

Academic Writing in the Sciences

Online Writing Resource



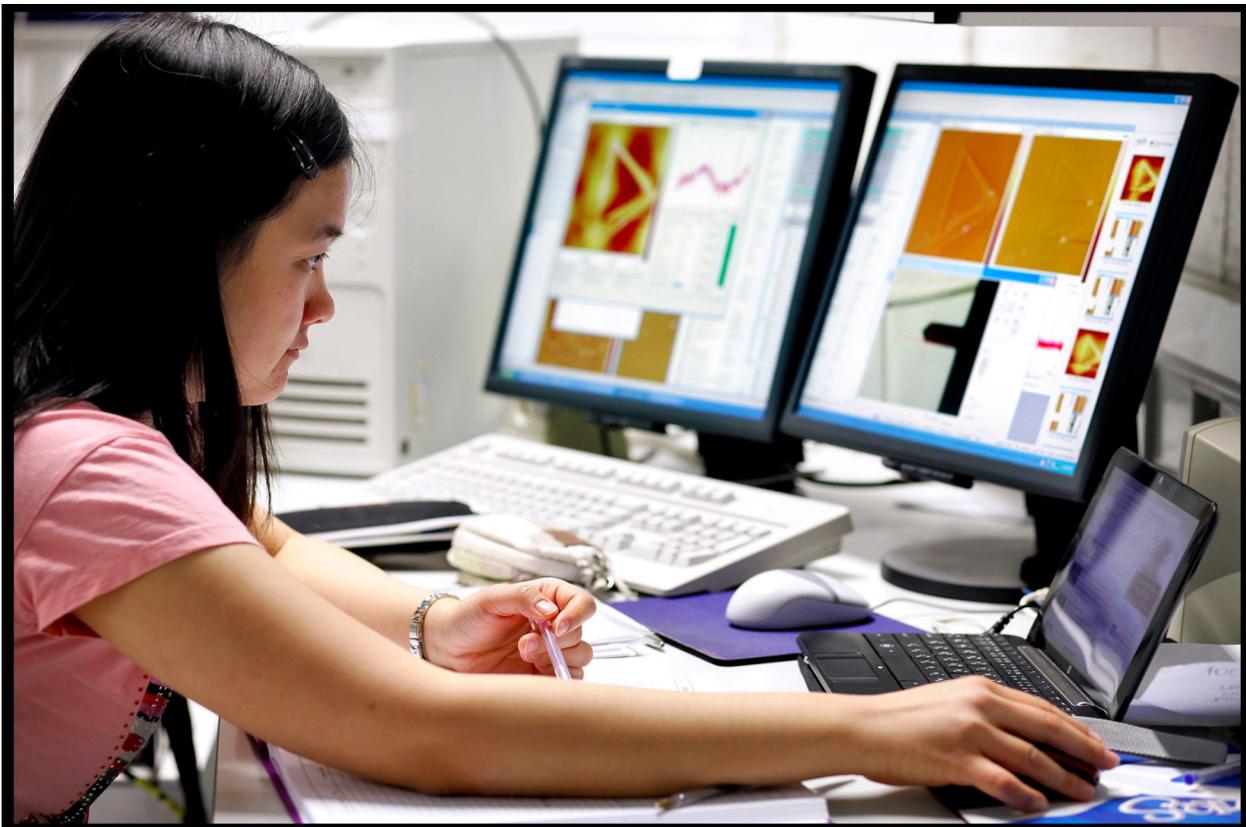
Academic Writing in the Sciences

Publishing is a crucial part of doing research. Yet, many students and other inexperienced writers often struggle with learning the skills required for good academic writing, while their supervisors or other experienced academics often lack the time to provide much needed guidance. As a result, students frequently lament a sense of overwhelming and anxiety that hinders their progress and prevents them from approaching writing with confidence and ease.

The term *academic writing* refers to a specific form of prose used in an academic context for a number of different purposes, such as fulfilling the requirements of a PhD exam through the submission of a PhD thesis or sharing and advancing knowledge through the publication of research papers.

