2. Writing your Literature Review

2.00-5.00pm, Wednesday 14th March, Friday 16th March 2007

Sciences/Applied Sciences
Venue: Guild Seminar Rm 1, 1st Floor Guild Village

Presenter:

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http://www.studentservices.uwa.edu.au/learning
http://www.postgraduate.uwa.edu.au
Objectives:

- to examine the role of literature in the research process
- to identify the elements of a good literature review
- to examine strategies for writing a good literature review
- to discuss methods for keeping track of your literature
- to assess your ability to correctly cite sources
Timetable

2.00 – 2.30  Literature and research
2.30 – 3.15  What makes for a good literature review? Stages in writing a good literature review.
3.15 – 3.30  Break
3.30 – 3.50  Keeping track of the literature
3.50 – 4.30  Citing sources, avoiding plagiarism
4.30 – 4.45  Evaluation and close
The Literature Search and Review

What is it for?

Stage 1: Literature ‘survey’: Finding a research topic
(little critical analysis at this stage)

- Survey the area historically and thematically
- Identify the key issues and major work done previously in your area
- Understand the methodology/ies of the discipline
- Evaluate previous research
- Discover research opportunities
- Define one or more potential topics
- Generate ideas, hunches, and hypotheses

Stage 2: Developing a proposal
(critical reading/critical thinking skills are important)

- Defining a research question
- Establishing the justification/rationale for your project
- Demonstrate how your project fits into established research
- Critically review previous research and develop your own criteria for accepting or rejecting arguments
- Demonstrate how your research will make a contribution to knowledge in the field
Stage 3: Doing the research

- Refine ideas
- Identify, evaluate and compare methodologies and designs
- Compare results
- Interpret results
- Keep abreast of developments in the field
- Evaluate your ideas against different perspectives
- Detect research that may contradict your hypotheses

Stage 4: In your thesis

Synthesise the relevant research literature to demonstrate that you are a competent researcher and that your thesis is valuable. Review the literature critically.

Show...that you have integrated the material you read and that you have evaluated the quality of information. After finishing the literature review (readers) should understand the research questions, procedures, and findings that characterise the field. They should also know the weaknesses of past studies and what has to be done to move the field forward. If you have organised the review skilfully you will have led the reader to the conclusion that the absolutely best next study to be done in the area is the one you are proposing. (Cone and Foster 1996, p. 104)

A Literature Review must:

1. Be organised around and related directly to the research question you are developing.

2. Synthesize results into a summary of what is known and what is not known.

3. Identify areas of controversy in the literature.

4. Formulate questions that need further research.

Use Critical Review Language frequently in your writing. Also use critical review language as you take notes from the Literature (once you have passed the initial survey phase).
Stages in writing a literature review:

- Survey the literature
- Develop an understanding of the issues
- Subject this understanding to **critical thinking** processes
- Develop a series of reasoned **arguments** that lead to your hypotheses

“To discuss an idea critically means subjecting it to sceptical inquiry in order to identify its strengths and weaknesses.” (Human Biology 205, Essay Assignment 2003, Notes).

**Evaluating arguments:**

- What is the stated research problem?
- What are the stated research aims? Are they likely to lead to some resolution of the research problem?
- Is appropriate methodology chosen and is it properly applied?
- What is your evaluation of the interpretation of the data presented by the author of the paper?
- Are you convinced by the argument/s presented? On what basis?
- What do other papers on this research topic say? Is there a difference of opinion? Are there differences in data obtained? Are there differences in interpretation? What might account for these differences?
- What observations, data, research, logic or theoretical framework are arguments in the literature based on?
- What assumptions underlie the theoretical framework employed in different papers?
- Do the assumptions always hold? Under what circumstances might they be flawed?
- What assumptions underlie the methods used to collect evidence? Are these assumptions reasonable? Under what circumstances might they be flawed?
How to Read an Engineering Research Paper:
A useful framework for reading papers and critically evaluating them.

How to Read an Engineering Research Paper

Bill Griswold

Reading research papers effectively is challenging. These papers are written in a very condensed style because of page limitations and the intended audience, which is assumed to already know the area well. Moreover, the reasons for writing the paper may be different than the reasons the paper has been assigned, meaning you have to work harder to find the content that you are interested in. Finally, your time is very limited, so you may not have time to read every word of the paper or read it several times to extract all the nuances. For all these reasons, reading a research paper can require a special approach.

To develop an effective reading style for research papers, it can help to know two things: what you should get out of the paper, and where that information is located in the paper. First, I'll describe how a typical research paper is put together.

