. The DNA barcode of the COI gene was isolated, amplified by Polymerase Chain Reaction, sequenced, and entered into a database of previously discovered barcodes, Genbank and BLAST, where a match was made to a species of fish. We found that two of our three samples, Red Snapper *Lutjanus campechanus* and Sea Bass were mislabeled, while Swordfish *Xiphias gladius* was correctly identified. This study is important in analyzing the use of the COI gene as a DNA barcode in successfully identifying species, and analyzing the prevalence of fish mislabeling in Collegeville, PA.

Introduction

The introduction is where you will explain the background information that led you to forming your hypothesis, and performing the study. You should start with general background information about why the study is important in the real world.

Example: Increasing amounts of impervious surface near freshwater systems are increasing the amount of runoff, which can include fertilizer, road salt, and insecticides, that enters the stream and alters the communities that keep these systems healthy.

After the general background information, start to talk about why you performed your study specifically, and include references to other scientific papers that have done similar experiments, or support the reasons why you performed your study. At the end of this background information, state your hypothesis. The final paragraph of this section should be a summary of what you found through your data and why this data is relevant to the real world.

What is a hypothesis?

Your theory as to why something is happening, which you will prove or disprove with the data you collected!

Example: From this study, it can be concluded that the organic insecticide is a safer alternative to regular lawn care insecticide, and that this toxic solution could potentially be harming the communities that live in freshwater systems.

Materials and Methods

This section is supposed to explain exactly how you performed your experiment. If someone were reading it, he or she should be able to perform your experiment. Keep this section in past tense, because you already performed this study.

Example: The two concentrations included 1 ppm and 10 ppm of each type of insecticide, and the solid material was stirred overnight to allow some of the insecticide to dissolve.

Results

This is where you will tell your audience about the data you found from your experiment. A great way to present this data is through tables or figures (graphs). Each time you present a table or figure a paragraph should precede it, which explains the results that were found and references the chart or figure below it. A caption should be above the table, or below the figure, depending on what you include, that sums up the data presented in the chart. This table or figure should also be labelled as a table 1 or figure 1, and continue in ascending order with the number of charts or figures you include.

Example: The goal of this experiment was to study the effect of both organic and toxic insecticide on the heart rate of *Daphnia*. The first set of data obtained was the control heart rate of the *Daphnia* in distilled water. The average was measured to be 201 beats/min \pm 11 (Table 1). This data was plotted along with the data obtained for concentrations of 1 ppm for both the organic and toxic insecticide (Figure 1). The average heart rate for the toxic solution at 1 ppm was calculated to be 298 beats/min \pm 16. The average heart rate for the organic solution was calculated to be 213 beats/min \pm 13 (Table 1).

Table 1. Average heart rates for various solutions tested on *Daphnia magna*, including distilled water, and differing concentrations of toxic and organic insecticide.

<u>Concentration</u>	<u>Toxic</u>	<u>Organic</u>
Control	201 ± 11	201 ± 11
1 ppm	298 ± 16	213 ± 13
10 ppm	358 ± 22	264 ± 24

Discussion

This is the place where you have the opportunity to analyze your data. Begin with a mini summary of what your hypothesis was and what you found. Then point out any patterns in the data, anything interesting that you found, and if the data supported your hypothesis. If the didn't support your hypothesis, try to explain why, and bring in some possible sources of error. This is also a really great place to compare your findings to other published research. End this section on a broader scale, and discuss why your study is important to society. You could also discuss any future experiments that might build on your conclusions.

Acknowledgements

Give your thanks, by name, to the people who helped you and to the organization that funded your experiment.

Works Cited

List all of your references used in the paper in alphabetical MLA style. There are other handouts on the website that discuss how to do this.

Additional Resources:

Emily Wortman-Wunder and Kate Kiefer.. (1994 - 2012). Writing the Scientific Paper. Writing@CSU. Colorado State University.

<http://writing.colostate.edu/guides/guide.cfm?guideid=83>.

"Formatting Science Reports." *Academic and Professional Writing: Scientific Reports*. Board of Regents of the University of Wisconsin System, 29 Aug. 2014. Web. 7 Oct. 2014.

<http://writing.wisc.edu/Handbook/ScienceReport.html>.

Works Cited

Fiocca, Katherine. "Comparison of the effect of Organic and Toxic Lawn Insecticide in Freshwater on the Heart Rate of *Daphnia magna*". Unpublished Research Paper. Ursinus College. 2013.

Emily Wortman-Wunder and Kate Kiefer. (1994 - 2012). Writing the Scientific Paper. Writing@CSU. Colorado State University.
<http://writing.colostate.edu/guides/guide.cfm?guideid=83>.