

Scientific Writing: IMRAD Format



A common scientific writing format is IMRAD, which stands for **I**ntroduction, **M**ethods, **R**esults, **A**nd **D**iscussion. This type of scientific writing is useful for educating and recording knowledge about research processes as well as findings. While this handout offers general principles and useful guidelines, always tailor your work to your audience and assignment.

Introduction

The introduction provides an overview of your work. Consider these guidelines to write an effective introduction:

- Contextualize your work by supplying readers with background information and an overview of the current conversation. If a literature review is not required as a separate section, provide a concise overview of relevant literature (guiding theories and studies) to orient and prepare the reader.
- Indicate how your work will address a gap in knowledge, and, if acceptable for your field or assignment, outline key results and conclusions.
- Present the theoretical rationale, hypothesis, and research question(s) you are trying to answer.
- State the general methods of the investigation, and if necessary, state why a certain method was chosen.

Methods

The methods section is an account of the research process used to produce the results. Consider the following principles when composing this section:

- Provide sufficient information about the methods and materials used to enable other researchers to reproduce your work. The ability to replicate research is an indicator of the validity of the work.
- Do not include results or analysis in this section, unless they are needed to understand the methodology.
- When working with living organisms, include their Latin names, including genus, species, and strain. If you worked with chemicals, provide generic names, as not all brand names are universally recognized. Quantify measurements if possible. If appropriate, acknowledge that IRB approval was received.
- Write in the past tense since present tense is reserved only for established, or previously published, knowledge. Write chronologically, so others may accurately repeat the process and procedure of your work. Also, because this section focuses more on the action than the actor, passive voice is acceptable.

Results

In the results section, give an overview of your methods and experiments along with an account of your data. Be selective when presenting your data, and consider the following:

- Provide data in a clear way and avoid misleading readers. For example, if you had a sample size of only four, saying that 25% of respondents felt a certain way may be irrelevant and misleading. Do not omit data that does not support your hypothesis, but account for it, so others can learn from your work.

- Organize data clearly and logically. There are many possibilities for organizing and addressing results: in the same order they were presented in your introduction, chronologically, most to least important, simplest data to most complex, chemical class by chemical class, etc.
- Use figures, tables, charts and graphs to better illustrate your data. Remember that the text should *refer* the reader to the chart, not *repeat* the information in the chart.

Discussion

The main purpose of the discussion section is to show the relationships between your data and your hypothesis. Consider the following to most effectively write the discussion section:

- Explain the principles, relationships, and generalizations implied by the results of your work. Discuss rather than simply repeat results.
- Do not cover up or falsify data. Address any exceptions or any lack of correlation, and explain unresolved or unexpected outcomes.
- Show how your results and interpretations agree (or disagree) with previously published work.
- Clearly state and summarize the evidence for your conclusions.
- Outline the significance and limitations of your research to give the reader an idea of the strength and validity of your work or position.
- Explain relevant theoretical implications, practical applications, or future research questions resulting from the work.
- End your discussion with a closing summary about the significance of the work.