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Scientific Writing & Presentation / Communication in Science

doc. dr. Michael Burnard, PhD

Renewable Materials for Healthy Built Environments -UP FAMNIT

Fall 2022

Course Overview

Don't panic!



Course Overview

Instructor:

Mike Burnard

Office: Trg Brolo 12

Office hours:

by appointment

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Feel free to reach out as needed.



Course Overview

Meetings

Tuesdays or Thursdays?
(or both days)

May add more or change the
schedule if needed.



Course Overview

Objectives

- Improve scientific writing
- Learn related skills (peer-review, finding literature)
- Learn different article types
- Learn about proposal writing
- Practice scientific presentations



Course Overview

Outcomes

- Understand key aspects of scientific writing and the publication process
- Write a complete proposal
- Become familiar and comfortable with presenting science



Questions about the class?



Your experiences

Where are we now?

- Writing experience
 - Articles/theses?
 - Proposals
- Presentation

INTRODUCTION TO WRITING SCIENTIFIC PUBLICATIONS

What are the two most important things you should do to become a better writer?

Writing well...

Read (a lot)



Write (a lot)



**Other important aspects
of writing...**



But first... talking about writing

Some important terms & concepts...

- **Diction** – word choice
- **Grammar** – structure of language
- **Persuasive writing & argumentation** – convincing others
- **Expository writing (exposition)** – explaining a subject
- **Narrative** – telling a story
- **Passive vs. active voice** (grammatical voice)
 - The relationship between x and y was examined, *vs.*
 - We examined the relationship between x and y

A useful resource: <https://owl.purdue.edu/> [Purdue Online Writing Lab]

Important aspects about writing

Simplicity & clarity

- Simple language
 - Direct language: “The majority of samples were not able to meet the desired level of performance.” vs. “Six out ten samples failed below the performance threshold of 30 kN.”
 - Positive form: “The sample did not withstand a force above 30 kN.” vs. “The sample failed at 30 kN.” *Say what it is rather than what it is not.*

Important aspects about writing

Simplicity & clarity

- Simple language
 - Avoid unnecessary words: use “also” and “that” sparingly; replace “this is a subject that...” with “this subject...”
 - Avoid fancy words: English has many synonyms, and it can be hard to choose the right one. Generally, use the most common term.
 - Be mindful of jargon: Your field has its own specific terminology. Consider readers from other fields.

Important aspects about writing

Simplicity & clarity

- Simple grammar
 - Shorter sentences are usually easier to read than longer (but variety in length is ok if they don't violate grammatical conventions).
 - Maintain tense appropriately (your experiment happened in the past).
 - Maintain voice (stick with passive or active; choose active if the journal accepts it.)



Important aspects about writing

Simplicity & clarity

Structuring your writing

- Think of the paragraph beyond the sentence.
- Guide the reader with a story
 - Use logic to structure narrative and compel the reader to the next sentence, paragraph, section.
- Use transition words sparingly. You can structure sentences to make them unnecessary.
 - “moreover”, “in addition”, etc.
 - When used sparingly and appropriately transition words can improve argumentation when they illustrate logical conclusions.

Important aspects about writing

They're more like guidelines anyway

Most of your audience will be reading in their second (or third) language. Sometimes, breaking English style “rules” will make your writing easier to understand.

[The Elements of Style by William Strunk JR. and E.B. White](#) is a useful guide, but you don't need to follow every suggestion.

Important aspects about sci. writing

Ethics & honesty

Write what is, not what you wish would be.

- Don't overstate findings
- Only claim what your methodology can support
- Never forget the scientific method



Article types

What kind of article are you writing

Article types

- Scoping study
- Bibliometric study
- Meta-analysis
- Literature review (narrative, systematic)
- Original scientific article
- Data article
- Pre-registration
- Conference articles/abstracts
- ...Other examples?

Common attributes

General structure

- Title, author info, abstract, keywords
- IMRAD
- Conclusions, acknowledgements, references, supplementary material

IMRAD?

