Conducting a methodical literature search

Information Services
Introduction and context setting

In the context of this session methodical literature searching means being transparent, rigorous and replicable when researching using scholarly sources.

The main aim is to help you to perform and record literature searches in an open and transparent manner relevant and appropriate to your subject discipline and project requirements.

The steps that follow are presented as a linear journey; but in reality, literature searching is an iterative process and you will need to revisit, refine and repeat certain steps as your project develops over time.

It is hoped that the session will give you with an opportunity to reflect on your current literature searching practice, and to consider the ‘toolkit of search techniques’ available to you as a researcher (even if you end up ultimately rejecting some of them).
Overview

This session will focus on the following areas:

• Early scoping
• Methodical approach to electronic databases
• Hand-searching
• Citation-searching
• Ongoing searching
• Wider sources of information (e.g. grey literature)
When to stop

• With literature searching, defining your scope, knowing how much time to spend and knowing when to stop is always tricky.

• Discuss with your supervisors about which type of lit review is best for your PhD as this may help you to decide which approach to take with your lit searching.

• Aiming for absolute comprehensiveness is rarely appropriate for PhDs, and a hybrid scoping approach is often best (especially in the early stages when you are developing your ideas).

• It can be very helpful to apply some of the techniques used in systematic literature reviews, without worrying too much about being exhaustive.
## Three literature review types

<table>
<thead>
<tr>
<th>Type of Review</th>
<th>Purpose</th>
<th>Recommended Search methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scoping Review</td>
<td>- Representative in scope</td>
<td>- Searching key database/s</td>
</tr>
<tr>
<td></td>
<td>- To find out how much literature exists</td>
<td>- Ongoing Research</td>
</tr>
<tr>
<td></td>
<td>- To find out the characteristics of the literature</td>
<td>- Limited hand searching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Limited citation searching</td>
</tr>
<tr>
<td>Mapping Review</td>
<td>- Aims to identify gaps in the literature in order to commission further research.</td>
<td>- Wider database searching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Citation searching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Hand searching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ongoing research</td>
</tr>
<tr>
<td>Systematic Review</td>
<td>- Aims to be exhaustive</td>
<td>- Searching all relevant databases</td>
</tr>
<tr>
<td></td>
<td>- Scope should be well-defined and clearly stated</td>
<td>- Grey literature</td>
</tr>
<tr>
<td></td>
<td>- Systematic reviews tend to focus on the highest quality evidence available</td>
<td>- Citation Searching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Hand searching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Contact with experts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ongoing research</td>
</tr>
</tbody>
</table>
Defining your search question for generating key concepts and keywords

• Identifying the keywords that you will use in your search strategy is a very important part of methodical searching. The quality of your keywords/phrases will largely determine the quality of your results.

• The more you read, the more confident you will become in recognising the ‘discourse’ of your particular discipline. Your ‘bank’ of keywords will expand as your knowledge and experience grows.
Identifying the main concepts in your question

The words and phrases shown below in bold are the main concepts in our example research question.

The keywords generated by them become the words and phrases you type into the search boxes of the information sources you choose.

“Does physical exercise increase a student’s ability to learn?”
Models and methods to help you to identify concepts, synonyms and keywords for searching

• **Concept map model**
  – This universal model first identifies the major concepts within your research question and then lists appropriate synonyms.

• **PICO method**
  – This model is popular with evidence-based researchers looking at health intervention questions.

Once you have established these useful concepts, list their synonyms, including variant spellings, variant endings (plural, singular, etc.). You don't necessarily need to include all of these elements when you search if, for example, you are not interested in a comparison, then leave it out.

**TIP:** Avoid terms that are too broad, e.g. “education” – this will skew your results.
“Does **physical exercise** increase a **student’s** ability to **learn**?”

**Concept 1:**
Physical exercise

**Synonyms:**
“physical exercis*”
“physical activ*”

**Concept 2:**
Student

**Synonyms:**
student*
undergraduate*

**Concept 3:**
Learn

**Synonyms:**
learn*
cognit*
“Does physical exercise increase a student’s ability to learn?”

Patient, Population or Problem

- Concept 1: Student
  - Synonyms: student*, undergraduate*

Intervention

- Concept 2: Physical exercise
  - Synonyms: “physical exercis*”, “physical activ*”

Comparison

- Concept 3: n/a
  - Synonyms: n/a

Outcome

- Concept 4: Learn
  - Synonyms: learn*, cognit*
Using natural language keywords

- Keywords in this context are **natural language**, or free text words and phrases, that you enter into database search boxes. This is in contrast to searching with **subject headings** (more on this later).

