

Technical Communication

Session 7

Scientific Literature Review

01.10.2025

Overview

1. What is a Scientific Literature Review?
2. How to write a Scientific Literature Review
3. Key elements of a Coherent Literature Review
4. Literature Review Structure

What is a Scientific Literature Review?

Scientific Literature Review

A scientific literature review is *a critical account of what has* been published on a topic by accredited researchers.

It may be for:

- A stand-alone assignment
- An introduction to an essay, report, thesis, etc.
- Part of research/grant proposals

Scientific Literature Review

Note : the literature, the research, the scholarship

What is the field?

“[D]ifferent disciplines ... have field-specific expectations for what a literature review is and does” (Purdue OWL)

Goals of this lecture

Understand the principles

Apply the process

Gain confidence and motivation



Scientific Literature Review

Writing a literature review will:

- Improve your topic knowledge
- Provide new insight on your topic to others
- Demonstrate your literature searching abilities
- Demonstrate your critical analysis skills
- Demonstrate your communication/writing skills

Scientific Literature Review

A scientific literature review is **not**:

- An English essay... using *scientific writing!*
- A summary of each research article that you read
- Based on personal opinion or biased towards your opinion
- A chronological history of events in your research area

Scientific Literature Review:

What is the purpose of a literature review?

Scientific Literature Review

What is the purpose of a literature review?

Communication and advancement of scientific knowledge!

- Scientific knowledge is **not static**: reviews help scientists to understand how knowledge in a particular field is **changing and developing** over time
- There is a **significant output** of scientific publications – literature reviews save time for the scientific community
- Literature reviews can lead to **new scientific insights** and highlight gaps, conflicting results and under-examined areas of research

Scientific Literature Review

A scientific literature review should:

- Provide a **clear statement** of the topical area (scope)
- Provide a **range of research** on the topic – and not just the “good” data!
- **Critically analyse** a selected topic using a published body of knowledge (backed-up arguments)
- Provide an indication of what **further research** is necessary
- Identify areas of **controversy** in the literature

Scientific Literature Review

Plan for a lit review

What is the working area?

What is its context?

How has it developed?

What is the research question for the lit review?

How ...? Why ... ? not just What ...?

Why does the research in this area matter?

How To Write A Scientific Literature Review?

Scientific Writing!

...is writing about scientific topics aimed at specialists in a particular field

Assume the reader is familiar with the research/topic area but not with the *specifics* of your review...

i.e. your Professor, your Principal Investigator, or any external reviewer

peer-reviewers (journal articles, research papers, book chapters, grant proposals)

Use precision, clarity and objectivity!

Scientific Writing!

1. Be precise!

Ambiguities in writing cause confusion and may prevent a reader from grasping key concepts of your review...

- Use precise concrete language, no ambiguity
- Exclude similes/metaphors (and humour!)
- Be *quantitative* wherever relevant (stats, numbers etc.)

Scientific Writing!

2. Be clear!

Concepts in the sciences can often be complex; without clarity the reader may be confused or misled

- Simple language – no unnecessary “frills” (distractions)
- Pay attention to sentence structure, grammar
Your reader will be interested based on the science only... make it easy for them to access!

Scientific Writing!

3. Be objective!

Any claims that you make need to be based on facts, *not intuition or emotion*

- **Passive voice** – focus is on the literature!
- Avoid **assumptions** or sweeping statements
- Be aware of **research limitations** and refer to these in the review

How to Write a Scientific Literature Review?

Reviewing the literature requires four stages:

- 1. Problem formulation** - Which topic is being examined and why? What aspects will be included/excluded? Define your scope
- 2. Literature search** - Identifying relevant research
- 3. Critical analysis** – Criticise the experts; identify conflicting evidence, assumptions, errors and misconceptions
- 4. Evaluation** – which authors are most convincing and provide the most significant scientific contribution? Have I conducted a fair and objective literature review?

1. Problem Formation

Ask yourself questions like these:

- What useful reviews are **missing** or not up to date in my research area?
- What new review topic would be useful to scientists?
- Is there a **specific aspect of this topic** that my literature review might help to define?
e.g. critically comparing different methodological approaches, contrasting evidence, assessing therapeutic potential, etc.
- What is the **scope** of my literature review? *Be specific*

Literature Searching...

1. Online Research (basic) – Background Information

- Relevant “background” websites (eg. university websites, journal websites, jstor)

2. General Literature Search – Literature Overview

- Google Scholar/Books

find other relevant literature reviews in the area to see what has been done/what is needed,
use appropriate key words

3. Specific Literature Search – The Detail

- Library databases e.g *Web of Science*
- “Advanced search” tool in Google Scholar
- Identify key references for each topic of your review

Note: Please use the Library!

