Scientific Writing

RSM 321 (Lecture 6)

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A complete report

Cover
Title page
Abstract
(Preface/Foreword)
Table of Contents
Summary

Administrative (Front Matter: lower-case Roman numerals for page numbers)

1 Introduction
2 Chapter
3 Chapter
...
...
n Final chapter (e.g., Discussion, Conclusions, Recommendations, Advice, Application)

References
Appendices/Annexes

Administrative (Back Matter)

The Writing Process

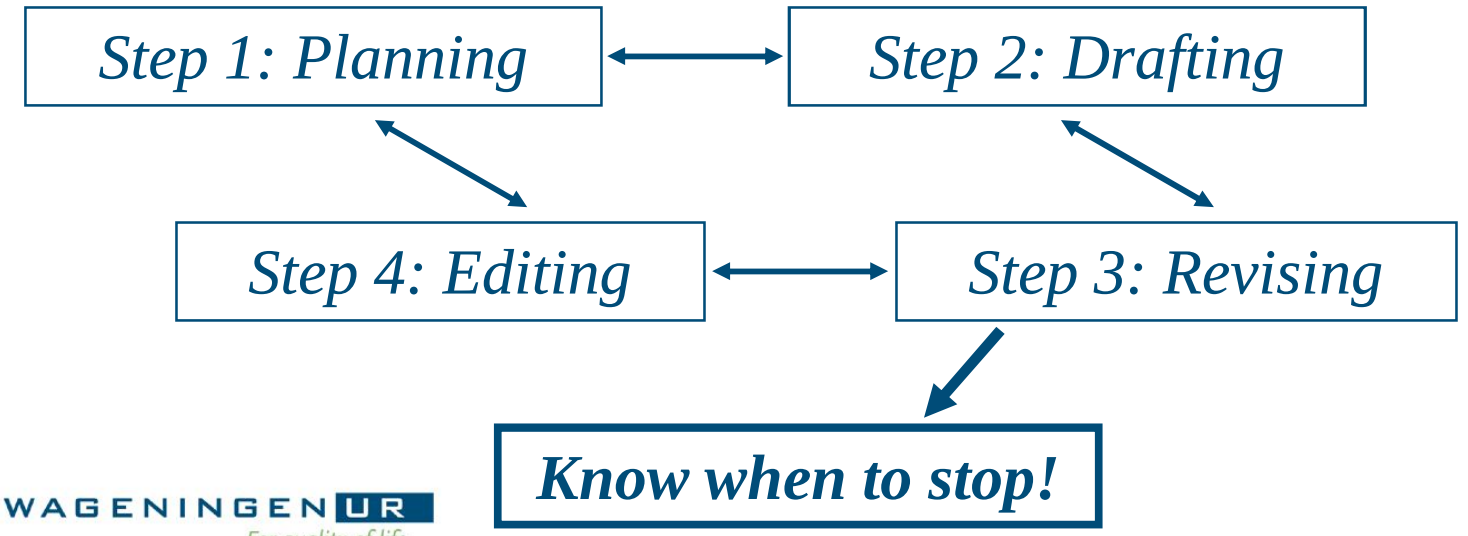
Goals/Questions for the Writer

What do I know about this topic?

What is my purpose for writing?

Who is my intended audience, and how much do they know about this topic? Should I worry about other readers?

Which structure will work best for this topic?



Steps in preparing a paper or written report

1. Clarify the aim/purpose/target/goal/objective
   - What am I trying to achieve with this report?
     - To describe, to explain, to instruct, to specifiy, to evaluate and recommend, to persuade…?
2. Consider your audience
   - Your target group
     - Your audience: for whom are you writing?
       - Handbook/manual, commercial leaflet, installation guide
     - Adjust subject matter, material, examples, tone, style, jargon and vocabulary, length/depth
     - Choose the appropriate mode of communication
       - Format (journal article, research report, technical report)
       - Text and/or illustrations (photos, graphs, tables, diagrams)
   - Your non-target group

Steps in preparing a paper or written report

3. Collect information
   - Literature search (second-hand)
   - Personal research (first-hand)
   - Combination of the two

What information is necessary to fulfil **this** communication task for **this** audience in **this** context?

DRIP (Data Rich, Information Poor): A good report need not be overly complex and thick. Do not try to over-impress the reader.