Despite a paper's condensed form, it is likely repetitive. The introduction will state not only the motivations behind the work, but also outline the solution. Often this may be all the expert requires from the paper. The body of the paper states the authors' solution to the problem in detail, and should also describe a detailed evaluation of the solution in terms of arguments or an experiment. Finally, the paper will conclude with a recap, including a discussion of the primary contributions. A paper will also discuss related work to some degree. Because of the repetition in these papers at different levels of detail and from different perspectives, it may be desirable, to read the paper "out of order" or to skip certain sections. More on this below.

The questions you want to have answered by reading a paper are the following:

1. **What are motivations for this work?** For a research paper, there is an expectation that a problem has been solved that no one else has published in the literature. This problem intrinsically has two parts. The first is often unstated, what I call the **people problem**. The people problem is the benefits that are desired in the world at large; for example some issue of quality of life, such as saved time or increased safety. The second part is the **technical problem**, which is why the people problem does not have a trivial solution; that is, why a new technological or engineering solution may be required. Implicitly there is implication that previous solutions to the problem are inadequate. Occasionally an author will fail to state either point, making your job much more difficult.

2. **What is the proposed solution?** This is also called the **hypothesis** or **idea**. There should also be an argument about why the solution solves the problem better than previous solutions. There should also be a discussion about how the solution is achieved (designed and implemented) or is at least achievable.

3. **What is the evaluation of the proposed solution?** An idea alone is usually not adequate for publication of a research paper. What argument and/or experiment is made to make a case for the value of the ideas? What benefits or problems are identified? Are they convincing?
4. **What are the contributions?** The contributions in a paper may be many and varied. Ideas, software, experimental techniques, and area survey are a few key possibilities.

5. **What are future directions for this research?** Not only what future directions do the authors identify, but what ideas did you come up with while reading the paper?

As you read or skim a paper, you should actively attempt to answer the above questions. Presumably, the introduction should provide motivation. The introduction and conclusion may discuss the solutions and evaluation at a high level. Future work is likely in the concluding part of the paper. The details of the solution and the evaluation should be in the body of the paper. You may find it productive to try to answer each question in turn, writing your answer down. I recommend that you keep a notebook on all the papers you read. You should use my [standard one-page form](#) that you can fill out for each paper. In practice, you are not done reading a paper until you can answer all the questions. I will be asking you these questions in class.

Also, you should be aware of the context of the paper in relation to the other papers in the class. Often a paper will represent a generalization, new direction, or contradiction to earlier papers.

If you find that filling out this form doesn't work for you, you can try writing a 250 word abstract of the paper--not rewriting the abstract at the front of the paper, but *your* abstract, capturing the above five issues from your perspective. I often find it useful to write an abstract because it develops the logical connections between the above five issues.

If you are somewhat lost on a particular paper, and sometimes if you are not, it can pay to write down questions you have about the paper. Perhaps the paper was vague on key issues, or ignored issues that you think are important. If you come to class with such questions, you are prepared to counter or preempt my own questions.

Reading a book is somewhat different. Although you want to answer the above questions for a book, it may not do the book justice given the amount of detail in each chapter. You may want to fill out the above questions on a chapter-by-chapter basis, and then produce a summary form for the entire book when you have finished reading it. However, each chapter will have a particular slant that may make certain questions irrelevant. Also, a book is often not oriented towards explaining the solution to a research problem. However, engineering books are invariably oriented towards problem solving of one kind or another.

I have a habit of writing on papers directly, less with books simply because they cost so much. A well-annotated paper is worth its weight in gold, as it not only contains the content of the paper, but your assessment of its value to you.
Reading a Research Paper: checklist

Title:
Authors:
Published in:

- What is the motivation for this work? What is the particular problem being addressed? What is the context in which this problem has arisen?

- What is the proposed approach for dealing with the problem or issue? How is this approach an improvement to previous methods of dealing with this problem/issue? How is the approach implemented?
What is the evaluation of the approach taken or solution proposed (both the author’s and yours)? What questions do you have or don’t you understand? What would you need to know before you would adopt this approach or accept these findings? Is the approach really going to work, who would want it, what will it take to give it to them, and when might it become a reality?

What are the paper’s contributions (author’s and your own opinion)? Ideas, methods, research results, research techniques etc.

What are future directions for this research (author’s and yours)? This might be driven by limitations in the present research, or by critiques made by others of this research.
Exercise One:
Look at some examples of well written articles. Notice how the writer develops an argument and inserts references to substantiate points made.

N.B. A literature review is NOT an annotated bibliography, but you will need to develop an annotated bibliography before you can write a critical review of the literature.

