

A Beginner's Guide to Writing Scientific Manuscripts

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Motto: "Manuscript writing is like playing in a pickup game. Everybody thinks they know how to play until they must compete against the big boys".

Abstract

Publishing articles is an existential issue for every scientist. All scientific journal websites have numerous pages describing the requirements for a manuscript. However, how to satisfy those requirements is not explained, which is a real problem for a beginner. Here, I provide a practical guide to less experienced writers by describing the procedure I use to write scientific articles. There are many methods to write a paper, but I can only share mine. Would you like to have more citations? Follow the guidelines below. I hope it helps.

Keywords: manuscript, publication, research article, structure, process,

Purpose, Rationale, and Limitations

The purpose of this editorial is to provide a guide for less experienced writers. Writing and reading are skills that can be learned. Although not everybody becomes a worldwide famous writer, the basics are the same. Writing is a skill, just like riding a bike, so you must first learn the basics and then practice it. Only practice makes a good writer. You may read countless books and listen to wonderful presentations on riding a bike, but you need a bike to learn to ride. There are many different article types, e.g., Perspectives, Opinions, Communications, Research articles, Reviews, Letters, Case Studies, etc. Here, I focus on the most important ones: research articles and a little bit of reviews. The controversial use of AI is not addressed here - that is a wasp nest that must be addressed separately. [1]

While I use this method, it is certainly not the only one—you need to develop your own process that works best for you.

Introduction

All journal websites describe their requirements for a manuscript. However, beginners are generally not shown how to satisfy those requirements, which is a real problem. This is demonstrated by the fact that three-quarters of submitted manuscripts recently had to be desk-rejected, primarily because of a lack of penmanship.

Let's start by defining what a scientific publication is. A scientific manuscript is a simple, well-organized, and systematic description of complicated things. It is NOT a complicated, hard-to-read-and-comprehend, disorganized description of simple things. The goal of a research article is to expand knowledge by presenting data, explaining the relationship between them, and identifying patterns that lead to new or improved pieces of information. A review organizes the pieces of information summarized in research articles into knowledge so we can understand principles and extrapolate from them for practical purposes.

Your fellow scientists are not interested in what you did in the lab but prefer to read an interesting scientific story.

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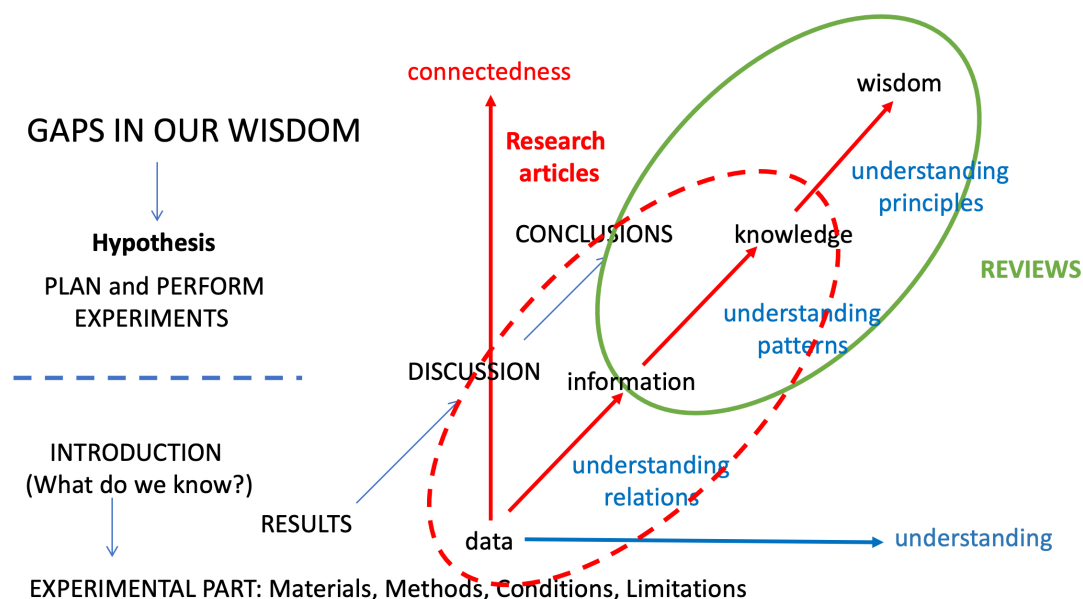