**The Library staff are always
there to help if you have
questions on literature
searching.**

3. Critical Analysis

In assessing each source, consideration should be given to:

- **Provenance** - Author's credentials? Are the author's arguments supported by evidence?
- **Objectivity** - Is the author's perspective fair? Is contrary data considered? Is information ignored to prove the author's point? (bias)
- **Persuasiveness** – Is the author's data convincing?
- **Value** - Does the work contribute in a significant way to an understanding of the field?

...this involves CRITICAL THINKING!

What is critical thinking?

“The process of looking at ideas and information critically, taking nothing for granted, but questioning accuracy, motivation and inferences, and seeking new understanding, connections and insights.” Cottrell (2016)

i.e. weighing up the evidence and arguments for or against something, and coming up with your own informed opinion.

Ask questions!

- “Is that really true?
- How do you know?
- Show me the evidence.
- Is that evidence reliable?”

“There is
evidence
on both
sides”



Critical Thinking...

Move from **Description** to **Analysis**!

Description – reproducing information

- Summarising texts - accepting details, results etc.

Analysis – deconstructing information in order to:

- *Challenge* assumptions; perspectives
- Show *limitations* in studies, exceptions to cases
- Highlight *under-examined* aspects of research

Key aspects of critical thinking

- Identify evidence to **back-up and challenge** key points
- Detecting **inconsistencies and mistakes** in authors' reasoning
- Detecting **bias**, premature conclusions, lacking evidence
- Distinguishing between **fact and opinion**
- Evaluating **conflicting** opinions/research
- Suggesting new or different **solutions**
- Constructing **your own arguments and opinions**

What should I be asking?

- Why is the author choosing to use the evidence presented?
- Is there a hidden agenda? (*eg. financial gain*)
- Are the sources reliable and objective?
- Is there bias present?
- Have all of the points been cited?
- Is there information missing?
- Are there conflicting opinions/conclusions?
And most importantly....

Critical Thinking...

Critical Thinking is the key to a good analysis...

...don't be afraid to question, critique (the experts) if you have understood the concept and have located the gaps

Understanding of the topic is very important - this is the most important aspect of a good literature review

4. Evaluation and Interpretation

- What **conclusions** can I make from the most convincing literature? What are my opinions/arguments?
Also evaluate your own interpretations...
- Have I made a well-informed decision? How good was my **information seeking**? Has my search been wide enough to ensure all relevant material is included? Has it been narrow enough to exclude irrelevant material?
- Have I **critically analysed** the literature I use?
- Instead of just listing and summarising research, do I assess them, discussing strengths and weaknesses?
- Have I cited and discussed studies **contrary** to my perspective to form a well-balanced argument?

Coherent Scientific Literature Reviews

Coherent Scientific Literature Reviews

Aim for:

- **Clear and cohesive** essay that integrates the key details of the literature and **communicates your point of view**
- Tackle **one key point** at a time
- Use **subheadings**, especially in long reviews
- Check the **flow** of your argument for coherence (logical order?)
*...this is all about **STRUCTURE!***

Coherent Scientific Literature Reviews

What is the principle of organisation? Choose one:

chronology — development of the topic over time (best if unfamiliar) — patterns, turning points, key debates — note how and why trends took hold

concept — where the area falls into clearly demarcated areas, each with its own development, use subsections

method — where the area crosses different disciplines or fields (qualitative/quantitative, empirical/theoretical)

theory — comparing models and definitions of key concepts — tendency to argumentation or synthesis

Ways to think

Hot debates, cool topics [dead zones]

Stacks, trends, sparks, clashes, and gaps

Don't neglect the loners ... some interesting niche area

Scientific Literature Review

How to structure a scientific literature review?

- **Introduction:** An *overview* of the topic under consideration, along with the *objectives* of the literature review.
- **Main body:** Critical analysis, evaluation of topically relevant research/data; Break into **sub-headings**
- **Conclusion:** Summarise the **key points** from your review

Before you start writing...

1. Brainstorm/plan your review

What are the key aspects of your review?

2. Decide on the number of “topics” you will address

Of the most interesting/relevant topics... how many can you address in the allowed word count? Prioritise!

3. Choose your topics

Scan the literature, make sure there is enough information out there for you to complete a coherent, critical summary of each chosen topic

1. Introduction

It is usually easier to write this after the main body...

