Practicum

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Course Design
Advising

• Each student has an advisor
  – Based on preferences of students and faculty
    • Taking into account funding

• Overall Progress reviewed at the end of each semester – Black Friday
  – Take these letters seriously
Your Advisor

Your Advisor

Schedule Meetings

Apprentice

Journeyman

Collaborator
Meet with your Advisor

WHEN TO MEET WITH YOUR ADVISOR

Is there ever a good time?

Beginning of the week
Pro: Get it over with quickly
Con: You have a guaranteed date with work on Sundays

End of the week
Pro: You might actually have something to show by then.
Con: You might not (!)

Mid-week
Pro: Good balance. Gives you time to work on feedback
Con: Your advisor will probably not show up (actually, this might be a pro)

Saturday/Sunday
Pro: There is no "pro."
Con: Your advisor is a workaholic maniac. Good luck with that.

Any time is a good time!
Advisor can be Pushy on Working Time

'I Regular Working Hours'

http://www.phdcomics.com/comics/archive/phd110306s.gif
Advisor can be Pushy on Working Time –cont.

To: Group list
From now on, I expect everyone in my group to work nights and weekends.
-Prof. Smith

'I mean, *in addition* to days and weekdays.'

‘Nights and weekends'
Advisor can be Pushy on Your Passion to Research

'Research should be the sole focus of your life. I expect you to eat, drink and sleep research.'

'I'm allowed to sleep? Only in a lie-awake-at-night-obsessing-over-it kind of way.'

'Outside interests only tell me you're not serious about getting your PhD. I mean, what could be more interesting than our research?'

'... I can't answer that. Exactly. Nothing.'

'Outside interests'
Advisor has MUCH more Tasks to do (and is Efficient in Tasks)

Average time spent writing one e-mail

Professors: 1.3 seconds

Yes. (Send)
No. (Send)
See attached. (Send)

Grad Students: 1.3 days

Dear (?) Prof. Smith,
I was wondering if perhaps you might have possibly gotten the chance to potentially find the time to maybe look at the draft paper that I am attaching in just in case. I know that you are very busy so if you have any quick questions, don't hesitate to ask.

'Average time spent writing one e-mail'
Appreciate the time that advisor allocates for you

• Be prepared before meeting advisor

• Be proactive in requesting advisor’s time allocated for you

• Be responsive to all of your advisor’s requests

• Be candid and realistic
AND be Responsive to Advisor’s Email

'Did you get it?'
Funding

- Funded on grants and contracts
  - Specific requirements
    - IGERT
    - DoD and Agency Contracts
  - PAPERS …
  - SUMMER & BREAKS ARE FOR RESEARCH
  - NO CONSULTING
- Funding generally covers
  - Terms + summer
  - Don’t assume you should do an internship
- Talk to your advisor
WRITE PAPERS!
Rejections Happen - Don’t Worry

Paper Rejected
R&R
Paper Accepted

Your results are clear and irrefutable, Dr. Gardner. Obviously, our agency can’t approve this.

Obviously, our journal can’t publish this.

Aim for 3 a year as junior faculty
Plan to graduate with at least 3
Writing A Successful Literature Review

• To write the successful Literature Review
  – Understand the purpose of the literature review.
  – Learn how to critique research.
  – Use a logical structure.
  – Keep track of sources.
  – Avoid common problems.

• To summarize effectively
  – Be an active reader
  – Put it in your own words
  – Provide a road map
  – Use colorful verbs

• To cite use a standard format for citations.
  – Always use the official manual or journal guidelines.
  – When in doubt, look it up.
  – Use original sources whenever possible.
The Purpose of the Literature Review

• To explain the historical background of a topic
• To describe & compare schools of thought on a topic
• To synthesize existing research
• To highlight and critique research methods, data
• To note areas of disagreement
• To highlight gaps in existing research, methods, data, theory
• To justify the topic you plan to investigate

Not all purposes are present in every literature review
Critical Reading

As you read a paper evaluate it by asking the following questions:

- Has the author clearly defined the problem/issue?
- Could the problem have been approached more effectively from a different perspective?
- Does the author show bias?
- What is the author’s theoretical approach?
- How good is the study design?
- How valid are the results?
- Are there flaws in the logic of the discussion?
- How does the work contribute to the discipline’s understanding of the problem?
- What problems has the author avoided or ignored?
Effective Literature Reviews are organized according to topic and the themes and problems identified by the research in the field. Try to do the following:

- Provide context by defining or introducing the problem/issue
- Identify trends in publications, problems in research, conflicting theories
- Establish your purpose in reviewing the literature
- Group studies according to commonalities—approach, attitude, findings
- Summarize individual studies
- Summarize major schools of thought or perspectives
- Evaluate the current body of knowledge
- In a thesis or background section—conclude by explaining how this study will add to the body of knowledge
Keep track of sources from the beginning

• Have a unique identifier for each source and keep full bibliographic information.
• Take notes as you read. You can do this on the computer or in a large notebook, but be sure to give yourself plenty of space.
• Type and save quotes you like with full documentation. These can be cut and pasted into your main document.
• Try a preformatted source sheet.
• Use software; e.g., Endnote to take notes and keep bibliographic information
• Synthesize notes by keeping a separate sheet that organizes sources by issue/argument
Common Mistakes

- Including every source, regardless of its value or pertinence to your topic.
- Summarizing without relating the source to your topic or the view you are creating of the body of research. Remember that the literature review is an argumentative piece.
- Organizing the discussion in an ineffective manner: for example, chronologically instead of by specific issue or school of thought.
- Losing track of sources and spending valuable time searching for them.
Active Reading: Effective Summarization

- Read the original text quickly to assess its value and get an impression of its main point
- If important, read the text more slowly a second time, highlighting important points
- If really critical, write an informal account of what you have read
- For final article, rewrite your account using more formal language
- Be careful of inadvertent plagiarism: Compare your draft to the original to be sure you have not used the author’s language and that you have represented the author’s ideas accurately and fairly
Use Your Own Words

• Use your own words to express the main idea and relevant details of the piece you have read
• Give a condensed version of the original reading
• Demonstrate your understanding of the original text
• Organize your review in the manner that best suits your purpose
• Remember that some concepts and terms cannot be summarized: E.G., Piaget’s Concrete Operations cannot be summarized as “Asphalt Functions.”
Create a Clear Road Map

For a thesis or background section: The summary presents information to the reader in an order determined by the purpose of your research project. Use transitions to show the reader how you are arranging the parts of the review.

- One of the first researchers to investigate this problem is Chen . . .
- Smith and Jones counter Chen’s argument . . .
- The issue becomes more complex when a third school of thought is considered . . .
- One researcher who agrees with Chen is . . .
- A different approach to this question looks at problems in y
- One of the most troublesome problems is addressed by Green . . .
- A problem with this approach is that . . .
- A recent study adds this to the mix . . .
- A crucial issue that has not been addressed is z . . .
## Use Colorful Verbs

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APA Style

• Name the author (last name only) and provide the date as you summarize:
  – Smith (2005) argued that x was always true, while Jones (2007) has demonstrated through his research that it is not.

• If your citation does not appear in your text, place it in parentheses at the end of the relevant sentence:
  – Neither of these views is true, however, as has been amply demonstrated by more recent research (e.g., Black, 2007; White, 2008).
  – To add a reference to an additional text, cite the primary and then give your reader a cue:
    (Clark, 2007; see also Diepenbrock, 2008).
In-text citations

- If the article has three to five authors, use all names in the first reference and then et al. for subsequent references.
- If the article has six or more authors, use the primary author’s name and et al.
- If an article does not have an author, cite the title of the text using quotation marks or italics as appropriate.
- If the article has no page or date, use n.p. or n.d.
- For each new paragraph begin citations again.
Citing internet sources

• Quoting material from an internet source without pagination:
  – If paragraph numbers are provided, use them in place of page numbers:
  – Basu and Jones (2007) suggest the need for an intellectual . . . cyberspace” (para. 4).