- A keyword search generally only looks for your search terms in the title and abstract of a reference in the research database. This is because databases do not always contain the full text of the articles, just information about an article (such as the author, article title, date, journal title, and an abstract where available).

- Some databases will only find the exact word or phrase you type, exactly the way you spell it, so make sure your spelling is accurate or you will miss references.

- SEARCH TIP: When you are reading relevant articles, make a note of any specialist terminology, acronyms or other useful keywords that you might want to add to your own search strategy to improve it. Include all common synonyms for each of your concepts using the help in the Identifying search terms section above.

- Creating an exhaustive list of synonyms is time-consuming, but using **truncation** and **wildcards** can save you time and effort by automatically finding alternatives to the keywords you use.
Using Truncation and Wildcards

**Truncation**

• Truncation is useful for finding singular and plural forms of words and variant endings. Shorten your keyword to its 'stem' or 'trunk' and add the truncation symbol.
  • Many databases use an asterisk * as their truncation symbol. Check help section if you are not sure which symbol to use.
  • For example, typing think* into a search box will find references containing any of these words: think, thinking, thinker or thinkers.

**Wildcards**

• A wildcard finds variant spellings of words. Use it to search for a single character, or no character at all, anywhere in the keyword.
  • Many databases use a question mark ? as their wildcard symbol. Check the help section if you are not sure which symbol to use.
  • For example wom?n will search for both woman and women.
Using phrase searching (also known as adjacency and proximity searching)

- If you want words to appear next to each other in an exact phrase, in that order, with no other significant words appearing in between, you can enclose the words in quotation marks, i.e. “self esteem”.

- Quotation marks work in most databases and Google Scholar, but Ebsco platforms allow you more flexibility:

  $W# = \text{within } X \text{ amount of words from the first word - in the order given}$
  
  e.g. Critical w1 skills - finds the phrase ‘critical skills’ - but also,
  
  "... is critical. Skills are vital ... “

  $N# = \text{near } X \text{ amount - order not important}$
  
  e.g. Critical n1 skills. finds all the phrase ‘critical skills’ - but also,
  
  "... the skills critical for research“

- Always check the help pages before you search it to see how the database conducts phrase searching.
Deciding which journal database to search

• The most effective way to search for journal articles on a topic is to use a journal database, such as Web of Science, Academic Search Complete or CINAHL. We refer to them as eresources at Cumbria.

• Most guidance on systematic searching recommends that at least two ejournal databases should be consulted.

• Databases bring together a large number of research articles, reports and conference proceedings, often concentrating on a particular subject area, although some databases are multidisciplinary.

• Databases have different interfaces and different search options and conventions.

• Find out which databases the library subscribes to here.

• Contact your subject Library and Academic Adviser for help (skills@cumbria.ac.uk) and see the subject-specific resources web pages for more info.

TIP: To be able to save your search histories, you will need to set up user accounts for the main database providers, e.g. Ebsco and Proquest.
Factors to consider when selecting databases

Consider:

• The subject coverage of the database.
• The number of journals indexed.
• The date range of articles indexed in the database.
• The search options, e.g. does it have a subject heading index or allow for saving search histories?
• The reputation/quality of the database.
• Types of studies contained.

<table>
<thead>
<tr>
<th>Database</th>
<th>Coverage and Size</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education Source</td>
<td>Contains full text to over 1,800 journals and over 550 books and monographs. It is the world’s largest and most complete collection of full text educational journals, covering all levels of education, from early childhood to higher education.</td>
<td>Chosen for education specific content</td>
</tr>
<tr>
<td>CINAHL</td>
<td>Cumulative Index to Nursing and Allied Health Literature. 2,737 indexed journals. Citations from 1,150 journals. 329 full text journals.</td>
<td>Chosen for health specific content</td>
</tr>
</tbody>
</table>
Inclusion/exclusion criteria

• Think of any Search Restrictions – anything related to your topic that you wish to exclude.

• Be aware that limits (language, publication date etc.) may introduce bias, avoid using these limits if you need a systematic search.

