Systematic Review

Workshop 2011

Zoe Handley
(zoe.handley@education.ox.ac.uk)

Plan

- Background
- Further information
- How to carry out a systematic review
  1. Setting the scope and methods for the review
  2. Gathering and describing research
  3. Appraising and synthesising data
  4. Making use of the review

- Systematic review checklist
- Administrative systems

BACKGROUND

What is a Systematic Review?

- **Systematic reviews** attempt to **reduce the subjective bias** characteristic of many traditional literature reviews through the use of a **transparent and explicit protocol, exhaustive database searches, explicit inclusion/exclusion criteria,** and **quality assurance measures,** i.e. **hand searches** to validate database searches and **double blind reviews** of individual studies

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History of Systematic Review

- The evidence movement
  - Need for evidence to support public policy decisions
  - Critical appraisal and synthesis of research in a systematic manner

- The Cochrane Collaboration (Evidence-based medicine)
  - Dedicated to managing knowledge in the domain of healthcare

- The Campbell Collaboration
  - Adapted the Cochrane methodology to broader public policy
  - Examines the effects of social interventions
  - Social welfare, crime and justice, education

- The EPPI Centre
  - Evidence for Policy and Practice Information Co-ordinating Centre
  - Adapted the methodology to education and social welfare

FURTHER INFORMATION

Methods

- *EPPI-Centre*: http://eppi.ioe.ac.uk/cms

Methods

- Resources from EPPI Centre
  - Examples of reviews: http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=61
  - Overview of methods:
    http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=89
  - Methods references:
    http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=1919

- Citing the EPPI Centre:
  - EPPI-Centre (March 2007) *EPPI-Centre methods for conducting systematic reviews*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

Zoe Handley
Applied Linguistics, University of Oxford

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**CONDUCTING
A SYSTEMATIC REVIEW**

Overview of the Systematic Review Process

1. Setting the scope and methods for the review
   - Users, review questions, inclusion/exclusion criteria, protocol
2. Gathering and describing research
   - Keyword map
   - Searching, screening, keywording, mapping
3. Appraising and synthesising data
   - In-depth review
   - Quality and relevance appraisal, synthesis, conclusions
4. Making use of the review
   - Communication

**1. SETTING THE SCOPE AND
METHODS FOR THE REVIEW**

Setting the scope and methods for the review

1. Define users

2. Define review questions

3. Define inclusion/exclusion criteria

4. Define protocol
   - Statement of review question, conceptual framework and method for review

Note:
- Systematic reviews are intended to be policy and practice oriented. It is therefore good practice to involve users in the definition of research questions and inclusion/exclusion criteria.
- If your review is initially broad the definition of review questions and inclusion/exclusion criteria might involve an iterative process

Zoe Handley
Applied Linguistics, University of Oxford

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Setting the scope and methods for the review

- Users
  - Oxford University Press and English language teaching professionals

- Review questions
  - What empirical research could be found on the use of new technologies in language learning and teaching with learners in primary and secondary schools since 1990?

- Inclusion/exclusion criteria
  1. Report on the use of **technology** ...
  2. ... in **foreign** or **second language learning** ...
  3. ... with **school age** (primary and secondary) learners.
  4. Focus on **learners**.
  5. Describe or include an **empirical study** carried out by the author(s)
  6. Have been **reported between 1990 and 2009**
  7. Have been **published peer-reviewed journal articles**, and
  8. Have been **published in English**.

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2. GATHERING AND DESCRIBING RESEARCH

Gathering and describing research

1. Searching for studies
   a. Database searches
   b. Hand searches
   c. Literature review searches
   d. General search engines, e.g. Google Scholar
   e. Specialist websites
   f. Experts in the field

2. Screening studies (against inclusion/exclusion criteria)
   a. Title and abstract
   b. Full document

3. Describing studies (keywording)
   a. Generic
   b. Review specific

4. Mapping studies (produce keyword map)

Searching for studies using Databases

- Aim is to identify a comprehensive and unbiased set of papers
  - Including published and unpublished papers
  - Easily accessible and harder to find papers