• If neither page nor paragraph number is provided, but headings are used, cite the heading and the number of the paragraph following:
  – Verbunt (2008) found that the “level of conditioning . . . (Discussion section, para. 1)

• If the heading is too long, use a shortened version with quotation marks:
Recent Changes for Most Internet Citing Protocols

- Previous protocols required a retrieval date for online sources and this is no longer required.

- The DOI—digital object identifier—is now used to replace the URL in the References section. This is a unique series of numbers assigned to online books and journal articles.

  - For additional information on the DOI, see pages 188 and 198 of the APA manual.

- Some journals want DOI for all articles not just internet objects
References


University Library, University of California, Santa Cruz. *How to write a literature review*. Retrieved from http://library.ucsc.edu/ref/howto/literaturereview.html
Proposal Acceptance Rate

- Acceptance rates can range from 5% to 50%
- Of proposals submitted typically about 40-50% are so poorly written or have such non-ideas they are not considered
- Of those that are reasonably written and have good ideas often only 1 in 8 or 1 in 10 are accepted
  - Funding cuts
  - Budgets out of line with program
  - Higher ranked alternatives
  - More politically attuned alternatives
  - Whims
  - Novelty sweet spot
White Paper

• White papers are one of the most misunderstood, miswritten and misused marketing tools available.
• Well written white papers get you invited for full proposals.
• Well written and applied white papers are powerful sales and marketing tools.
Writing A Successful White Paper

• To write the successful White Paper
  – Understand the program manager’s purpose
  – Appropriately critique research
  – Use a logical structure
  – Outreach
  – Broader Impact

• Writing Style
  – Clarity
  – Provide a road map
  – Use colorful verbs
  – Figures, charts, tables
  – Ties to sponsor’s history
  – Ties to literature
# Use Colorful Verbs

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Rule 1: Know Your Message

- What do you want to convey?
- Why?
- Who should care?
  - Academically
  - Industry
  - Government
  - Military
Rule 2: Know your Audience

• Three audiences
  – The program manager and his/her bosses
    • Attend propose days
    • Go meet the person
    • Send in questions
    • Call
  – The assigned reviewers
    • They won’t be all like you, but …
  – The non assigned reviewers
    • Capture attention fast
Rule 3 - Logical Linear Structure

1. **attract** the right audience
   - You should write different white papers tailored toward different groups of stakeholders

2. **engage** your reader
   - show you understand their problem and “feel their pain”
   - Show mastery of the subject, through good, clear writing

3. **inform** your reader
   - not an obvious sales pitch, but an objective magazine article
   - present a problem, the business case for solving the problem, and alternative ways of solving the problem

4. **convince** your reader
   - to consider your proposal
   - Your conclusion should more or less “fall out” as a natural result of the logical argument and information you have presented
Rule 4 - Titles Matter

- Point of writing a white paper is to maximize the number of targeted prospects who read it
- Titles drive readership,
- Focus on benefits
- Use words that connote an easy, enjoyable
- Self-serving titles lack appeal and are likely to be ignored
Rule 5: 3-30-3

- You must earn a browsing prospect’s interest within the first three seconds of glancing at your article.
- During the next 30 more seconds reader’s will determine whether or not your message deserves more calculated consideration.
  - A powerfully written introduction that speaks to the reader about their need, and delivers the payoff of opportunity or improvement that can be gained through manageable and well-defined action, is absolutely necessary.
- Then three more minutes to make your point.
  - No matter how complex your product or challenging...
Making a complex point in 3 minutes

- Remember to talk about **business problems from the reader’s perspective**, not products from your perspective.
- Remember people who buy shovels don’t want shovels; they want to make holes or fill in holes easily and quickly.
- Make key points with devices other than text.
  - Use illustrations showing the cycle from problem to solution.
  - Graph statistics on the problem and the benefit of solving it.
- Showcase quotes from experts or the news.
- Use subheadings that make the main point of the following paragraphs.
Rule 6: Use Your Audiences

Language

THREE general stakeholder groups:

1. **Strategic stakeholders** are interested in implementing solutions to improve competitive advantage, augment financial performance, accelerate operational efficiency, foster other business-oriented objectives.