Examples:
• Publication date
• Publication source/type
• Peer reviewed content
• Language
• Geographic location
• Gender
• Age
• Type of research
Initial scoping search

Search for existing reviews and familiarise yourself with the topic and volume of literature by a scoping search on select databases

Determine which databases are to be included in the full search

Develop and document a search strategy
A Methodical Database Search Strategy Example

• Create three concept ‘search sets’ using Boolean OR to discover the widest possible set of results.

• Combine the results from the above into a fourth search set using Boolean AND to refine your results.

• Save your search history table in each database.

• De-duplicate same items found in multiple databases.

• Sift on abstract reading.

• Sift on full-text reading.

• Add final results to reference list (RefWorks)
Using subject headings

What are subject headings?

• In certain databases (but not all) an indexer chooses the most appropriate headings from a controlled vocabulary list and adds them to an article's record to help describe the major topics of that article.

• Searching by subject heading means that your results will be significantly about that topic, regardless of the words the author used to refer to the topic in the actual article.

• Where possible you should combine subject heading searches with keyword searches in your strategy.
Using Boolean operators

The main Boolean operators (AND, OR) allow you to combine search terms in different combinations. Databases often show Boolean operators as buttons or drop-down menus that you can click to combine your search terms or results.

OR

• OR increases the number of results you retrieve and is usually used to combine synonyms to make your results more comprehensive.

• Searching for “critical” OR “analytical” finds articles that mention EITHER of these topics.

AND

• AND reduces the number of results you retrieve and is usually used to combine different concepts to make your results more relevant.

• Searching for “critical” AND “performance” finds articles that mention BOTH of these topics.

Combining AND and OR

• (critical OR analytical) AND (performance OR achievement)
### Natural language keyword results in **Education Source**

<table>
<thead>
<tr>
<th>Concept Set</th>
<th>Search No.</th>
<th>Natural language keywords</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1 Physical exercise</td>
<td>S1</td>
<td>“physical exercis*”</td>
<td>6,311</td>
</tr>
<tr>
<td>CS1 Physical exercise</td>
<td>S2</td>
<td>exertion</td>
<td>941</td>
</tr>
<tr>
<td>CS1 Physical exercise</td>
<td>S3</td>
<td>S1 OR S2</td>
<td>7,091</td>
</tr>
<tr>
<td>CS2 Teenagers</td>
<td>S4</td>
<td>teenage*</td>
<td>77,494</td>
</tr>
<tr>
<td>CS2 Teenagers</td>
<td>S5</td>
<td>adolescent*</td>
<td>112,660</td>
</tr>
<tr>
<td>CS2 Teenagers</td>
<td>S6</td>
<td>S4 OR S5</td>
<td>131,644</td>
</tr>
<tr>
<td>CS3 Learn</td>
<td>S7</td>
<td>learn*</td>
<td>654,421</td>
</tr>
<tr>
<td>CS3 Learn</td>
<td>S8</td>
<td>cognit*</td>
<td>113,111</td>
</tr>
<tr>
<td>CS3 Learn</td>
<td>S9</td>
<td>S7 OR S8</td>
<td>720,071</td>
</tr>
<tr>
<td>CS4 All concept sets combined</td>
<td>S10</td>
<td>S3 AND S6 AND S9</td>
<td>36</td>
</tr>
<tr>
<td>CS4 Refined by date and PR</td>
<td>S11</td>
<td>Limiters - Scholarly (Peer Reviewed) Journals; Published Date: 20070101-20171231</td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>
# Natural language and subject heading results in CINAHL

<table>
<thead>
<tr>
<th>Concept Set</th>
<th>Search No.</th>
<th>Subject Headings and Natural language keywords</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1 Physical exercise</td>
<td>S1</td>
<td>(MH “Exercise”) OR “physical exercise”</td>
<td>38,977</td>
</tr>
<tr>
<td>CS1 Physical exercise</td>
<td>S2</td>
<td>exertion</td>
<td>8,236</td>
</tr>
<tr>
<td>CS1 Physical exercise</td>
<td>S3</td>
<td>S1 OR S2</td>
<td>46,446</td>
</tr>
<tr>
<td>CS2 Teenagers</td>
<td>S4</td>
<td>(MH “Adolescence”) OR “teenagers”</td>
<td>401,660</td>
</tr>
<tr>
<td>CS2 Teenagers</td>
<td>S5</td>
<td>adolescent*</td>
<td>99,431</td>
</tr>
<tr>
<td>CS2 Teenagers</td>
<td>S6</td>
<td>S4 OR S5</td>
<td>420,721</td>
</tr>
<tr>
<td>CS3 Learn</td>
<td>S7</td>
<td>(MH “Learning”) OR “learn”</td>
<td>36,889</td>
</tr>
<tr>
<td>CS3 Learn</td>
<td>S8</td>
<td>cognit*</td>
<td>125,818</td>
</tr>
<tr>
<td>CS3 Learn</td>
<td>S9</td>
<td>S7 OR S8</td>
<td>158,734</td>
</tr>
<tr>
<td>CS4 All concept sets combined</td>
<td>S10</td>
<td>S3 AND S6 AND S9</td>
<td>277</td>
</tr>
<tr>
<td>CS4 Refined by date and PR</td>
<td>S11</td>
<td>Limiters - Published Date: 20070101-20171231; Peer Reviewed</td>
<td><strong>212</strong></td>
</tr>
</tbody>
</table>
Example of a search history overview table