Figure 1: Scholarly publications should reflect their function.[2] The function of a research article is to provide new information that contributes to specific knowledge. The role of a review is to reconcile these pieces of specific knowledge and clarify principles that fit a coherent system of human knowledge (based on the graph in [3])

Table 1. The function of components in a manuscript:

Component	Function
Title	Clearly and attractively describes content for your intended audience.
Authors	Ensure recognition for the authors.
Abstract	What is done and why, what is the outcome, and how is it useful for others
Keywords	Ensure the article is correctly identified in abstracting and indexing services
Introduction	The summary of what is known.
Materials and Methods	List materials, identify methods, and describe experimental conditions.
Experiments	Describe how the data were collected.
Results	Summarize and illustrate your data. Tell us what was done and what was found.
Discussion	Converts your data to information. Analyze your data and highlight the most significant ones and their relations to each other.
Summary/Conclusions	Logically lists your conclusions in one paragraph. Explain why and how your work is helpful to others.
Acknowledgments	Thank everybody who helped in the research. Don't forget to include funders!
References	Recognize those who had previously published on the topic.
Supplementary material	Provides details for the expert reader.

The process of writing:

First, decide on the topic and identify a story. Tell the story to yourself first: imagine you are recounting a trip to an exciting place. Collect all pictures and notes (i.e., topic-related data) and organize them in tables, images, and graphs. Print them out and arrange them on a big table. Find the best way to show them. Then tell us:

- Why did you go there? (rationale, motivation, hypothesis)
- Who was there before? What did they see? How did they get there? (Introduction)
- How did you get there? (methods, materials)
- What happened? (observations, measurements)
- What do you think about all this experience? (Discussion)
- What is your advice for us and the future? (Conclusions)
- Don't forget to thank those who made your trip possible! (Acknowledgement)
- List those who were there before you (References).

Do you want more readers?

If you'd like to receive more citations, readers must be able to find your paper, download your article, read it, and find it relevant enough to cite it. Think about what and how you read or do not read publications. Your peers do the same.

What do they look at *first*? The title. If it is too complicated or boring, readers quit. People judge based on expectations, and it is the title that sets those expectations. If you are over-promising, readers quit later because they get disappointed. Topic and title are not necessarily the same! Start with the topic and finish with writing the title.

What do they look at *second*? It is probably the graphical abstract. Then, they decide whether to read the abstract. A Graphical Abstract is an eye-catching graphic for the article and the Table of Contents. Its function is to generate interest in your work. Think of it as a single PowerPoint slide that captures the reader's attention and gives a quick visual impression of the essence of the manuscript. Remember, an excellent graphical abstract greatly increases the chances of your article being read and possibly cited.

At third? The figures. If they are low-resolution and full of mistakes, the reader stops. If not, they may continue to the body or download it to read the body of the article later when they have more time, which may never happen. Do you remember those heaps of printed publications in your mentor's office? (Today, everybody has a vast number of PDFs on a computer.) Those publications are the ones that "I will read them when I have more time."

Fourth and fifth: The body. A publication must be either interesting or useful to be read (the best is a combination of the two). We will find out its significance five years later [4].

Be aware that you lose potential readers at every step if they are not done correctly.

What is next when you have finished the first draft? *You revise.*

Authors

Authors are those who made a significant contribution to the conceptual design and/or the execution of the study [5].

The abstract

One continuous paragraph (100-250 words) should summarize the paper's purpose, methods, results, and conclusions to help the reader quickly understand what has been done and how this is useful for others. Abstracts are published separately in bibliographical sources, so they must be less technical than the body. It should stand alone without any citations, footnotes, and non-trivial abbreviations. Do not forget to point out the work's usefulness. That may be trivial for you, but not to every reader. Avoid high-flying statements and the "great promise of "whatever. It does not matter whether a topic "has recently acquired a great interest." These are meaningless statements. Nobody cares. Instead, say: "In the past three years, 1247 articles were published about this topic." Much better.