Steps in preparing a paper or written report

4. Outline the report structure
   - What goes into the chapters, sections, paragraphs

5. Write a draft report

6. Edit and check the final version

   Have someone read it!!!

   Use spell-check and grammar-check tools

Text Structure

"If a man can group his ideas, then he is a writer"
–Robert Louis Stevenson

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In the middle of a report, you present your work as numbered chapters

Choose a logical strategy

Make sections and subsections

1. Heading
    - 1.1 Subheading
    - 1.2 Subheading
2. Heading
    - 2.1 Subheading
    - 2.2 Subheading
    - 2.3 Subheading
3. Heading

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Common strategies exist for the middle of scientific reports

- Methods of classification:
  - Method-based (IMRaD: Introduction, Methods, Results and Discussion)
  - Thematic:
    - *aspects*
    - *parts*
    - *groups/persons*
    - *enumeration*
  - Chronological
  - Geographical
  - Persuasive (e.g., policy paper)
  - Journalistic

Arrange chapters, sections, subsections

- The writing strategy should be evident from the titles of the chapters and the headings of the sections and subsections
- Think about the global order and the internal order

Organization: sections & subsections

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Organization: sections & subsections

Performance of the Solar One Receiver

- Introduction
- Steady State Efficiency
- Average Efficiency
- Start-Up Time
- Operation Time
- Operation During Cloud Transients
- Panel Mechanical Supports
- Tube Leaks
- Conclusions

Performance of the Solar One Receiver

1. Introduction
2. Receiver's Efficiency
   - 2.1 Steady State Efficiency
   - 2.2 Average Efficiency
3. Receiver's Operation Cycle
   - 3.1 Start-Up Time
   - 3.2 Operation Time
   - 3.3 Operation During Cloud
4. Transients
5. Receiver's Mechanical Wear
   - 5.1 Panel Mechanical Supports
   - 5.2 Tube Leaks
6. Conclusions

Numbering Chapters

4. Operation
   - 4.1 Operator interface
   - 4.2 Explanation of operating keys
   - 4.3 Setting passcodes
     - 4.3.1 Passcode protection
   - 4.4 Display examples
5. Parameters
   - 5.1 ……
   - 5.2 ……

2. SAFETY

2.1 Instructions

2.1.1 *Safety instructions*

3……

Contents

- Change title of Chapter 1 to “Introduction”
- Don’t divide into 1.1
- Page numbering: page 1 should be the title page
- Classification appears method-based
- Include Chapter 2 (“Problem statement”) in the Introduction
- Revise structure of Chapter 2 and avoid repetition of “Introduction” and “Tapping”
- Make two chapters out of Chapter 2 on the basis of situation and consequences

Structure of a Literature Review/Policy Report and IMRaD

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The Introduction prepares the reader for the topic, defines the scope and limitations, and tells the reader why the research is important

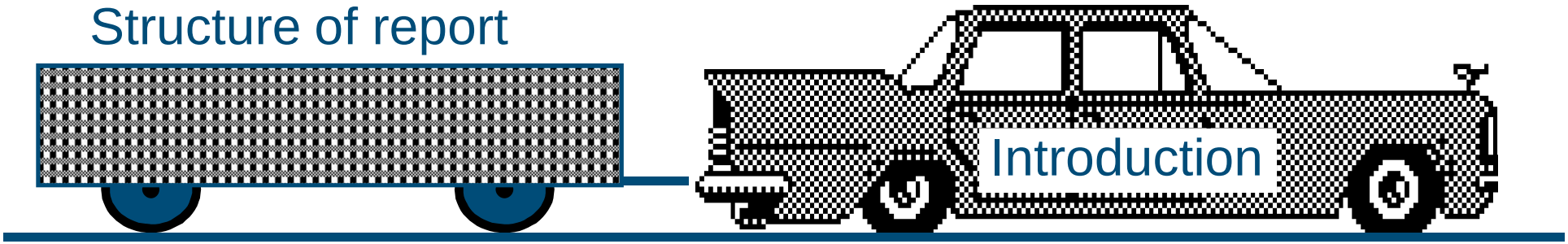
Topic

Importance/relevance

Background

Structure of report

The Introduction is always Chapter 1



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Chapter 1: Introduction

- The Introduction is not the same as the Preface/Foreword
- The Introduction is always the chapter one
- The Introduction should put the reader on the right track/set the stage
  - Introduce relevant background
  - Subject of the study
  - The aim(s)/objective(s)/purpose(s) of the study
  - The research questions (in straightfoward terms)
  - Why this subject?
  - Which aspects/factors/parameters are discussed?
  - Which aspects/factors/parameters are not discussed and why not?
  - Working method: how did you obtain your information/data (e.g., literature research, empirical study)?
  - Who may use your information (for whom is the report intended)?
  - How is the report organized (e.g., chapter arrangement)?