Unlike other forms of academic writing, however, scientific writing follows a well-defined structure that other scholars can easily recognise and identify. So, in some respect, *scientific writing* is easier than other academic prose. Scientific writing also differs from academic writing in other disciplines for some defining features. These are reflected in a language that is accurate, specific, concise, clear, cautious, and objective [1].

Learning about the structure and style of scientific writing can (and should!) be achieved at the reading stage. Once you start paying attention to the structure and style of the papers you read (rather than just focusing on their content) you may realise that most scientific papers are the same! Emulating their key features will help you produce good drafts in your own writing.



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The structure of a scientific paper, thesis or dissertation

Research papers (but also PhD theses and dissertations) in scientific subjects typically contain the following sections (generally in the order shown below):

Abstract

This is the most read part of any paper and in some case the only one fully accessible through online repositories. For papers that target a non-specialised audience, the abstract offers an overview of the entire paper and contains information on the purpose of the study, the approach used, the key results obtained and possibly their implications in a given field. In such cases, the abstract is a bit like a paper in miniature. For papers that target a specialised audience, the abstract will normally contain only the methods and results obtained in the study.

Introduction

The main purpose of the introduction is to identify a problem or gap in current research and to provide the motivation for the study. This is done by briefly recalling key results already available in the literature and showing how/why any discrepancies or gaps hinder further progress. The research gap identified in the introduction will then form the focus of the study presented in the paper. Occasionally, the introduction may end with a brief overview of what can be found in the paper and where.

Literature Review

Whether a paper contains a literature review section in its own right or not normally depends on the type of paper. Regular Articles may contain such a section (sometimes called Scientific Background or Current Status), but Letters do not. By contrast, Review Articles contain extensive literature reviews and serve as an excellent starting point for students new to a given research field. PhD theses normally have a whole chapter devoted to an in-depth review of existing literature around the specific project presented in the thesis.

Methods

The Methods section forms a key component of any scientific paper as it serves to provide all necessary and sufficient information to allow interested readers to repeat the study if they so wish. Reproducibility of results is in fact at the heart of the scientific method (as formulated by the founding figures of modern-day science such as Copernicus, Galilei and Bacon) and requires that the approach used in the study be fit for purpose. If it is not, the validity of the study (and the results obtained) may be either questioned or completely invalidated.

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Data Analysis and Results

As the name suggests, this section provides a description of the approach used to analyse the data obtained in the study and offers an overview of the main results, often displayed in Figures or summarised in Tables. Even though scientific writing is supposed to be objective, it is important that you tell your reader what you think of your results by using appropriate language (for example, by saying “in as many as 30% of cases” you may indicate that you regard your result as a strong one).

Discussion and Conclusion

Finally, the discussion and conclusion section (or sections) serve to compare your results to those already available in the literature (discussion) and to present the implications of your results in the wider context of your research field (conclusion).

Even though most students are familiar with the overall structure described above, few are aware that each of those sections has its own intrinsic structure too. To discover what this structure is, you need to pay attention to the function of each sentence or paragraph in the section. Hilary Glasman-Deal brilliantly explains how to do so in her excellent book *Science Research Writing for Non-Native Speakers of English* [2]. She also provides section templates that you can use in your own writing.



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The Five Steps of Writing

Knowing how to structure your writing, however, is often not enough to help you avoid procrastination. Ultimately, the thought of summarising the results of years of research into a cohesive and comprehensive PhD thesis or research paper can be a daunting prospect for most. For this reason, it may be helpful to approach your writing as a sequence of specific steps, each devoted to fulfilling specific tasks. The following steps provide a useful framework to organise your writing.

Pre-writing

The purpose of this step is to learn about basic aspects of academic writing (content, structure and style) already at the reading stage. Paying attention to the structure as well as style can help you prepare templates to follow when planning to write specific sections.