This provides an overview of the results that you received in the different databases you consulted. Useful for comparative analysis.

<table>
<thead>
<tr>
<th>Database Searches and Number of Results</th>
<th>Education Source Date of Search:</th>
<th>CINAHL Date of Search</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search Concept Set 1 (physical exercise): combined with OR</td>
<td>7,091</td>
<td>46,446</td>
</tr>
<tr>
<td>Search Concept Set 2 (Teenagers): combined with OR</td>
<td>131,644</td>
<td>420,721</td>
</tr>
<tr>
<td>Search Concept Set 3 (Learn) combined with OR</td>
<td>720,071</td>
<td>158,734</td>
</tr>
<tr>
<td>Search Sets Combined with AND and limited to 10 years</td>
<td>36</td>
<td>212</td>
</tr>
<tr>
<td>Total unfiltered results</td>
<td>248</td>
<td></td>
</tr>
<tr>
<td>Results after De-duplication</td>
<td>Enter number</td>
<td></td>
</tr>
<tr>
<td>Relevant after abstract sift</td>
<td>Enter number</td>
<td></td>
</tr>
<tr>
<td>Relevant after reading</td>
<td>Enter number</td>
<td></td>
</tr>
</tbody>
</table>
Saving your search

Once you have de-duplicated and sifted your databases search results make sure that you save the references. Most databases give you a few options, such as:

• Save
• Print
• Email
• Export - to reference software such as Refworks
• Use the ‘folder’ features within the database

Saving your search history/table

• The database may have a free personal account feature that allows you to save a copy of your search history. We strongly recommend that you do this. It means you have a record of your search terms, how you combined them and any limits you applied, which can be re-run whenever you want.
• You may find it useful to include the dates that you carried out searches so you can track changes over time.
Refining your search

Sometimes database searches can produce very large numbers of references or sometimes not as many as you had expected. Sometimes you may have to repeat some of the previous steps and consider:

• Is the search question too broad? Too narrow?
• Have you used Boolean operators correctly?
• Have you used the best databases?
• Consider searching for keywords within certain fields of the bibliographical record, e.g. just the author field, title field or the abstract field – different databases allow for different searchable fields.
• Could the search be limited by date?
  – Be aware of the date ranges offered by the database.
• Could you limit the search to English-language material?
  – If you are conducting a full-scale systematic review and have the resources to translate non-English-language papers, then include them to minimise bias. Otherwise you may consider it appropriate to limit your search to English-language material.
Finding the full-text of articles

Once you have refined your search strategy and have a table of transparent and replicable results you will be left with a number of articles that you will need to read in full and critique for your literature review. Here are some suggestions for obtaining the full-text. The full-text may well be available via the database that you have searched. If not, make a note of all the bibliographic details of the article, and:

• Check the A-Z list of journals that the University of Cumbria subscribe to

• Many articles are available as open access. Search open access repositories using search tools such as CORE and OpenDOAR

• University of Cumbria’s repository Insight

• Google Scholar – To link to UoC content go to Settings – Library Links – Search for Cumbria – click all options - SAVE

• The article may be accessed via web sites such as ResearchGate

• Check other universities near where you live, you can access their print journals via the Sconul Access reciprocal borrowing scheme

• Use the library’s interlibrary loan service (free for postgraduate students and academic staff)

• Contact authors directly – they are usually very happy to share their work

• For support in finding full-text articles please email, skills@cumbria.ac.uk
Developing your search strategy: Next steps

To complement the methodical database searching strategy:

1. Include relevant studies from the key journals and authors using the following:
   - Hand-searching
   - Citation-searching
   - Wider information sources

2. Save all bibliographical details for references (consider what reference management tool to use, Refworks etc.)

3. Talk to your supervisor about how to organise and present your literature review
Hand-searching journals

No database search strategy is perfect, as errors can be made by both the database indexers and by the person searching. Also, information in book chapters is not routinely indexed in some databases.