Introduce pertinent literature in the Introduction

- "Parmenter (1976) and Chessman (1978) studied the diet of *Chelodina longicollis* at various latitudes, and Legler (1978) and Chessman (1983) conducted a similar study on *Chelodina expansa.*"

- "Within the confines of carnivory, *Chelodina expansa* is a selective and specialized predator that feeds upon highly motile prey such as decapod crustaceans, aquatic bugs and small fish (Legler, 1978; Chessman, 1984). In contrast, *C. longicollis* has a diverse and opportunistic diet (Parmenter, 1976; Chessman, 1984). Neither of these studies, however, has reported on…"

Many articles follow a set structure: IMRaD

1. Introduction
   - aim(s)
   - current limitations
   - literature review
   - importance/relevance
   - overview of the report
2. Materials and Methods
   - materials/reagents/subjects
   - methods/protocols
   - literature regarding the methods
   - operational definitions
   - statistical analyses
3. Results
   - tables, graphs, diagrams
   - interpretation
   - need not be chronological
4. Discussion
   - discussion
   - answer to the aim
   - hypotheses for further research
   - conclusions

Materials and Methods

- Provide reproducibility to others
- Provide legitimacy of your study
- Should contain sub-headings
- Describe equipment and reagents precisely (e.g., “Licor Model LI192SB underwater quantum sensor”, “8-week old male FVB mice”)
- Usually follows the same order as the results
- Should be brief but detailed
- Include references as needed
- Avoid overusing “as previously described”

Results

- Present your findings in an objective manner
- Tell a story
- Present the data, digested and condensed, with important trends extracted and described
- Use tables and graphs
- State the findings clearly and simply

"It is clearly evident from Fig. 1 that bird species richness increased with habitat complexity".

"Bird species richness increased with habitat complexity (Fig. 1)".

Results (cont.)

- Show us, don't tell us

"The large difference in the mean size between population C and population D is particularly interesting."

"Mean size generally varied among the populations by only a few centimeters; however, the mean sizes of populations C and D differed by 25 cm (Table 1). Two factors might account for this...."

Results (cont.)

- Subsection titles should be in present tense
- The data should be in past tense
- General conclusions that are drawn from the data should be in present tense

  "*Cqk* knock-out mice **had** impaired long-term memory compared with wild-type littermates; thus, Cqk **is** important for memory consolidation."

  But: "…thus, in our study, Cqk **was** important for memory consolidation under our experimental conditions."

Discussion

- What principles have been established or reinforced?
- What generalizations can be drawn?
- How do your findings compare to those of others? How do they differ (and why)?
- Are there any theoretical/practical implications to your work?
- The discussion should be firmly based on the data that were presented in the Results
- Continually refer to your results (but do not repeat)
- Do not extend conclusions beyond what is in your results (although hypothesizing/speculating is okay)
- Don’t let the reader walk away thinking “so what?”

Discussion (cont.)

- Develop a strategy
- Don’t start or end with the weaknesses/limitations of your methods
- Begin with the most important points from your results
- End with a strong concluding paragraph (avoid “Future research is needed to confirm these results…”)

Prepare your readers to understand your work

- Cover – non-essential element of the document
- Title page – orients the readers to the document and is required for scientific documents
- Abstract – tells the readers what is in the document
- Table of contents – tells the readers the overall layout
- Summary – tells the readers what happens in the document
- Introduction – Prepares the readers for the middle sections

The Importance of the Title

"The title is the single most important phrase of a scientific document. The title tells readers what the document is. If your title is inexact or unclear, many people for whom you wrote the document will never read it."