Drafting

To avoid the infamous writer's block and facilitate your writing, you may start by talking about your research (for example by giving a seminar in your department). You can then prepare the overall layout of your paper (or thesis) by using mind maps or similar techniques. Once you are ready to write, aim for producing relatively large amounts of content over a short period of time. Do not worry too much at this stage about structure, grammar or punctuation. The text you produce here is simply meant as an early draft that you can revise and edit iteratively in the following steps until you produce a polished final version.

Revising

This is where you should start to pay specific attention to the overall structure of your early drafts and make sure that the information is presented in a logical flow. When revising your text, make sure you identify the most pressing issues and treat those in order of severity before focusing on minor, or less pressing, details. Asking for feedback at this stage is one of the best ways to improve your writing.

Editing

Editing is when writing meets elegance. This is the stage where you need to improve your writing style by carefully paying attention to the choice of words and the usage of language. For a bit of fun, check how well your writing scores in The Writer's Diet Test [3]. Tips for improved style include using active verbs, avoiding negatives, and de-cluttering your prose by removing empty words that do not add content to your text.

Proofreading

The purpose of this step is to make sure that the final work looks professional and error-free. Things to look out for include checking for punctuation and grammar mistakes, formatting conventions, proper citations and bibliographic details. Figures and Tables should also conform to the high-quality standards required for publication. Also, remember that Figures captions and Tables titles must provide enough information for the readers to understand what is displayed without having to read the entire paper.

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References

- [1] M Aliotta (2018) *Mastering Academic Writing in the Sciences: A Step-by-Step Guide*, Taylor & Francis, CRC Press
- [2] H Glasman-Deal (2010) *Science Research Writing for Non-Native Speakers of English*, Imperial College Press
- [3] H. Sword (2016) *The Writer's Diet*, Chicago Guides to Writing, Editing and Publishing



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Further Resources

[H Glasman-Deal: Science Research Writing for Non-Native Speakers of English, Imperial College Press \(2010\)](#)

A very clear and well-designed book that will take you step by step into the process of structuring the various sections or chapters of your research paper or thesis. Lots of useful tables with frequently used phrases on academic writing.

[A. Greene: Writing Science in Plain English. The University of Chicago Press \(2013\)](#)

A little gem of a book! A must-read for students and staff who want to improve their writing by applying some simple and practical strategies. Plenty of examples (and 'solutions') for you to practice your skills.

[P. Goodson: Becoming an Academic Writer – 50 Exercises for Paced, Productive, and Powerful Writing. SAGE Publishing Ltd \(2013\)](#)

If you are short of ideas on practical things you can do to improve your writing, here you'll find plenty of suggestions and examples.

[H. Sword: The Writer's Diet. Chicago Guides to Writing, Editing and Publishing \(2016\)](#)

I just love the analogy between writing and eating! If you take the Writer's Diet Test, don't get too disappointed with the results... It's good fun to see at once where your writing is going wrong.

[A.M. Koerner: Guide to publishing a scientific paper. Routledge \(2008\)](#)

If you are new to publishing a research paper, this book will take you through every step in the process from choice of journal, to manuscript submission, to response to reviewers' comments. Excellent advice even if you are *not* new to publishing!

[W. Strunk: Elements of Style. Dover Publications Inc. \(2006\)](#)

A classic that never seems to go amiss. Some advice is probably out dated, but plenty is still valid today as it was almost a hundred years ago, when the book first came out.

[I. Atkinson: Copy. Righter. LID Publishing Ltd \(2011\)](#)

Not exactly a book on academic writing. But there is nothing wrong about borrowing some of the best tactics that highly successful copywriters use to hook their readers!

This resource was created by Marialuisa Aliotta, Professor of Experimental Nuclear Astrophysics at the University of Edinburgh (UK). Marialuisa runs popular writing workshops at various universities in Scotland and overseas. More information on the type of support she offers to PhD students and early career academics can be found at:

<https://academiclife.coachesconsole.com> and <http://www.handsonwriting.com>

Marialuisa is also the author of [Mastering Academic Writing in the Sciences: A Step-by-Step Guide](#), published by Taylor & Francis Group, LLC. The book will become available in the UK from May 2018.

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