- Use a range of databases (available on OXLIP+)
  - ERIC (Education Resources and Information Center)
  - LLBA (Language and Linguistics Behavior Abstracts)
  - PsycINFO (Psychology)
  - INSPEC (Computer Science)
  - Index to Theses
  - Dissertations and Theses (ProQuest) / Dissertation Abstracts International

Searching for Studies using Databases

- Developing your search strategy
  - Based on inclusion/exclusion criteria
  - Combination of
    - Free text searches (keyword searches)
    - Thesaurus searches

Free text searches

- Free text searches (or keyword searches)

  - Searches for keywords in title and abstract

  - Develop a list of terms
    - Consult practitioners/academics
    - Consult dictionaries or thesauri in the subject area
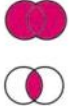   - Consult the indexes of standard texts

Free text searches

- Techniques: Regular expressions
  - Search for all variations of a word
    - Truncation (usu. * or $)
      - educat* or educat$ will find educate, educating, education, educational, educator, educators... etc.
      - technol* will find technology and technologies
      - techn* will also find technical, technician, etc.
    - Wild character (?)
      - wom?n – finds women and woman
      - behavio?r – finds behavior and behaviour
  - Search for phrases
    - Using quotes (e.g. "language learning")

Free text searches

- Techniques
  - Combining search terms
    - Logical operators: OR, AND NOT
    - OR broadens your search
      - secondary school OR secondary education
    - AND narrows your search
      - bullying AND secondary school
    - OR should be used before AND
      - bullying AND secondary school OR secondary education ✗
      - bullying AND (secondary school OR secondary education) ✓

Zoe Handley
Applied Linguistics, University of Oxford   5

Thesaurus searches

- Thesaurus searches
  - Thesaurus terms are attached by trained indexers
    (In the ERIC database they are referred to as **descriptors** – an example is presented on the next slide)

  - Developing a list of thesaurus terms
    - Pearl growing
      - Use the thesaurus terms that have been used to classify papers which you know meet the inclusion criteria
    - Thesaurus mapping
      - Maps your own search terms to subject headings
    - Do not include methodological terms as these are usually not well indexed
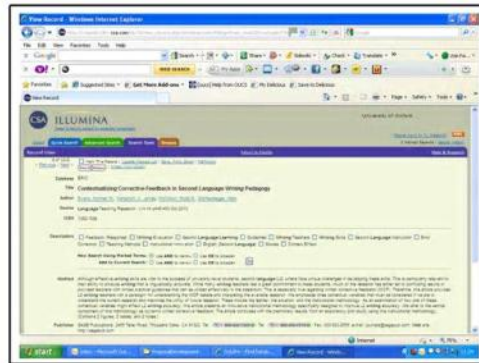
Piloting Searches

- Searches should aim to identify **all and only** studies which meet the inclusion/exclusion criteria for the review
  - That is, searches should aim to achieve a balance between precision and recall
  - Precision: Identify only studies relevant to the review (narrow search)
  - Recall: Identify all studies relevant to the review (broad search)

- Developing a search strategy is therefore an iterative process

- Screen titles and abstracts against inclusion exclusion criteria
  - Free text searches: Note potential additional search terms (i.e. keywords) and also terms that you may wish to exclude
  - Thesaurus searches: Note potential additional descriptors (thesaurus terms) and also descriptors that you may wish to exclude

- Repeat the process

- Keep a log of pilot searches

Example Database: ERIC

- What empirical research has been undertaken on the use of technologies in language learning and teaching with learners in primary and secondary schools since 1990?