–Michael Alley, Penn State University

A strong title orients the reader to your area of work

The Effects of Humidity on the Growth of Avalanches

The Effects of Humidity on the Growth of Electron Avalanches in Electrical Gas Discharges

The title of the report

The title is in fact the shortest summary of the text

Guidelines for the title:

- Contains essential words and/or phrases
- Is informative, non-colloquial (do not try to be cute or funny)
- Should not contain abbreviations
- Does not contain a final punctuation mark (except a “?”)
- Use title capitalization: do not capitalize articles, conjunctions or prepositions
- If possible, give the result in the title
  - Avoid “The effect of...” titles (e.g., “The effect of sugar on diabetes in toddlers”)
  - Give the actual result (e.g., “High sugar intake in toddlers increases the risk of juvenile diabetes”)

Examples of titles: what can go wrong

- Human Influenza Vaccine
- Panda Mating Fails: Veterinarian Takes Over
- Instruction on how to handle in case of fire
- Proceedings of the conference on unemployment in Brussels
- Flying doctors in Zimbabwe can be dangerous
- Report of New Health Data Results from the 1999 National ASAP-FYI-ERGO Health Study: Lung Cancer in Women Mushrooms
- Control Equipment Selection
- Alcohol for women is worse than men

Title page

- Five essential elements:
  - Author's name(s)
  - Title (and subtitle)
  - Publisher or responsible institute (or author affiliations)
  - Place of publication
  - Year and month of publication

Report Writing for Science, Technology and Management

Dr. C.F. Barrett

9 September, 2011

Wageningen University, Wageningen

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Page Numbering

Front material should be numbered:

"i, ii, iii, iv, etc."

Middle and back material (i.e., References and Appendices) should be numbered:

"1, 2, 3, 4, etc."

Summary

1. belongs to the main text as administrative part; for a quick communication of the content
2. contains quantitative and qualitative data
3. length is “unlimited”
4. can be sub-divided into paragraphs (representing the chapters)
5. can refer to chapters, sections, annexes, figures and tables, bibliography, etc.

Abstract

1. can be moved out of the publication into documentation systems (e.g., Pubmed)
2. contains quantitative and qualitative data
3. max. length 250 words (half a page)
4. must *not* be sub-divided (no captions, no paragraphs)
5. must *not* refer to specific elements in the main text
6. has three parts (heading, text, key words)

Summary

- The paragraphs in the summary give the most important information of the chapters in the report.
  - Chapter in report = paragraph in summary.
- The summary gives no new information.
- Is informative, not descriptive
- Maximum length: 1.5 A4
- A summary is generally required in a report of 15+ pages

Abstract

- In an abstract, you address the question:

  What is the report about, in brief and without too much detail? (250 words max.)

- By doing the following:
  - *State the primary objectives*: What did you investigate and why?
  - *Describe the methods*: How did you do it?
  - *Summarize the most important results*: What did you discover?
  - *State the principal conclusions and their significance*: What do your results mean? To whom?
  - Key words

Key words

- Should be logical and relevant to the report/article
- Should be simple words or short phrases
- Provide at least five key words
- Do not used abbreviations/terms that are specific/unique to your report/article

Essentials of an abstract in a research report

- **Do not** include call outs to figures or tables.
- **Do not** include references
- **Do not** include information that is not in report.

- Title page includes the following elements:
  - International classification system; Author; Institute of author; Original title; translated title; language in which originally published; full reference to the article
- Abstract contains:
  - Objective, materials, methods, results, discussion, application, key words

What is wrong with this abstract?

The review essay report on the United Nations Convention to Combat Decertification (UNCCD) was not structured properly. An inventory of the relevant sections of the report was not comprehensive, and the different parts of the report were not linked well together.

Classification of the report did not follow a logical order, and the language used contained many faults. The reference list was also incomplete.

Table of Contents

- Provides a directory of the work
- It must include a centered title “Table of Contents” and “Page” must be aligned to the right margin
- It should begin with the “Abstract”, “List of Tables”, “List of Figures” and “Acknowledgements”
- Thereafter follows the numbered chapters/section subdivisions
- It must not include “Title Page” or “Table of Contents” as listed elements
- It concludes with the “References” and “Appendices”
- All listed elements must have a corresponding page number

Table of Contents

Table of contents

- No chapter or section numbers
- “Frontpage” (title page) and “Table of Contents” should not be listed in the table of contents
- “Literature” should be called “References”
- Sections do not relate to chapters
- Is “What must happen” “Recommendations”?
- Repetition of “planning”

Table of Contents

Table of contents

- No sections
- No references
- Very short report (3 pages)
- Does not start each new element on a new page

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Why Cite?

