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ACFA7004

Research Methods & Professional Development

Lecture 3 - Literature Searching, Critical Reading and Reference Management

Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives



www.uwtsd.ac.uk

Your research question now needs evidence

Week 2 defined the problem and question. Week 3 finds, evaluates and records the research that can answer it.

1

Define

Start from a bounded question.

2

Find

Build a deliberate search.

3

Judge

Examine methods and findings.

4

Record

Save citations and notes.

Remember

Finding many articles is not the same as building a reliable evidence base.

By the end of Week 3, you should be able to...

- 1 Plan**
Choose appropriate research databases and document a replicable search.
- 2 Construct**
Combine concepts, synonyms and Boolean operators into a search string.
- 3 Evaluate**
Screen sources for relevance, credibility and research quality.
- 4 Critique**
Read a paper critically and extract findings, methods and limitations.
- 5 Manage**
Organise sources and produce accurate, numbered citations and references.

01 Purposeful literature searching

Search to answer a research question, not simply to collect PDFs.

A search strategy makes your evidence defensible

Good literature searching is relevant, transparent and revisable.

Coverage

Find the principal studies, established ideas and emerging debates.

Precision

Reduce irrelevant results while avoiding a search so narrow that key studies vanish.

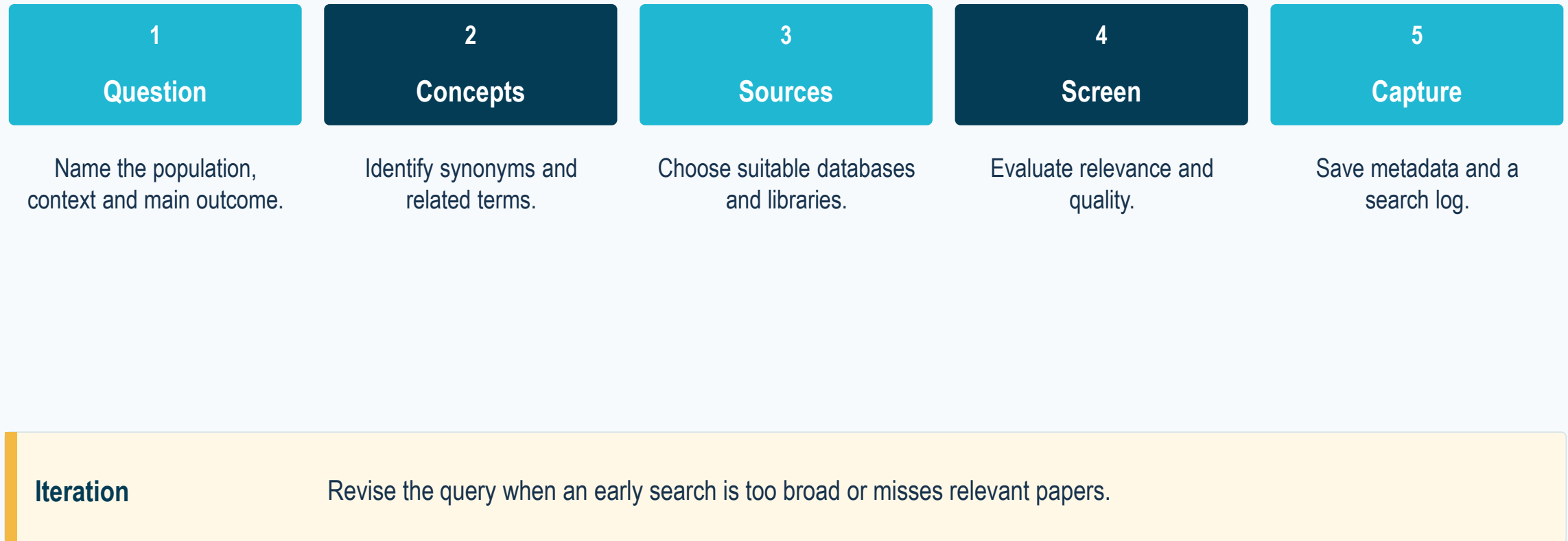
Traceability

Record how evidence was identified, screened and included.

Core principle

Search methods should be appropriate to the purpose of the review; not every review must be an SLR.

Move deliberately from question to evidence



An example that continues across Weeks 3 and 4

How does guided use of generative AI affect independent debugging performance among first-year programming students?

Population

First-year programming students

Intervention or exposure

Guided use of generative AI

Outcome

Independent debugging performance

What should your database search include?

4 MINUTES

Work in pairs

For the debugging research question, identify three search concepts. Give at least two alternative words or phrases for each concept.

Produce

A 3-column concept table ready for a database search.

02 Databases and search strategy

Use keywords, structured searching, filters and citation chaining.

Different discovery tools serve different roles

IEEE Xplore

Strong starting point for engineering, computing and related conference literature.

ACM Digital Library

Useful for computing, human-computer interaction and software education.

Scopus / Web of Science

Broad citation databases for interdisciplinary searches and citation tracking.

Google Scholar

Good for discovery and citation chasing; check coverage and source details.