- Free text / Keyword search
  - Initial search
    - Language AND learning AND (computer OR technology)
  - Using regular expressions
    - All variants of a term: Truncation *
    - Phrases " "
  - Developing and refining the search
    - Date range
    - English only
    - Education level
    - Combine searches from search history using AND/OR

Saving your Search Strategies (ERIC)

Developing the search

1.	Language learning >> 4203
2.	Language learn* >> 6832
3.	**1 OR 2 >> 10860**
4.	Language >> 55333
5.	Language* >> 57479
6.	4 OR 5 >> 117636
7.	Learning >> 119451
8.	Learn* >> 146906
9.	7 OR 8 >>248661
10.	**6 AND 9 >> 40384**
11.	3 OR 10 >> 40384
12.	Computer >> 24506
13.	Comput* >> 33045
14.	12 OR 13 >> 70063
15.	Technology >> 38389
16.	Techno* >> 46375
17.	15 OR 16 >> 72296
18.	15 OR 17 >> 126003
19.	**10 AND 18 >> 5238**
20.	**3 AND 18 >> 1411**

To run 20 again:

((TI=(language learning) or
AB=(language learning)) or(TI=(language
learn*) or AB=(language learn*)))
and(((TI=computer or AB=computer)
or(TI=comput* or AB=comput*))
or((TI=technology or AB=technology)
or(TI=techno* or AB=techno*)))

For an extended example see:
http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=268

Saving Your References

- Save your references to a reference management system
  - Endnote
  - RefWorks

- RefWorks guides:
  - Quick start:
    http://www.refworks.com/content/quick_start_guide.asp
  - WebHelp:
    http://www.refworks.com/rwathens/help/Refworks.htm

- RefWorks course:
  - OUCS, Wednesday 2nd March:
    http://www.oucs.ox.ac.uk/itlp/courses/detail/TDBM

Logging your Searches

Database searched	Date & person searching	Search strategy	Time period of search	No. of hits	Downloaded file saved as	Config (filter) file used	Imported into which database
ERIC	15.09.03 Zoe Garrett	Saved in document ERIC1.txt	1976 - June 2003	2563	ERIC1.txt ERIC2.txt ERIC3.txt	ERIC Cambridge Scientific Abstracts	1. School size 2. ERIC
PsycInfo	19.09.03 Mark Newman	Saved in document psycinfo1.txt	1872-2003/09 wk3	623	Psycinfo1.txt	OVID(ONLINE)	1. School size 2. PsycInfo
Social science citation index	10.09.03 Zoe Garrett	Printed from web	1981-2003	126	Search history SSCI.wos	Imported from website	1. School size 2. SSCI

Example Database: ERIC

- What empirical research has been undertaken on the use of technologies in language learning and teaching with learners in primary and secondary schools since 1990?

- Thesaurus search
  - Identifying descriptors
    - Use the descriptors from articles that match your inclusion/exclusion criteria
    - Explore the thesaurus
  - Developing and refining the search
    - Date range
    - English only
    - Education level
    - Combine searches from search history using AND/OR
    - Combine with keyword searching
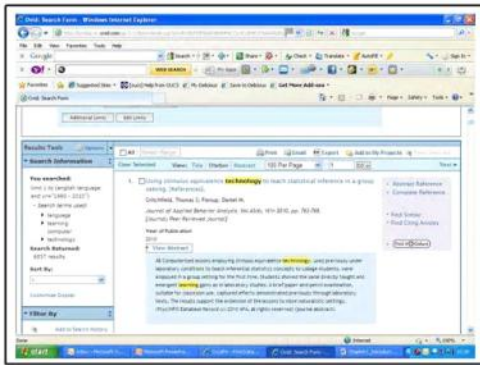
Example Database: PsycInfo

- What empirical research has been undertaken on the use of technologies in language learning and teaching with learners in primary and secondary schools since 1990?

- Free text / Keyword search
  - Initial search
    - Language AND learning AND (computer OR technology)
  - Using regular expressions
    - All variants of a term: Truncation $
    - Treats sequences of words as phrases
  - Developing and refining the search
    - English language
    - Publication year
    - Combine searches from search history using AND/OR
    - Find citing articles

Example Database: PsycInfo

- What empirical research has been undertaken on the use of technologies in language learning and teaching with learners in primary and secondary schools since 1990?

