

SCIENCE WRITING

Writing about Data, Graphs and Charts

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Introduction

Graphs, tables and other illustrative means of displaying numerical data - often collected in experiments or obtained from calculations - are integral in most scientific or technical writing pieces like reports, laboratory notes, and journal articles. Effective description and relating data to your research topic or idea often aspires towards clarity and concision. As much as you may have a lot of data to work with, it is of utmost importance for you to make sense of the information for your reader, and direct their attention to specific details of your data that will contribute to their understanding of your research. This handout will guide you through the process of writing about data to support your research idea - allowing you to best explain how your data matters to your reader.

The Big Picture

When you begin to describe your data to your reader, provide an overview of what it is about. Make sure that your graph is placed in a suitable location where your reader can easily refer from your writing to the figure itself.

- (i) What is the main idea/signal that your graph or chart communicates? How does it relate to the main ideas of your research?
- (ii) Think about what information is self-evident in the figure and what is not. Describe your axes, units, and the context of the data (that can also be expressed via legends, labels and captions, but explained in prose if necessary)
- (iii) How does the particular presentation of your data in this graph/chart help the reader understand your work? Is there any specific approach to reading the data? (For example, is there a directional flow of understanding the chart? Are colours indicative of something else?)

Methods of Data Collection and Analysis

More often than not, you are not presenting raw data in your scientific report or article. Paramount to understanding your data is informing your reader of how the data was collected and analysed prior to its presentation.

- (i) Are there particularities about the way you collected your data, and are there changes in ways of collecting/analysing data across the entire range of your dataset? If so, how, and why?
- (ii) If you have chosen any formulas or ways of organizing your data, why did you choose to do so? Explain the process of your data analysis, and talk about how it is suitable for your research purposes.

Trends and Specifics

After explaining how your data has been treated, you need to pick out significant points about your data that will convey your main findings and how they link to your main research idea and/or hypotheses.

- (i) Are there trends, correlation patterns or distinct spikes/decreases in your numerical data? Are there clusters or outliers that are significant to your research? Cite examples to explain these trends and observations.

- (ii) Aside from main trends and signals, are there smaller pieces of information that your data present, minor to your main research? (This information is often useful in your later discussion and thinking about possibilities for further research)

Error, Uncertainty, and Limitations

You often want to write about these aspects of your data, to allow for further analysis of your data's significance, and for future researchers to be able to improve particular limitations of your data collection.

- (i) How are you reporting your errors and uncertainties in your data, if you are? Are the errors and uncertainties normal in your kind of data, or do they seem to be out of the ordinary? What do they tell you about the precision/accuracy/consistency of your data?
- (ii) How have your techniques/instruments used in the data collection and analysis process affected these margins of error and uncertainty?
- (iii) With an awareness of your research field, do the errors and uncertainties you have allow you to say that you have found significant data? Is there a standard you were looking for? (For example, physicists subscribe to 5 standard deviations to declare discoveries)
- (iv) What were some of the limitations of your data collection and analysis techniques that might have caused these errors? (This will later segue into your discussion and evaluation) How could they have been done differently to give better results?

Conclusion and Transition

Where has the explanation and analysis of your data taken you? How will you link these ideas to the overarching idea of your research, and to the next part of your writing?

- (i) Did you have a hypothesis, and if so, does your data communicate with that hypothesis? (A hypothesis is not always necessary, especially when there is a bigger picture to your research beyond the hypothesis)
- (ii) Reiterate your major takeaways and inferences from the data you have analysed. What remains to be studied, and what are you absolutely sure of, with what certainty?
- (iii) Segue into what you think is important for discussion of your method and data obtained. Is there any part of your data that is interesting for you to outline before moving into the discussion/evaluation?

Closing Thoughts

Data can be hidden, discarded, tampered with, smoothened out to fit the purposes of what you may want it to show, but one of the cornerstones of research in data collection revolves around reproducibility and consistency as other researchers follow in our footsteps - and data that is well-recorded and dutifully-reported will not betray your work. While there is no easy formula to deal with different types of data, refer back to each sub-section to make sure that you are inferring correctly, and making the most of what data you have collected and decided to process for your reader, and reach out into the main ideas you are working with at large.

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