Keywords

Keywords help to find the study. Do not repeat the words in the title; they will be found anyway. Think about keywords as hashtags. Look up the most sought-after keywords in your field because many potential readers use

the internet to search for keywords or phrases. Aren't you?

Introduction

Summarize what is known (the relevant literature) and what information is missing, describe your hypothesis, and explain the motivation of your hypothesis. Tell the reader briefly what was known before this research and what was unknown.

Experimental

What is your plan to reach your goal? Describe your model and experimental design. Justify your model and methods – why have you chosen these? If *in vitro* experiments, why those cell lines? If *in vivo* experiments were used, then justify animal use; why and how were they selected? Animal care? IRB? Human subjects?

Materials and Methods: What did you use, why, and how? Mention ethical considerations, if any.

Experiments: Describe how the data were collected. Characterization should be system-based for all components. For Biology and Medicine, select appropriate controls, statistical evaluation, etc.

Your conclusions cannot be better than your data.

Results

Present your data nicely. Describe observations, measurements, and other experimental information using graphs and tables and summarize the main findings in the text. Follow them with the interpretation of your data, including relations between them. Are your measurements reproducible? Organize data into tables (max 1 page for each group) and present trends, changes, and comparisons in figures (max 1 page in size at least 300 DPI). Present your data clearly. Simple charts are better than too-complex ones unless you are writing to Nature.

Discussion

Draw conclusions based on the data you have provided and explain them briefly; apply statistics if needed. Analyze your data and highlight the most significant ones. Patterns? Relations? Explain how the results relate to each other and the original question. Discuss findings and their implications. Emphasize new knowledge, its significance, and its limitations. Do the findings

confirm existing knowledge? Do data support your hypothesis? Provide a mechanistic understanding or at least a new hypothesis, if possible. Do NOT overstate, be specific.

Summary/Conclusions

Summarize your article. What have you learned? What should we remember? Explain why and how your work is useful for others!

Acknowledgments

Thank those who helped with the experiments or made other significant contributions but did not make a substantial contribution to the conceptual design and/or execution of the study. Remember to thank the funders for the funding!

References

A list of items, each referring to the source of information in another publication. A citation gives authoritative sources for your statements and acknowledges that the information used in a paper did not originate with the writer. The use of the NLM reference style is highly recommended [6]. One of the most frequent mistakes is not citing the original source, which might lead to plagiarism claims.

Supporting information

Only the very motivated will read this part. The supporting information describes the experiments in such detail that someone trained in the art can reproduce the experiment(s). Provide all necessary experimental details. Someone who is trying to replicate your work is a potential collaborator!

Don't forget

Manuscripts should be written in clear and concise English. Have your text proofread by a native English speaker before you submit it for consideration, which will highly accelerate processing and will not annoy reviewers.

Articles are written for OTHERS and not for yourself! Your reader knows only as much as you have told them.

Have a good story, keep it simple and easy to understand, and make it good-looking.

Someone trying to reproduce your work is a potential collaborator – provide all necessary experimental details, at least in the supplementary material!

Research articles are based on interpolating within your data; in other words, your conclu-

sions are valid within your data range. One cannot generalize one's findings to the whole world. Avoid bombastic statements - those are not for science but marketing.

Before submitting your manuscript

If any of the figures/tables you used are copyrighted, you need to obtain permission from the copyright owners to reproduce these figures. You also need to document the copyright permission in the respective figure legend.

1. Write a cover letter to briefly explain what the authors tried to achieve. Describe how the work differs from the knowledge available in the literature and point out how it improves or has the potential to improve the field.

2. Run a free plagiarism checker. Somebody may have forgotten to assign a reference.

3. Always read the Author's Instructions. It is very well worth it.

4. Be specific and use simple language. Avoid overreaching general statements.

5. Have a question? Send an email and ask!

What happens after the journal office receives your manuscript?