Ensure that your search is as comprehensive as possible by searching a selection of key resources by hand. This will pick up material which might otherwise be missed.

Hand-searching involves selecting the most important journals in a particular subject area and searching each one individually, by hand or electronically, with specific criteria in mind. It can also be used to search for sections/chapters in books.

To identify these journals consult: your supervisor, your colleagues, research networks, conferences, organisations, peers, librarians and any other experts in your particular field.

The A-Z list of journals that the University of Cumbria subscribes to can be accessed here.

The more reading/searching you do, the more familiar you will be with the main journals and key authors for your research question. Take time to note the names of journal publications and authors.

When you have identified a key journal you can usually set up alerts which can inform you when a new table of contents is published or when a particular author has published a new article or conference proceeding. ZETOC provides a particularly useful alerting service.
Citation-searching

Following up references from a relevant article to find other articles is referred to as citation-searching or ‘snowballing’, cited-reference searching or sometimes “ancestor searching”.

Use citation-searching to:

• find out whether articles have been cited by other authors
• find more recent papers on the same or similar subject
• discover how a known idea or innovation has been confirmed, applied, improved, extended, or corrected
• You can use citation-searching in Web of Science and Google Scholar.
Wider information sources

You may have to think about different kinds of information sources beyond the more obvious databases and journals, e.g.:

- **OpenGrey** for grey literature
- **Proquest Dissertations & Theses Global** for PhD theses and Masters dissertations
- **Archives Hub** for special collections and archives
- Policies, statistics and reports are available via [GOV.UK](https://www.gov.uk) and [National Archives](https://www.nationalarchives.gov.uk)
- National and Academic Catalogues - search UK and Irish academic, national & specialist library catalogues through [Copac](https://www.copac.org)
- Professional or research organisations may provide access to their own specialist libraries, publications or collections. i.e. the [Wellcome Library](https://www.wellcome.ac.uk) from The Wellcome Trust
- Specialist Portals - subject specific portals such as [VADS](http://vads.ac.uk) (online resource for visual arts)
- Access to global university open access repositories via [OpenDOAR](http://opendoar.net)
- Some research data beginning to be made open access via [UK Data Archive](https://data.gov.uk)
- Contact researchers directly via research portals such as [ResearchGate](https://www.researchgate.net) and [Academia.edu](https://www.academia.edu)

Keep a list of information that you come upon via other channels, e.g. web sites, conference proceedings, posters, working papers, grey literature, primary information, emails, case studies, surveys, statistical data, etc. Using a reference management system such as Refworks is recommended.
Documenting your search strategy

Documenting your search

• This means recording where and when you looked for information, why you chose those sources, how you carried out your searches and how many results were found.

• Keep track of your activities as you search. It is much harder to justify the decisions you made and to remember the results you found in each source after the event.

• Consider using the template used in this presentation as a personal record of your search strategy.
To what extent should you document your search?

This depends on your reason for searching the literature. For example, if you are just looking for background reading, you may not need to demonstrate to anyone else how and where you found your references (but it’s still good practice to be methodical!).

However, if you are carrying out detailed research (e.g. a systematic review) you are more likely to need to provide rigorous documentation of your search process as part of your submission.

Perhaps your search strategy could be presented as an appendix to your project?

If you are unsure, check with your department or supervisor in case there are procedures you should be following.
Examples of written search strategies

• To see an example of how a very detailed search methodology can be written up, refer to a systematic review in the Cochrane Library to see how the Methods section has been reported, e.g. see the Search methods for identification of studies section of this review.

• You could use this session’s template as a starting point.

• Have a look at other PhDs to see how the search methodology has been written up for your discipline, you can consult:

  —ProQuest Dissertations & Theses Global — the library pays for a subscription to this database which contains full-text dissertations and theses from around the world.
Further support

For individual advice and guidance about literature searching please email: skills@cumbria.ac.uk

Have a look at the Library’s Research Support web page.

Look out for related workshops that are offered via the Researcher Development Programme. Contact the graduate school for more information: graduateschool@cumbria.ac.uk