- Thesaurus search
  - Identifying descriptors
    - In advanced search: Map to subject heading (combines keyword and thesaurus search)
    - Search tools: Map term OR Thesaurus
  - Developing and refining the search
    - English language
    - Publication year
    - Combine searches from search history using AND/OR
    - Find citing articles

Saving your Search Strategies (PsycInfo)

Developing the search

1.	Language learn$ >> 153	21.	Virtual >> 4918
2.	Language$ >> 53353	22.	Digital >> 2781
3.	Learn$ >> 119404	23.	Intelligent >> 2240
4.	**2 AND 3 >> 12070**	24.	E-mail >> 1297
5.	**1 OR 4 >> 12070**	25.	CMC >> 373
6.	Technol$ >> 22454	26.	CSCL >> 83
7.	Computer$ >> 38075	27.	Chat >> 934
8.	**6 OR 7 >> 54428**	28.	Wiki$ >> 77
9.	**4 AND 8 >> 1285**	29.	Podcast$ >> 37
10.	Web >> 7153	30.	**OR [10-29] >> 36498**
11.	Internet >> 12470	31.	**30 AND 4 >> 838**
12.	Network-based >> 229	32.	**(30 OR 8) AND 4 >> 1497**
13.	Courseware >> 111		
14.	Software >> 6909		
15.	Authorware >> 7		
16.	Authoring >> 427	**To run 32 again in PsycInfo:**	
17.	E-learning >> 788		
18.	Online >> 8129	You will need to replicate the search	
19.	Mobile$ >> 2305	step-by-step.	
20.	Corpus >> 3099		

Google Scholar

- A useful tool for identifying initial articles and search terms

- Advantages:
  - Allows full-text searches

- Limitations
  - Secrecy about its coverage – some publishers do not allow it to crawl their journals
  - Ranks articles on a combined measure of relevance, citation counts, publication date, etc.
  - Puts high weight on citation counts – so, the rich get richer in terms of citation counts
  - Puts high weight on words in titles

Database Searches (Two-Stage Screening)

- For each database
  1. Pilot searches
  2. Run final search

  3. Screen titles and abstract, applying inclusion/exclusion criteria
  4. Keyword studies which meet inclusion criteria

  5. Screen full texts, applying inclusion/exclusion criteria
  6. Keyword studies which meet inclusion criteria

Practical

- Start developing the search strategy for your own study using ERIC or PsycInfo

  1. Go to OXLIP+
  2. Select database
  3. Follow steps for developing a search strategy

- Discuss observations and problems encountered

Hand Searches (One-Stage Screening)

- Searches of electronic databases will not show up every article
- Hand searching the principal journals on the topic allows researchers to validate database searches

- For each journal:
  1. Screen titles, abstracts and full texts, applying inclusion/exclusion criteria
  2. Keyword studies which meet inclusion criteria

Literature Review Searches

- Searching the reference list of literature reviews on the topic also allows researchers to validate database searches

- For each literature review:
    1. Screen titles, abstracts and full texts, applying inclusion/exclusion criteria
    2. Keyword studies which meet inclusion criteria

Keywording Studies

- Generic keywording
    - http://eppi.ioe.ac.uk/EPPIWebContent/downloads/EPPI_Keyword_strategy_0.9.7.pdf
    - Language, Country, Topic, Curriculum, Population (teachers vs. learners), Age of learners, Sex of learners, Type of study (descriptive, exploration of relationships, naturally occurring experiment, researcher-manipulated experiment)

- Review specific keywording
    - Technologies, SLA theories, SLA pedagogy

Mapping Studies: An Overall Map

- See handout

Mapping Studies: Cross-tabulations

- Table 1 Studies by linguistic knowledge and skills, study date and phase of education (P = primary, S= secondary; n = 97; studies not mutually exclusive by linguistic knowledge and skills)

Linguistic knowledge and skills	1990-1994		1995-1999		2000-2004		2005-2009		Total		
	P	S	P	S	P	S	P	S	P	S	Total
	n=5	n=13	n=7	n=9	n=9	n=7	n=18	n=29	n=39	n=58	n=97
Vocabulary	0	4	2	4	4	0	4	7	10	15	25
Grammar	0	1	0	2	0	1	2	2	2	6	8
Pronunciation	0	0	0	0	1	0	2	0	3	0	3
Reading	2	3	2	1	2	3	6	5	12	12	24
Writing	1	4	1	2	0	4	3	9	5	19	24
Speaking	1	0	0	2	1	2	0	1	2	5	7
Listening	1	0	1	2	1	1	1	0	4	3	7