- Introduction
- (Materials and) **M**ethods
- **R**esults, and
- **D**iscussion

Structuring your paper:

<https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously>

Introduction

Key elements

- Combination of exposition and persuasive writing.
 - Explain the problem, persuade readers it is important
- Convince readers there is a problem to solve
 - Gap in literature/other research
 - New challenge (i.e., policy initiative, societal need)
- Define state of the art, review relevant literature
- Define your objectives
- State hypotheses to be tested
- Keep this under 2 pages for most articles

Every paper type relies on this section to set the stage for the rest of the article

(Materials and) Methods

Key elements

- This structure of this section depends on the article type!
- Define clearly and briefly:
 - Materials
 - Equipment
 - Standards
 - Procedures
 - Structure of collected data
- Define clearly and briefly (cont.):
 - Analytical methods (explain that the methods are appropriate for the data, and visa versa)
 - Confidence levels and thresholds for statistical significance
- If using established methods/standards: do not repeat, reference instead!

Results

Key elements

Observed results

- Present the observed data in sufficient detail to support further analytical steps.
- Figures like boxplots are helpful
- Tables of observed central tendencies (means, medians, modes), frequencies, variances, and the number of observations per group

Analytical results

- Explain the outcomes of statistical comparisons or modeled predictions/trends.
- Favour confidence intervals over p-values.
- Explain differences in real terms (effect sizes), not statistical terms.



Discussion

Key elements

Place your results in context

- Of previous studies, the current state of the art
- Meaningful outcomes
 - Your p-value might be small, but will the actual effect size produce a meaningful difference in application?

Explain how your results could be used to advance the state of the art, address the problem you introduce in your introduction.

Avoid introducing new literature or new concepts here.

Conclusion

Key elements

- State the advances study accomplished in 2-3 sentences
- State how the advances can be used
- Suggest further extensions of the study / new experiments based on the study
- State any notable limitations to your study

Keep this section related to the objectives you stated in the introduction. To maintain the narrative, link your concluding statements to the arguments you made in the introduction.

Abstract

What is in it

- The abstract comes first in the paper, but it is the last thing you should write.
- It should be short (< 250 to 300 words, depending on journal)
- Avoid abbreviations
- No references
- Can be structured (IMRAD) or not, depending on journal.

What it does

It needs to convince the reader to continue. You will quickly learn, that you first dismiss articles based on title (related or not) then abstract (related and interesting or not).

Finding a starting point: Literature reviews

Before starting your study, let alone an article, you need background information.

What should I search for?
Where do I search for it?



Literature searches

All article types include some sort of literature review as part of the introduction.

Literature searches are an ongoing activity throughout your career.

What do I type into Google Scholar?

Start with your research question...
What are the key terms? How can they be restated?

Ask your advisor for help.

Exploratory & Structured Searches

Exploratory

- Exploratory searches help you find key search terms, identify research groups, authors, journals
- Google scholar is great for this
- Read titles and abstracts to see if the articles are related
- Take note of keywords
- Check articles in the references section

Structured

- Used for systematic literature reviews, scoping studies, bibliometric studies, meta-analyses.
- Use well-formulated search phrases
- Often include progressive searches
 - “hardwood” -> “hardwood AND modification” -> “hardwood AND modification AND environmental footprint”
- Try Web of Science and Scopus

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Let's try...

Assignments

Don't panic!



Assignments

#1 Rhetorical Précis

- Do an exploratory search for literature related to your thesis topic.
- Select two important articles
- Write a Rhetorical Précis about each.
- Due by Meeting 2 (19.10)
- Rhetorical Précis

https://web.archive.org/web/20160314125333/https://oregonstate.edu/instruct/phl201/modules/rhetorical-precis/sample/peirce_sample_precis_click.html

#2 Article types

- In groups of two, select an article type from those discussed (or one I missed), and prepare a 3- to 5-minute presentation about the article type. Students will present at Meeting 3 (25.10).
- Include key elements, sections, special methods, submission procedures, required materials, and stipulations for publication (i.e., not all journals publish all journal types); include references to a few articles as examples.

Questions?