When editors and reviewers first read your manuscript, they make up their minds before evaluating your actual results. The manuscript's lack of thoroughness and mistakes make the editors and reviewers think the same is true for the experiments. Don't forget: **You never have a second chance to make a first impression.**

When your manuscript arrives, it will be checked for plagiarism (Figure 1) and image integrity by Profig. (<https://www.profig.com>).

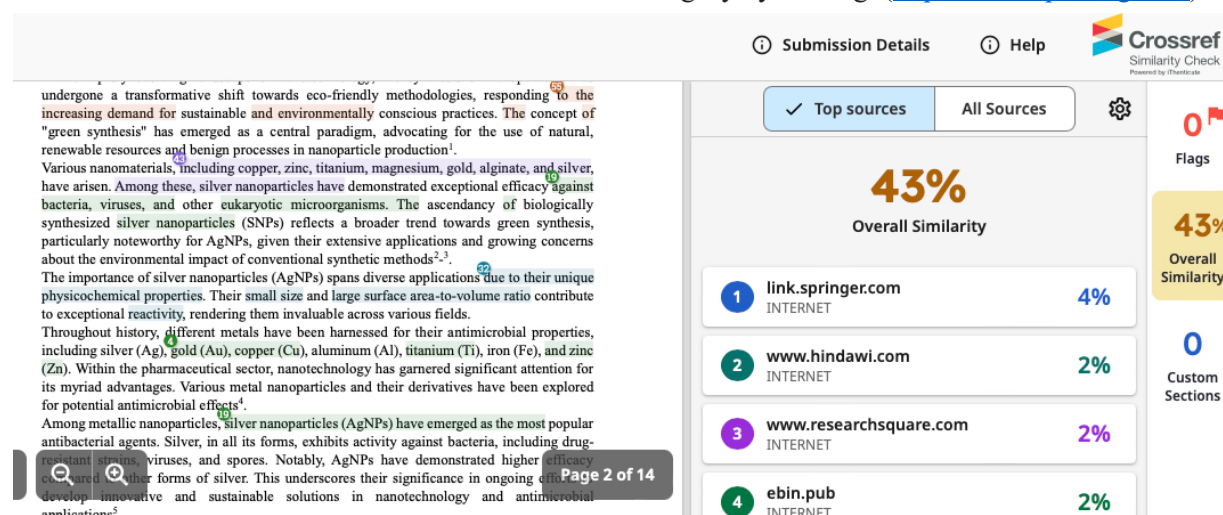


Figure 2: How the editors see your manuscript. There are many programs, but the view is similar.

Frequent mistakes committed by authors:

1. *Believing that readers know the background.* One of the most frequent and hard-to-avoid mistakes is that the writer considers everything (s)he or knows that others are aware of, too. Of course, we start from our personal knowledge, but if you want to reach a broader readership, always assume that the reader is educated and not necessarily trained in that specialty. Your manuscript will also do better with reviewers.

2. *Failing to revise the manuscript.*

Put it aside at least for a day and come back later to check whether you have said what you really intended to say. Repeat this a few times

until you are satisfied with the outcome, then ask one of your colleagues to read and comment on it. You need fresh eyes to see clearly.

3. *Not using the reviewers' comments to improve your work.* If a reviewer did not understand your manuscript, that is your fault.

4. *Believing that AI is perfect.* Large Language Models can access more information, but human intelligence is still better. (Healthy humans do not hallucinate.)

Many authors believe they may have preferable treatment if they know an editor. In reality, no editor is willing to downgrade themselves (and the journal) for somebody else's sake.

Conclusion

This is a practical guide for less experienced writers describing the procedure I use to write scientific articles based on a common experience: sharing stories with our friends. Following this procedure will enhance your chances of publishing good articles. In the end, your manuscript will be evaluated by peers based on the overall quality of the work and whether it fits the scope of the particular journal. Good luck, and never give up.

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