2. **Technical stakeholders** are interested in detailed feature/functionality comparisons, architectural advantages, compatibility and integration with existing systems, security, scalability, longevity and other measures that make the technology a wise investment both today and in the future.

3. **User stakeholders** are people whose day-to-day jobs are affected by the application of the solution. They are interested in usability, willingness and speed of adoption, learning curves, ability to simplify processes and boost efficiency, improving employee morale and enhancing overall job satisfaction.
Rule 7: Knowledgeable & Principled

• Be objective and inclusive.
  – cover credible alternatives for resolving a problem, not just your alternative.
  – Be “big enough” to mention your competitor in a favorable light.

• Well researched and technically documented
  – demonstrate your understanding of entire field
  – Remember, other approaches have some merit
  – Don’t completely discount other approaches, only show that after all the pros and cons are tallied, your solution has the most tangible benefits.

• Readers should feel like they have been educated, not “sold.”
Rule 8: Graphics are Content

• informative illustrations that walk the reader through a relevant process
• “pictograms” are effective
  – the combination of words and pictures in a chart or diagram, communicate
  – much more effective than either words or images by themselves
Rule 9: Use Writers to Write

- Useful to have a team
  - Manager may be too close to the solution
  - Not everyone is good at persuasive writing
  - Spreads the “cost” of writing
Rule 10: Low Branding

• Keep logos and group names to a minimum
Auxiliary Reading

- Anatomy of an NSF Proposal
  - cs.wustl.edu/~cmg/NSF/nsfOutline.html

- Some common mistakes when writing an NSF proposal

- The NSF reviewing process
System or Wiring Diagram

- A box and flow image showing causal linkages between parts of a complex system
- Useful for describing key issues in an area
- Precursor to formal modeling
System or Wiring Diagram's Characteristics

- Holistic models of dynamic systems
- Focus on flows and feedback
- Illustrate a story
- Interaction among key components
- Focus on distributions and delays
- Often start as top level view of system
- Many models never realized as code
  - When they are: convert wiring diagram to system of equations

**Goal:** increase understanding & develop policy guidance
System Thinking

• Think of dynamics
  – look at behavior not events - overtime plots
  – don’t focus on prediction
  – draw things up as an influence diagrams or causal loops
  – utilize system archetypes

• Everything endogenous
  – closed loop thinking - everything of interest is in the model
  – what are the interdependent feedback loops
  – everything is causally related - think of flows (arrows) and containers (stocks/boxes)
  – draw up a structure diagram

• Focus on generalities
  – examine regularities, don’t use case examples

• All variables are continuous, not discrete
  – rejection of rule base reasoning
Systems Thinking, Cont.

• Specify the structure
  – specify units
  – specify equations
  – define boundary conditions (specify rates and levels)
  – define relationship between variables (often simply by drawing a graph)
  – define behavior of structures (a structure is flow + container) (graph)

• Practice is more important than theory
  – model should reflect how things really work

• All variables are quantifiable
  – not measurable
  – most things can be represented as levels (containers) and rates (flows)
Understand Cause & Effect

- Causal thinking is the key to organizing ideas in a system dynamics study
- Instead of ‘cause’, ‘affect’ or ‘influence’ can be used to describe the related components in the system
- Some are logical (e.g. physics)
  - Food intake $\rightarrow$ weight
  - Money $\rightarrow$ happiness
  - Fire $\rightarrow$ smoke
- Some are not (e.g. sociology, economics)
  - Use of seatbelts $\rightarrow$ reduced highway fatalities
  - Shortened daylight hours $\rightarrow$ increased suicide rates
Casual-loops

- Provide insight into a system's structure
- Often difficult to infer the behavior of a system from its casual-loop representation
- Need to use computer simulation
- Simulation model: flow diagrams, equations, simulation language
Causal Loops

