Chapter 7: Writing a Scientific Article

1/ What is a Scientific Article

A scientific article is a published written work intended for experts, specialists, students, and researchers. Its structure and level of reading demand specific skills. Scientific articles typically contain few illustrations, photos, or advertisements. A peer-review committee or group of experts assesses the scientific quality of the article before publication. A brief abstract precedes the main content of the article.

2/ The Structure of a Scientific Article

The first page should include the title, author's name, and the address of the laboratory where the work was conducted.

• The Title

It should be short, comprehensive, and captivating. Generally, it is written last to accurately represent the presented work. A subtitle may be included if the main title is too lengthy.

• The Authors

Authors are individuals who actively contributed to the conception of the research work. Typically, the number of authors should not exceed six, based on consensus. The listing of authors should adhere to hierarchical ranking rules.

The initiator and designer of the project should be listed last. Authors who conducted the study and contributed significantly to the work are mentioned first, each with their substantial contribution. Individuals who played a more distant role in the study are acknowledged in the acknowledgments section.

• Abstract

It should be written last. The construction of the abstract depends on the guidelines provided by the publisher. Generally, it should present a well-defined structure, including the purpose, materials and methods, results, discussion, and possibly the conclusion, using bibliographic references. The word count should not exceed approximately 250 words, with each word counted.

• Keywords

Keywords are important and informative words related to the content of the article.

Reading scientific literature helps increase knowledge and improve critical thinking, requiring an understanding of how a scientific article is structured.

- The foundation of a scientific article is the IMRAD structure:

I: Introduction

M: Materials and Methods

R: Results

A: And

D: Discussion. We will provide an overview of all parts of a scientific article.

• Introduction

This initial section of the report should provide a detailed presentation of the scientific context, the novelty, and the objective of the work you have undertaken. It may also outline the structure of the report (presentation of the plan) without presenting all the obtained results.

- **Project Theme:** These are a few sentences (2-3 max.) contextualizing the theme of your report. The introduced subject should initially be somewhat "broad" and then gradually narrow down to the specific issue.

Avoid clichés such as "Since time immemorial... Everyone knows that...".

- **Problem Statement:** Clearly articulate the problem statement of your work in a simple, concise, complete, and precise interrogative sentence that outlines your problem.
- **Hypotheses:** Describe how you expect the experiment to unfold, the anticipated result(s), possible explanations, etc. Your hypotheses should be verifiable and capable of addressing your problem statement.

• Materials and Methods

This section presents the essential information necessary for understanding and replicating the experiments described in the report.

• Results

This section should exclusively present all the results—announcing and demonstrating without drawing conclusions. It is advisable to use relevant tables and/or graphs with clear titles and explanatory legends.

• Discussion

In this section, a comparison with studies previously identified in the literature review should be presented. Some journals prefer to combine results and discussions into a single chapter.

The objective of the discussion is to address the posed problem statement. As the name suggests, this part should provide a commentary on the obtained results. The discussion should inform whether the results are statistically or clinically significant and identify any potential biases.

- For each of the studied parameters, you should:

Recapitulate the results by citing them and referring to the table and figure numbers.

Explain these results by comparing them to the existing literature, with references to support your points.

Recap and validate your hypothesis (refute or confirm).

Discuss potential sources of errors and critique the methodology if necessary.

Provide a "mini-conclusion" for each paragraph, highlighting the essential element.

• Conclusions

In this section, the main contributions of the work to addressing the questions and achieving the objectives presented in the introduction are outlined. To draft this section, consider the question: "What should the reader take away from this work?"

Additionally, discuss the perspectives opened up by the obtained results.

• References

Every time you cite statements from an author or a work, you must provide the consulted reference. Since no one has innate knowledge, it is essential to regularly indicate the source from which your information comes. There are various ways to cite a reference, but there is unanimity on one point: footnotes are not used in a scientific report.

3/ Introduction to Reading and Understanding a Scientific Article

-A scientific article in a journal or scientific publication may seem complex and difficult to understand if you have little experience in research. However, most scientific articles have a clear structure that greatly facilitates their reading.

-By reading a scientific article in a structured manner, you can better determine if it is relevant and useful for your essay or thesis. In this article, we explain how to read a scientific article.

-If you know that the scientific article is relevant to your research and of good quality, you can delve into a more in-depth reading of the article.

First Step: Read the Introduction of the Scientific Article

-Many students start by reading the abstract, but it is better to begin with the introduction. The abstract is concise and often written in complicated terms, making it challenging to grasp if you haven' t read anything else from the rest of the article.

Second Step: Determine the Key Question within the Research Domain

-What is the "big question" that researchers in this field of study aim to answer?

-When you understand the overarching question, you gain a better grasp of the research's motivations discussed in the article. The article is, in fact, just a small part of a much larger study on which other researchers write articles.

-Look for the reasons behind undertaking the research. Often, a study builds upon a previous one. Examine which studies were conducted before, their limitations, and how this new research advances the previous ones. You don't necessarily have to search for this information yourself, as it is often provided in the article itself.

Third Step: Determine the Research Questions of the Scientific Article

-What research questions are the authors specifically trying to answer in the scientific article? There may be multiple questions, or there may be just one. Note the research question(s) on a piece of paper for your reference.

-It is possible that there are no research questions but rather hypotheses. When there are hypotheses instead of research questions, the research aims to determine if the author's expectations (the hypotheses) are correct. In this case, note the hypotheses.

Fourth Step: Consider the Approach :-What are the authors doing to address the specific questions? What is the plan or approach they have outlined?

Fifth Step: Read the Methodology Section

-Take note of exactly what the authors did for each experiment. For instance, describe this in the form of a clear diagram, ensuring not to miss any details so that you can grasp the overall idea from the diagram. Doing this by hand is quicker than using a computer.

Sixth Step: Read the Results Section of the Scientific Article

-Write one or more paragraphs summarizing the results of each experiment, each figure, and each table. Do not contemplate the significance of the results; simply note them as they are. Often, results are summarized in figures and tables, so study these carefully!

Seventh Step: Determine if the Results Address the Specific Questions

-Form your own interpretations before reading those of the authors (in the discussion section). At this stage, ask yourself what the results mean. If you are a novice in reading scientific articles, this may be more challenging than when you become more experienced.

-In the beginning, you may often need to align your opinion with that of the authors themselves. Later, you will likely become more critical.

8th Step: Read the conclusion and discussion of the scientific article

Now, read what the authors think about the significance of the results. Do you agree with their interpretations? Pay attention to what the authors identify as research flaws and their proposed directions for future research. Don't assume they have done everything correctly – be critical.

Have you identified flaws not mentioned by the authors? Do you agree with their suggestions for further research?

9th Step: Go back to the abstract

You can now read the abstract. Does it reflect what the authors state in the article? Does the abstract correspond to your interpretation of the scientific article?

10th Step: Save the scientific article and note the source reference

Now that you have read the article thoroughly, is it relevant and useful for your research?