

SCIENTIFIC WRITING: ORGANIZATION

Most writing in the natural and social sciences follows a standard IMRAD structure: Introduction, Methods and Materials, Results, Discussion. This structure can include many variations, some of which are described briefly below, but it is shared by everything from lab reports to professional journal articles. Each section serves a very different purpose, so think carefully about where you choose to put each piece of information. Common problems shared by student writers include putting information in the wrong section and putting the same information in more than one section.

Title

- Precisely identifies research topic without using extra words.
- Creativity is rarely appropriate, particularly in the hard sciences.

Abstract

- Should always be written after the paper.
- Should communicate all main points of paper.
- In a journal article, this is the only part that most people will read. If it's not in the abstract, you might as well not have done it!

■ **Introduction**

- Establishes that your research question is worth asking.
- Establishes that your methodology is an appropriate way of answering it.
- (In geology, specifies relevant features of the geologic setting--sometimes a separate section.)
- Shows how existing literature informs your research question (this part may be brief if a separate literature review follows).
- Shows how your approach fills gaps in existing research.
- Ends with a clear statement of the problem: what the project was looking for and why.

Literature Review

- Is a required Chapter 2 in many thesis- and dissertation- length projects, but not a separate part of some other assignments.
- Synthesizes the existing research on your topic, establishing what has already been learned about it, what is debated, and what remains unknown or unclear.

■ **Methods and Materials**

- Must be specific enough to allow someone else to replicate your work.
- Establishes exactly what you did or plan to do
 - (*Geology*) Starting Samples
 - Source, characteristics, method used to characterize
 - Materials or methods used, including sampling methods

- Treatment of those materials
 - Limited detail for standard methods; greater detail for new or modified methods
 - Specify brands, models of instruments, and measurements
- Data analysis
 - Specify software
 - Specify statistical methods
- Addresses method's reliability and validity, if appropriate
- Addresses limitations and delimitations of approach

■ Results

- No interpretation. No procedures. No findings irrelevant to stated purpose of paper.
- Use tables, figures.
- Explain information displayed in tables and figures precisely.
 - Do NOT just refer the reader to the table or figure.
 - Avoid discussing how data was plotted: readers can see this.

■ Discussion

- Evaluates and interprets data.
- Explains how data supports or conflicts with previously published findings
- Supports interpretive statements with references to specific data
 - NOT "Table 3 shows that...."
 - BUT "the X% increase in X values shown in column X of Table 3 shows that..."
- References figures and tables as precisely as possible
 - NOT "as shown above"
 - BUT "as shown in column X of Table 2"

Conclusions

- This section is sometimes combined with the discussion section above.
- Importance of Findings
 - Major findings and what they mean.
 - How they contribute to the field and what remains for further study.
- Why this research did or did not meet its initial objectives.

Acknowledgements

- Usual in published work; less so in student work.

References

- Organized in citation style specified by teacher or professional journal.