Recognise the different types of sources

Primary research

Reports an original investigation: methods, data, results, analysis.

Review article

Synthesises primary studies; useful for terminology and finding references.

Grey literature

Reports, theses or standards, relevant when the research question calls for them.

Check first

Is it relevant? Who produced it? What evidence or method supports the claim?

Translate the question into searchable language

Concept	Possible terms	Notes
Generative AI	"generative AI" OR ChatGPT OR "large language model"	Brand names can supplement technical terms.
Debugging	debugging OR "program error" OR "code repair"	Explore discipline-specific vocabulary.
Learning context	student* OR undergraduate* OR "programming education"	Use context terms if results are too broad.

Tip

Include known alternative spellings and terminology; test each concept block separately.

Use Boolean operators to control relevance

AND: intersect

"generative AI" AND debugging
Both concepts must appear.

OR: expand

ChatGPT OR "large language model"
Either term may appear.

NOT: exclude carefully

debugging NOT "hardware fault"
May unintentionally remove useful records.

Remember

Put synonyms inside brackets, then combine concept groups with AND.

Search syntax depends on the database

Exact phrases

Use quotes where supported: "programming education".

Truncation

A wildcard such as student* may retrieve student and students.

Field searching

Try title, abstract or keywords for a more focused search.

Database help

Proximity operators, wildcards and query field labels differ between platforms.

Combine synonym blocks into an initial search

```
("generative AI" OR ChatGPT OR "large language model")  
AND (debugging OR "code repair")  
AND (student* OR undergraduate*)
```

Too many results?

Restrict title/abstract; add context; filter appropriate years.

Too few results?

Remove the narrowest block; add synonyms; search related fields.

Make selection decisions explicit

- 1 Date range**

Choose a justified period; retain seminal earlier work if needed.
- 2 Source type**

Decide whether journals, conferences and reports are eligible.
- 3 Subject area**

Avoid excluding interdisciplinary studies by default.
- 4 Language**

Declare language constraints and recognise possible bias.
- 5 Full text**

Do not equate access availability with scholarly relevance.

Relevant papers lead to other relevant papers

Backward searching

Read the reference list of a relevant paper to find foundational and related studies.

Forward searching

Find later publications that cite that paper, then screen their relevance.

Use citation chasing to complement a database search, not replace one.

Make the search reproducible and easy to update

Database / date	Exact query & limits	Screening notes	Records
IEEE Xplore / 10 Oct	AI block AND debugging; title/abstract	Many technical papers; fewer student studies	42
ACM DL / 10 Oct	AI block AND education; 2020 onward	Useful computing education papers	31
Scopus / 11 Oct	AI AND debugging AND student*	Review key citations and duplicates	58

Illustration

Record counts above are hypothetical; students must log their own actual search results.

Construct and test a search for your own topic

12 MINUTES

From question to search string

Write 2-4 concept groups with synonyms. Run the query in two suitable databases, note the differences, and revise it once.

Produce

A query, two logged searches, and an explanation of one improvement.

What good documentation looks like

Research question	Guided generative AI use and independent debugging
Source and date	ACM Digital Library, accessed during workshop
Search	("generative AI" OR ChatGPT) AND (debugging OR "code repair")
Filters	Publication year and document type recorded explicitly
Revision	Add student* only if the first search is too broad
Decision rule	Read titles, then abstracts; record exclusions

03 Critical reading and appraisal

Move from understanding what a paper says to judging what it supports.

Read strategically, then critically

1

Orient

Title, abstract, headings and conclusion.

2

Inspect

Question, contribution, figures and key results.

3

Analyse

Methods, measures, sample and analysis.

4

Critique

Strengths, limits and implications.

From source notes

Record evidence in your own words, with page details when you may quote directly.

Five questions to answer after reading

1 Problem

What gap or issue motivates the paper?

2 Design

Which data, setting, participants and methods are used?

3 Findings

What results are actually demonstrated?

4 Inference

Do the conclusions follow from those results?

5 Relevance

How does the paper inform your research question?

Use explicit criteria rather than a vague quality score

Research fit

Are the question, design and measures aligned?

Sampling & context

Who or what was studied? What biases are possible?

Validity & reliability

Are measures, comparisons and analysis convincing?

Reporting & ethics

Are procedures, limitations and ethical safeguards clear?

Separate observation, inference and speculation

Results actually measured

In a hypothetical experiment, students using structured prompts completed more debugging tasks within a fixed time.

Conclusion that needs caution

"Generative AI makes every student a better programmer" overstates the sample, intervention and outcome.

A paper may be relevant without being conclusive. Identify exactly what was measured.

Spot the design limitations in this invented study

The example is fictional and is provided solely as a practice exercise.

A lecturer gives 18 volunteers access to an AI code assistant for two weeks. Their average task score rises from 61 to 74 points. The paper concludes that AI causes improved debugging skill across all first-year students. There is no comparison group or delayed independent test.

Discuss

Which claims are justified, and what additional evidence would you need?

Four reasons to qualify the conclusion

Selection bias

Volunteers may differ from other first-year students.