Mapping Studies: Graphs

- Studies by technology and year (n=97)

ASR = Automatic speech recognition
CSCL = Computer-Supported Collaborative Learning

Zoe Handley
Applied Linguistics, University of Oxford

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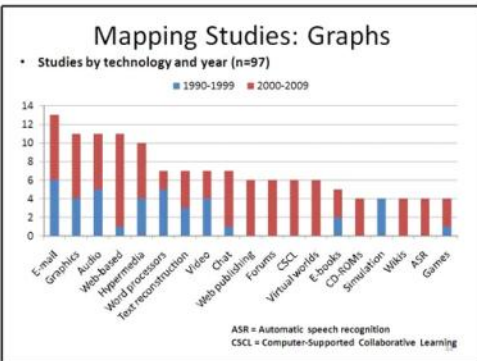
3. APPRAISING AND SYNTHESISING DATA

Appraising and Synthesising Data

- In-Depth Review
  1. Define research questions
  2. Define inclusion/exclusion criteria
  3. Screen studies in keyword map
  4. Double blind reviews
     a) Complete evaluation grid for each study
     b) Evaluate weight of evidence of each study
     c) Compare and come to an agreement with second reviewer
  5. Synthesise the findings

Evaluation Grid

In-depth review item	Criteria for quality
The abstract	Does the abstract provide sufficient information for initial map
Introduction/rationale: does the study say	when the study was carried out?
	Why it was carried out at this point in time?
	Why it was carried out with this particular group of people?
	In which country was the study carried out?
	If the study was funded, and by whom.
The literature review	Is the study linked to a recognisable theory or group of theories?
	How much empirical evidence is presented?
	Is it mainly primary evidence, or mainly secondary evidence?
	Does it end with a summary?
	Does the summary clearly invite the research questions that follow?

Evaluation Grid

Research Questions	clearly stated or implied?
	Language skills involved
	Technology involved
Method	What, broadly, is the methodology adopted? Quant/Qual/mixed
	cross sectional or prospective?
Variables	Is it clear what the dependent/independent variable(s) was/were?
	What other variables are 'controlled for'? (confounding variables?)
Sampling	Population clearly stated (including nationality and L1)
	sampling frame provided
	Sampling procedure explained
	What was the actual sample?

Zoe Handley
Applied Linguistics, University of Oxford

Evaluation Grid

Grouping	How many groups?
	How was the sample divided into groups?
	Did the groups know they were being divided up like this and for this purpose?
	Was their consent sought?
	What treatment if any did each group get?
Data collection	Were the research instruments trialled or validated in some way?
	How/who was the data collected (does this seem a reliable way of collecting the data?)
	Were there sufficient amounts of data collected?

Evaluation Grid

Data analysis	Are we told how were the data analysed?
	Does this seem like a valid way of analysing the data? (how?)
	Does this seem like a reliable way of analysing the data? (who?)
	Does the analysis match the requirements of the research questions? (sufficient?)
Results/findings	Are there any shortcomings in the reporting of the results?
	What are the actual results?
	Do their conclusions match your assessment of the findings/results.
	Are limitations of the study discussed (e.g. confounding variables)
	Are there implications? For teaching and learning?
	Do the implications match the study findings?

Weight of Evidence

- Rate each of the following on a 3 point scale (High, Medium, Low) for each research question

  - **Relevance of particular focus of the study** for addressing the research question of this systematic review

  - **Appropriateness of research design and analysis** for addressing the research question of this systematic review

  - **Trustworthiness** – can the study findings be trusted in answering the research question of this systematic review

  - **Contribution** of the study to answer the research question of this systematic review

Methods for Synthesis

- Statistical meta-analysis
  - "Statistical meta-analysis a set of statistical procedures designed to combine the numerical results of primary research studies addressing similar research questions"

- Narrative synthesis
  - "This type of synthesis brings together the results of empirical research that are in a narrative form to provide an accessible combination of results from individual studies in structured narratives or summary tables."

