Instructions for writing a Scientific Articles

The scientific article must be structured so that it is manageable and easy to read. Scientific articles must follow the IMR&D structure(introduction, methodology, results, discussion, and conclusion).

You should ask your course manager about the expected length of each section as this likely differs between courses.

Structure for scientific articles:

1. Title
2. Author list
3. Abstract
4. Introduction
5. Materials and Methods
6. Results
7. Discussion
8. Conclusion
9. Acknowledgements
10. Author contributions
11. References
12. Appendices

1. Title

2. Author list

First Author[1,*], Second Author[2,ǂ], and Third Author[1,2,ǂ]

[1]Affiliation, department, city, postcode, country
[2]Affiliation, department, city, postcode, country
[*]corresponding.author@email.example
[ǂ]these authors contributed equally to this work

3. Abstract

The abstract gives the reader a short "preview" of what they can expect to read in the article. Abstracts should be one paragraph, of about 100-250 words. No references, subheadings, or abbreviations in an abstract.

You can write an abstract in 6 sentences:

- (1) Why is the topic of interest?
- (2) Research problem(s) you investigated
- (3) The basic design of the study
- (4-5) The major results
- (6) A brief summary of your final conclusions.

4. Introduction

The introduction should include the relevant background on the topic of investigation clearly summarized in your own words, including citations so that the reader can find further information if necessary. The introduction should expand on the abstract:

- Paragraph (1) Why is the topic of interest?
- Paragraph (2) What is the research problem(s) and what has been the previously used solution(s)
- Paragraph (3) What was the basic design of your study? Also include why you think that your approach will be better than the previously used solutions.
- Paragraph (4) What will be presented in this paper? Clearly state your hypotheses briefly how you will test them experimentally. The final sentence of this paragraph should give a short summary of the results directly addressing your research question e.g. "We found that…..".

*Remember, there should not be any surprises in a scientific article – it is not a novel - don't wait to reveal your interesting results until the end.

5. Materials and Methods

Describe how you obtained your results in a way that others could replicate them. It should include:

- Source of materials.
- Analytical methods, including brand and model for the analytical equipment (including software)
- Reference to previous studies and standard procedures (if any) and modifications.

It should not include

- A protocol ¨step by step¨ is not necessary, the reference to a standard method should be included. If there are any modifications to a standard protocold that should be mentioned. Compare the next two paragraphs to see the difference between a step-by-step protocol and a methods section:

"To measure enzyme activity we first took a 200 µL pipetter and transfered 150 µL of Buffer 1 into an 1.5 mL Eppendorf tube, then added 35 µL of Enzyme Solution 1, and 50 µL of Substrate Solution 1. We turned on the spectrometer and waited 30 min for the lamp to warm up, next we……."

"Laccase (Sigma-Aldrich) enzymatic activity was measured by observing the oxidation of substrate indigo carmine at 620 nm using a Shimadzu UV-1800 spectrometer following the protocol of Walsh. Briefly, 20 µM Laccase in 0.1 M phosphate buffer (pH 6.3) was assayed with varying concentrations of indigo carmine (0 – 50 µM) for 15 min at 30 s intervals."

- Calculations. Include relevant equations; do not show calculations.

6. Results

This is where you present the results of your experiments. Before you include any figures or tables, you need to introduce your results section with a paragraph.

- Describe all the results in a short form in the text. All tables and figures must be described and referenced in the text.
- Include subheadings in your results
- The results section is not a diary of all the data you have collected during the whole semester – only show results that are important to answering your hypotheses.
- It is important that you do not discuss the results or speculate as to why something happened; this is what makes up the Discussion section.
- Make tables and figures of interesting results, and decide what messages to communicate. Only the edited results should be included.
- Raw data (if desired) and results not interesting enough for the main text should be placed in an Appendix at the end of the report.
- Format of figures
  - Make figures clear and easy to read and keep always the same format
  - Remember to add the axis legend
  - Don't repeat the same information in different figures or in tables
  - Remember to number the figures and tables
  - Figures captions are place under the figure
  - The figure caption should include a description of the figure and explanation of what is being presented
- Format of tables
  - Tables need to be clear and easy to read and always have the same format
  - Tables need a table number, a table title, and the units of the data need to be clearly specified
  - Use footnotes for further explanation.
  - Be accurate with numbers. (significant figures)
  - Tables caption are place above the figure.

7. Discussion

This where you discuss your results:

- Highlight the most significant results, but don't just repeat what you've written in the Results section. *Remember to refer to your figures with their figure numbers.
- How do these results relate to the original question?
- Do the data support your hypothesis?
- Are your results consistent with what other investigators have reported?
- If your results were unexpected, try to explain why.
- Is there another way to interpret your results?
- What further research would be necessary to answer the questions raised by your results?
- How do your results fit into the big picture (the scientific field that you introduced in the introduction)?

8. Conclusion

- End with a short paragraph or 1-2 sentences summary of your conclusion, emphasizing why your work is relevant.
- 1 sentence on future work you plan to do (if hypothetically you continued with this work)

9. Acknowledgements

Here you thank those who helped with the experiments, data analysis, interpretation of results etc. but who are not included in the author list.

10. Author contributions

Here you should briefly state which author did what in the article; just refer to the authors by their initials

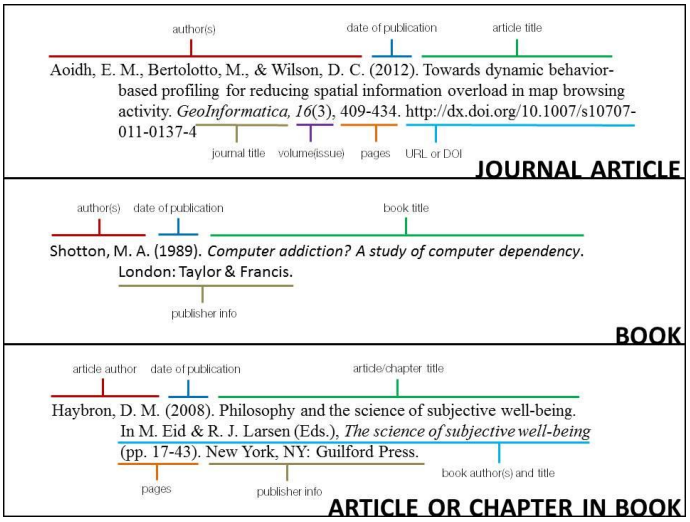
e.g. All experiments were designed by S.M.W, C.M.P, and E.J.E. S.M.W carried out assays, C.M.P performed statistical analyses, E.J.E undertook modelling, all authors wrote and reviewed the final manuscript.

11. References

Different reference styles can be chosen. However it is important to be consistent during the whole document. All references must be included in the text. (As numbers or author last name and year)

It is recommend to use a reference management software such as Mendeley.

At the end of the document, a reference list is included and all the reference information must be added.



12. Appendices

In appendices you include methods and results which did not make it into the main text.

- Your appendicies should be as clear and easy to read as the main figures and tables of your text
- Your appendices should be numbered
- Refer to your appendices in the main text using their numbers e.g. Unprocessed data for Figure 1 is shown in Appendix 1.
- Appendices could include:
    - untreated raw data can be inserted,
    - examples of performed mathematical calculations
    - program scripts e.g. python

- special protocol used