No comparator

Changes may reflect practice, teaching or other factors.

Short measurement

Scores after two weeks may not show lasting skill.

Construct validity

A task score may not measure independent debugging.

Compare sources in a single structured record

Study	Design / context	Finding	Limitation	Use in my study
Paper A	Survey, 120 students	Frequent AI use reported	Self-report only	Context / patterns
Paper B	Classroom trial, 2 groups	Guided prompts linked to scores	Single module	Intervention design
Paper C	Interview study, 15 students	Perceived reliance on AI	No performance test	Mechanisms / concerns

Practice data

Papers A, B and C are invented examples, not real publications.

Use a paper from your search

10 MINUTES

Read, judge, record

Select one relevant research paper. Identify its question, design, sample or dataset, main result, two limitations and specific relevance to your study.

Produce

One completed evidence-matrix row and a 60-second verbal critique.

04 Referencing and source management

Organise your evidence with reliable metadata and accurate attribution.

Your citations make claims checkable

Academic integrity

Acknowledge words, ideas, figures, code and datasets that are not your own.

Evidence trail

Help readers trace a statement back to a precise source.

Efficiency

A managed library reduces inconsistent citations and lost sources.

Module convention

In Applied Computing at UWTSD, we use an IEEE-style numbered referencing system.

Number references in order of first citation

Example sentence: Prior work outlines a structured approach to reviewing research [1].

[1] A. Fink, Conducting Research Literature Reviews, 5th ed. SAGE Publications, 2019.

Check details

Use square brackets for citations, verify author/title/year, and keep numbering consistent.

An imported citation still needs human checking

1

Authors

Correct order, spelling and initials.

2

Title

Full article or chapter title without truncation.

3

Publication

Journal or proceedings, year, volume, issue and pages as available.

4

Persistent link

DOI or stable URL, when available.

5

Document type

Journal, conference, book, report, webpage or dataset.

Use Zotero, Mendeley or a supported alternative

1

Capture

Save from databases or
import RIS/BibTeX.

2

Verify

Check metadata against the
source.

3

Organise

Group by themes; add tags
and notes.

4

Cite

Insert in-text citations and
bibliography.

5

Review

Refresh and proofread
before submission.

Useful guidance

Zotero: [zotero.org/support/quick_start_guide](https://www.zotero.org/support/quick_start_guide)

A five-minute Zotero demonstration checklist

1 Create

Make a collection for your research topic.

2 Import

Add two references with the browser connector or RIS file.

3 Attach

Keep a PDF or stable link with each item.

4 Annotate

Record one method, finding and limitation in notes.

5 Insert

Add a citation and generated reference list in a document.

Automatic citation is not automatic accuracy

Duplicate records

Merge duplicates before writing a final reference list.

Broken metadata

Correct all-caps titles, authors and missing proceedings details.

Inconsistent output

Apply the module-required style and inspect each citation.

Unverified AI output

Never add an AI-generated reference without locating the actual source.

Treat AI outputs as leads, not as evidence

Appropriate support

Explain unfamiliar terms, suggest search synonyms, or help create a reading checklist. Verify against the paper.

Not appropriate

Invent citations, quote unseen sources, or accept a summary without checking the original methods and findings.

Follow university rules on permitted AI use and disclosure.

Build your Week 3 evidence pack

20 MINUTES

Search + critique + reference

Work on your chosen proposal topic: run searches in two databases, save at least five relevant candidate items, critically appraise two papers, and insert one verified IEEE-style citation.

Produce

Search log + concept matrix + two evidence rows + reference list.

Check quality before moving to Week 4

Search is explained

Databases, date, terms, filters and screening decisions are logged.

Selection is defensible

Sources are relevant and quality decisions are clear.

Reading is critical

Findings, strengths, limitations and applicability are recorded.

References work

Metadata is checked and citation numbers match the source list.

Quick review: decide and justify

1

What expands retrieval?

A. AND B. OR C. Exact phrase

2

What most weakens causal inference?

A. No comparison group B. DOI provided C. Larger reference list

3

What is a good search record?

A. Only total results B. Database, query, limits, date

4

What should you trust automatically?

A. Imported metadata B. Generated citation C. Neither

A disciplined workflow creates trustworthy evidence

Search transparently

Build, test, revise and log queries.

Read critically

Record method, result, limitations and relevance.

Manage from day one

Save checked metadata and cite consistently.

Week 4 bridge

Your evidence matrix becomes the raw material for synthesis, review writing and a conceptual framework.

Use these alongside the four supplied teaching documents

1. Fink, A. Conducting Research Literature Reviews, 5th ed., SAGE, 2019.
2. IEEE Author Center, IEEE Reference Guide: journals.ieeeauthorcenter.ieee.org.
3. Zotero Documentation, The Basics: zotero.org/support/quick_start_guide.
4. Zotero Documentation, Using the Word Processor Plugins: zotero.org/support/word_processor_plugin_usage.

Questions?

Bring your concept matrix, two critical-reading notes and reference library into Week 4.