- Conceptual synthesis
  - "Conceptual synthesis is where different understandings or concepts about the World are brought together to create new concept or concepts. "

- The selected method will depend on the type of studies (quantitative vs. qualitative) and the quality of the reporting (is there enough information to calculate effect sizes?)

4. MAKING USE OF THE REVIEW

Final Report

- EPPI Centre produces reports in 3 formats
  - One page summary – key findings
  - Short report – concentrates on findings and provides some details of method
  - Technical report – includes all details, including search strategies

- Provide enough detail for someone to update the review, i.e. re-run searches

SYSTEMATIC REVIEW PROCESS CHECKLIST

MARKING

Marking Conventions for MSc ALSLA

- For candidates submitting a Systematic Review instead of an empirical study, examiners will, in addition to many of the criteria above, be looking for:
  - Evidence of understanding the principles underpinning systematic review
  - Evidence of completeness and coverage of review
  - Evidence of bias-avoidance and objectivity
  - Transparency of the study selection process
  - Contribution to knowledge building in the specific review field
  - Contribution to teaching and learning

  NB: Systematic Reviews should contain a 'non-technical summary' accessible to readers who are not necessarily experts in the field.

  (MSc ALSLA Handbook, 2011: 24)

PRODUCING THE FLOW CHART

Producing the Flow Chart

- Health Warning!!

- You will need to produce a flow chart which shows how you filtered the papers from the output of the database searches to the studies included in the in-depth reviews

- It is important to set up good administrative systems from the start because you will require a lot of information in order to produce the flow chart for the review

- The information that you will need to produce at each stage is summarised on the following slides

Producing the Flow Chart (2)

- Database searching (Two-stage screening)
  - Stage 1: Screening titles and abstracts
    - Number of articles which the database searches threw up
    - Number of articles included
    - Number of articles excluded
    - For each inclusion/exclusion criterion, the number of articles that were excluded for that reason
    - Number of articles unsure

  - Stage 2: Screening full documents
    - Number of articles screened (unsure from previous stage)
    - Number of articles included
    - Number of articles excluded
    - For each inclusion/exclusion criterion, the number of articles that were excluded for that reason
    - Number of articles that you could not get hold of

Zoe Handley
Applied Linguistics, University of Oxford   15

Producing the Flow Chart (3)

- Hand searching (One-stage screening)
  - Stage 1: Screening titles, abstracts, and full documents
    - Number of articles screened
    - Number of articles included
    - Number of articles excluded
    - For each inclusion/exclusion criterion, the number of articles that were excluded for that reason

- In-depth review
    - Number of articles screened
    - Number of articles included
    - Number of articles excluded
    - For each inclusion/exclusion criterion, the number of articles that were excluded for that reason

Administrative Systems

- Save all searches

- Reference management system in which all references are saved (RefWorks recommended; see slide 26)

- Spread sheet recording all searches (Excel recommended; see slide 27)

- Spread sheet recording filtering, keywording, and weight of evidence (SPSS recommended; see slide 39)

- Save all evaluation grids

On the up side ...

- All the effort systematically coding studies according to different themes etc. is worth it in the end.

- One problem I often encounter when reviewing literature is determining how to structure the synthesis.

- Systematically coding the studies really helps you to see the different themes in the research and identify possible structures for your synthesis.

FURTHER HELP

Zoe Handley
Applied Linguistics, University of Oxford

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Further help

- EPPI Centre website: http://eppi.ioe.ac.uk/cms

- Library:
  - Training sessions: http://www.bodleian.ox.ac.uk/education/services/training (Mon 15th Nov, Mon 31st Jan)
  - WebLearn: https://weblearn.ox.ac.uk/portal/hierarchy/socsci/education/library

- Contact me: zoe.handley@education.ox.ac.uk

QUESTIONS

How can I be systematic?

- What quality assurance measures can I use in my review?
  - Validate the application of inclusion/exclusion criteria to database searcher with hand searches
  - Validate keywording with evaluation grids
  - Note reasons for Weight of Evidence ratings
  - Check your intra-rater reliability for Weight of Evidence ratings