- Recognizes the work of others
- Allows readers to cross-reference your sources easily
- Provides consistent format within a discipline
- Gives you credibility as a writer and shows that you are not just giving your own opinions
- Supports an argument you wish to make
- Protects yourself from plagiarism
- When in doubt, cite (but be accurate!)

When to Cite?

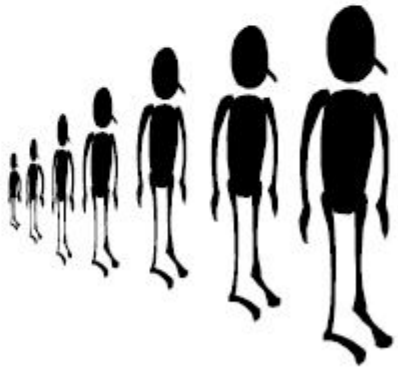
Commonly known facts do not need a citation.

TASK 2: Look at the following statements. Which one needs a citation?

a) *The moon revolves around the earth.*

b) *Sydney is on the east coast of Australia.*

c) *Australia's population will double by 2010.*



d) *Food is necessary for survival.*

When to cite

- You need to cite your source, even if:
  - You put all direct quotes in quotation marks
  - You changed the words used by the author into synonyms
  - You completely paraphrased the ideas to which you referred
  - Your sentence is mostly comprised of your own thoughts but contains a reference to another author's ideas
  - You mention the author's name in the sentence

What is plagiarism?

PLAGIARISM = using others' ideas and words without explicitly acknowledging the source of that information

Give credit whenever you:

- State another person's idea, opinion, or theory
- Use any facts, statistics, graphs, drawings, etc. that are not common knowledge
- State another person's actual spoken or written words verbatim
- Paraphrase another person's spoken or written words

Plagiarism Simplified

"If you didn't think of it

and write it all on your own,

and you didn't cite the sources where you found the *ideas* or *words*,

it's probably *plagiarism*."

Lathrop, A. and Foss, K. (2000). *Student Cheating and Plagiarism in the Internet Era*. Englewood, CO: Libraries Unlimited, Inc., 116.

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References

- In-text citations
  - Numbers
    - “In a previous study (1),”
    - “In a previous study [1],”
    - “In a previous study,[1]”
  - Names and dates
    - “In a previous study (Smith et al., 1997),”
    - “In a previous study by Smith et al. (1997),”
    - One author: “Smith, 1997”
    - Two authors: “Smith and Jones, 1997”
    - >Two authors: “Smith et al., 1997”
  - Unpublished data should be cited as “Data not shown” or “J.L. Smith, personal communication”
  - Direct quotes should be contained within quotation marks and quoted verbatim

Referencing at the end of your assignment

References or Bibliography – what's the difference?

- Reference list – a single alphabetical or numerical list of each citation that you have specifically mentioned in the text
- Bibliography – a list of sources you have read but *not* necessarily mentioned in the text

References

- Reference list
  - In articles and book chapters, use the publisher's recommended style/format
  - Journal article
    - Include author's name(s), year, title (optional), journal title, volume and page numbers
  - Book
    - Include author's name(s), year published, title (including edition, if applicable), editor, publisher and city
  - Book section
    - Include author's name(s), year published, "in: title" (including edition, if applicable), editor, publisher and city and page numbers
  - In press papers should have "In press" added at the end

References

Reference manager programs (e.g., Endnote) can be a life-saver!!

Appendices

- Supply additional details for secondary/specialized audiences
- Provide secondary or tangential information to primary readers
- Contain subordinate (but useful and essential) information or collection of supplementary materials
  - tables and illustrations that the reader should use regularly
  - tables and illustrations that are not essential to the main report
  - very large illustrations, maps, tables, etc.
  - a detailed elaboration of research, computer print-outs, methods of analysis, questionnaires, correspondence, etc.
  - list of specific words, abbreviations, symbols, etc.
- Number appendices: A, B, C or I, II, III

General Suggestions

- Know your audience
- Do not turn in a first draft!
- Your supervisor/professor is not there to teach you basic grammar and spelling
  - Use spelling and grammar tools
  - Read and re-read with breaks in-between
  - Ask colleagues/classmates/partner to proofread your report
- Use an outline
- The beginning and the end are the hardest
- HAVE FUN!!