“A modern review is judged solely on the quality of its ideas and opinions.// The purpose of a review is not to present a catalogue of names, dates and facts, but to present reasoned arguments about the field under review based on as many names, dates and facts as are necessary to support those arguments.” (Lindsay, D. (1995) A Guide to Scientific Writing, Longman p. 69)
**Exercise Two:**
Complete the following Table in relation to your understanding of the literature on your research problem.

<table>
<thead>
<tr>
<th>Known</th>
<th>Unknown</th>
<th>Controversial (why?)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Three Ways to Read and Discuss Texts

(ref: http://www.criticalreading.com)

“In his social history of venereal disease, No Magic Bullet, Allan M. Brandt describes the controversy in the US military about preventing venereal disease among soldiers during World War 1. Should there be a disease prevention effort that recognized that many American men would succumb to the charms of French prostitutes, or should there be a more punitive approach to discourage sexual contact?

Unlike the New Zealand Expeditionary forces, which gave condoms to their soldiers, the United States decided to give American soldiers after-the-fact, and largely ineffective prophylaxis. American soldiers also were subject to court martial if they contracted a venereal disease.

These measures failed. More than 383,000 American soldiers were diagnosed with venereal diseases between April 1917 and December 1919 and lost seven million days of active duty. Only influenza, which struck in an epidemic, was a more common illness among servicemen. This contrasts with fewer than 10,000 New Zealand soldiers diagnosed with venereal diseases over the same period.”

If you were asked to write about this excerpt you could do in one of three ways:

1. As a restatement of the basic information.
2. As a description of what the text does.
3. As an analysis or interpretation.

Exercise:
Write about this excerpt in one of these three ways.
Three Ways to Read and Discuss Texts:

1. Restatement
   “American soldiers in World War 1 contracted venereal disease in far greater number than soldiers of the New Zealand Expeditionary force, who had condoms.”

2. Description
   “The passage compares the prevention techniques and diseases of American and New Zealand soldiers in World War 1. It notes that American soldiers contracted venereal disease in far greater numbers than soldiers of the New Zealand Expeditionary force, who had condoms.”

3. Interpretation/Analysis
   “By examining the outcomes of various approaches to condom use during World War 1, the text argues for honest and realistic approaches to health prevention in the future. However to sustain this argument, information is needed about the relative size of the American and New Zealand forces.”
Literature searching and storage

Searching

- Brainstorming key words and phrases, now where do you look?

- Where to start? (Get to know your Reference Librarian, what are the key data bases? Types of sources – will they all be print based? Will all your sources be academic journals? If not, where to access other materials?)

- Be systematic: consider date, place, author and location – full referencing details

- Be a good sharer

- Find out leading researchers in your area and focus attention there

- Cover the main ideas

Storage

- You are building your own library

- Start your thesis bibliography NOW

- Record the vitals but also record your COMMENTS including critical responses to this article

- **Schedule time for this task**
Managing the Literature

Any system you devise should reflect key sections and ideas in your research and should be flexible so that it can reflect your changing ideas as the research progresses.

One example:

Research Project Title:
What differences are there in the ecology and genetic diversity of two nitrogen fixing groups of bacteria that live in the same field environment?

Four key ideas/concepts
1. Evolutionary relationships of these bacteria
2. Existence in soil
3. Existence in plants
4. Methods for studying them

(1st level of organisation, colour code articles using post-it notes?)

1. (red) Evolutionary relationships…

2. (orange) Existence in soil….
   - abundance (orange A)
     - genus 1 (orange A1)
     - genus 2 (orange A2)
     - comparison (orange Ac)
   - persistence (orange P)
     - genus 1 (orange P1)
     - etc
   - genetic diversity (orange GD)
     - genus 1 (orange GD1)
     - etc

3. (yellow) Existence in plants…
   - Nodulation of plants (yellow N)
     - genus 1 (yellow N1)
     - etc
   - Nitrogen fixing effectiveness (yellow E)
• genus 1 (yellow E1)
• etc

4. Methods (green)

- Genetic diversity (green GD)
  • Molecular methods (green GD M)

- Abundance (green A)
  • MPN (green A MPN)
  • Direct (green AD)

- Symbiotic effectiveness (green SE)

File articles alphabetically by author with coloured and labelled tags attached.

Endnote, file card, notebook entries include colour code.
Exercise:

What strategies can you use to:

- keep track of referencing details,
- keep track of ideas and their source,
- manage photocopied articles, printed articles?
Citing Sources and Avoiding Plagiarism

All academic research is grounded in the literature. This means that all research draws on the work and ideas of others. These must be acknowledged. Plagiarism (using other people’s words and ideas as though they were your own) is one of the most serious misdemeanours in academic/research circles.

The following material from the Indiana University Bloomington provides useful information on how to recognise and avoid plagiarism.

Take the plagiarism test and see how well you can apply the principles of correct citation.