- Wiring diagram (boxes and arrows)
- Arrows often show positive or negative influence
  - can be augmented with comments such as delay, soft, objective
  - loops can be either reinforcing (positive feedback loop) or balancing
- Arrows often show flow
- Boxes can be
  - actions
  - outcomes
  - inputs
  - intentions
  - anything that can affect something
Feedback

• Thinking in terms of “cause and effect” is not enough
  - ocean → evaporation → cloud → rain → ocean → …
• Feedback: an initial cause ripples through a chain of causation ultimately to re-affect itself
• Search to identify closed, causal feedback loops is one key element of dynamic system thinking
• The most important causal influences will be exactly those that are enclosed within feedback loop
Example - Population and Birth

Births → Population

Population → Births

Births

Population
Example - Children and Adults

Births → Children → Children maturing → Adults

Births → children → Adults

Children maturing → Adults
Issues

• Going from a causal loop to a model is non-trivial
• Going from a graph of a relationship to the distributional relationship
  – can be done based on empirical data
  – can be done based on assumptions
  – sometimes many functions that generate similar behavior in range
• Output is in terms of mean behavior
• SD makes possible a focus on complex interactions
• SD makes possible a focus on dynamics
• How do you interpret and understand over time output
Feedback

- feedback loop between eggs and chickens
  - positive feedback from eggs to chickens
  - positive feedback from chickens to eggs
  - negative feedback from chickens to road crossings
  - negative feedback from road crossings to chickens

Diagram: Feedback loop between eggs, chickens, and road crossings with positive and negative feedback arrows.
Loops - the Causal Diagram

• Positive link
  – If cause increases effect increases
  – If cause decreases effect decreases

• Negative link
  – If cause increases effect decreases
  – If cause decreases effect increases

• For correlation – arrow points both ways

• Positive loops – reinforcing

• Negative loops – balancing

• Recommendation – label loops
Common Notation

- Words denote *variables*, values that go up or down.
  - E.g., "seek truth" is a variable.

- Arrows denote causal relationships.
  - I.e. change in one variable causes change in another.

- Arrows with "+" sign indicate positive correlation.
  - E.g., "seek truth" drives "do the right thing".

- Arrows with "-" sign indicate negative correlation.
  - E.g., "do the right thing" controls "need to be right".

- A closed loop of arrows form one causal loop.
  - A causal loop is a feedback loop of variables. The sign for the loop is the product of all the signs of the arrows.

- A loop with "-" sign indicates a balancing loop which stabilizes.
  - E.g., the green loop consisting of "need to be right", "seek truth", and "do the right thing" form a balancing loop.

- A loop with "+" sign indicates a reinforcing loop which magnifies the values.
  - E.g., the purple loop consisting of "do the right thing", "fear of being condemned", and "correct others" form a reinforcing loop.
CLD with Nested Feedback Loops (Self-Regulating Biosphere)

- Evaporation $\rightarrow$ clouds $\rightarrow$ rain $\rightarrow$ amount of water $\rightarrow$ evaporation $\rightarrow$ ...
Step 1. Tell the Story

- The Department of Transport in the UK are beginning work on a £100 million bypass of Newbury - a town in Berkshire.
- Inhabitants are divided about the need for a bypass - anti-road protestors and consultants say that it will take only 5% of the traffic out of the town.
- Local council representatives, on the other hand, say that a bypass is the only solution.

Step 2. Draw 'Behavior Over Time' Graphs

- The idea here is to identify the key variables in the system and plot their behavior over time.

Step 3. Create a Focusing Statement

- "Why do more and more roads not seem to relieve traffic congestion?"

Step 4. Identify the Structure

- The fact that the problem symptom (traffic congestion) alternatively improves and deteriorates while the reliance on the short-term fix (more roads) grows stronger suggests a case of the *shifting the burden* archetype.

Step 5. Go Deeper

- Add links and loops to enrich the story.
- Two of the variables represented in step 2 (traffic and public transport) are not included in the shifting the burden structure.

Step 6. Plan an Intervention

• Try to strengthen the fundamental solution and weaken the symptomatic solution.
• One obvious way to do this is to introduce transport policy legislation restricting the use of cars and promoting the use of public transport.