Introduce your topic by highlighting the **core scientific facts** that are well backed up and widely accepted

Highlight the **importance** of the review – What are you assessing? Research relevance? Gap in research area? New perspective?

What is the **core aim** of this review? To compare and contrast conflicting evidence? To identify under-examined aspects of the topic?

Tell the reader ***what you are going to talk about... list your topics in order!***

2. Writing the Main Body

- Group research topics according to common elements and back up main points with research
- Focus on **recent** data where possible – scientific fact changes/develops over time!
- Summarise individual studies or articles with as much or as little detail as is relevant – detail denotes significance!
- Tackle **one key point per paragraph** so as not to overwhelm the reader
- Use **sub-headings** to group your topics
- Use diagrams, figures, tables where appropriate

Table 1: Proposed tabular structure to plan your literature review

| Tackle 2-3 key points per section... | | | |
|--------------------------------------|--|-------------|-------------|
| Intro | Go from the broad to the specific. Introduce the general topic, why it is an important area, then state what you will specifically do to investigate it further. | | |
| Section 1 | Sub-point 1 | Sub-point 2 | Sub-point 3 |
| | | | |
| Section 2 | Sub-point 1 | Sub-point 2 | Sub-point 3 |
| | | | |
| Section 3 | Sub-point 1 | Sub-point 2 | Sub-point 3 |
| | | | |
| Conclusion | Go from the specific to the broad. State the conclusions you can draw from the points you've made in the essay, and connect this learning to the general topic. End by posing a question for future research in the field. | | |

...one key point per paragraph!

1. Topic Sentence

- Start each topic with a strong “umbrella” sentence introducing your key point

2. Supporting Sentences

- Provide context, examples or data
- Each point backed up with a source/reference
- Use “linker” words to introduce similar points
- Opposing data should also be considered

3. Concluding Sentence

- Include summary sentences at end of paragraphs... why this information is relevant
- May link to following paragraph

2. Main Body: Figures/Tables

- Aim for one key figure/table per section; this can be to:
 - *illustrate a complex concept*
 - *summarise a large body of relevant data*
 - *describe the order of a process (flow diagrams)*
- Legend *below* image/figure and *above* table
- Always refer to figures/tables in text... direct the reader to them
(as seen in Figure 1; as summarised in Table 1)
- Provide a detailed legend... each figure + legend should stand in its own right without the review text
- **Figures and tables provide a break for the reader and a chance to understand and reflect on key concepts**

Writing the Conclusion

- Maintain the focus established in the introduction
- Summarise major research contributions to the scientific field (most convincing data) and make your point of view clear
- Point out major flaws/gaps/inconsistencies in research
- Highlight potential future studies
- Provide closure so that the path of the argument ends with a conclusion of some kind

NOTE: A literature review in a thesis or dissertation usually leads to the research questions that will be addressed.

Revising & Editing

Voice – passive voice? Target audience?

Cohesion – sentence length/clarity?

Criticality – clear critical thinking?

Referencing – have I referenced where appropriate?

Grammar – Grammarly!

Mechanical issues – sentence length, spelling, punctuation

Ask peers/family members – get second/third/fourth opinion!

Read out loud Give yourself a break – Fresh eyes!

YOU HAVE PUT IN SO MUCH TIME ALREADY... So make it perfect

Referencing

It is essential to credit published papers for work mentioned in your manuscript...

- In-text
- Reference List/Bibliography – *what is the difference?*

“atherosclerosis has been claimed to be an independent risk factor for cardiovascular death (Detrano *et al.*, 2008)”.

Detrano R, Guerci AD, Carr JJ, Bild DE, Burke G, Folsom AR, Liu K, Shea S, Szklo M, Bluemke DA, O'Leary DH, Tracy R, Watson K, Wong ND, Kronmal RA. Coronary calcium as a predictor of coronary events in four racial or ethnic groups. *N Engl J Med* 2008. **358**:pp1336-1345.

Harvard referencing guide....

CiteThemRight....

Zotero referencing manager... Mendeley/RefWorks – other options

Referencing

Figures/Tables:

In-text citation in the figure legend after description

May need to ask for permission from the publisher – be careful! (*is the image copyrighted?*)

If figure is adjusted: “image adapted from [source]”

MAKE SURE YOU REFERENCE THE SOURCE MATERIAL (original research paper, where appropriate) and NOT A REVIEW OF THE RESEARCH

Except when you are referencing another reviewer’s opinion/critique etc.

- Avoid plagiarism... use quotation marks for direct quotes + “in-text” citation
- Use “in-text” citation only to reference ideas/opinions/indirect quotes