

Fall 2013
Seminar: Teaching Thinking Across the Curriculum
16:300:695

Clark Chinn
Room 347 GSE
Tuesday 4:50-7:30

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The learning goals for this class, along with how they will be assessed, are as follows:

Learning goal	How the goal will be assessed
Understand, evaluate, and apply research on expertise in reasoning and thinking and research on how to promote students' growth in reasoning and thinking.	Weekly discussions and the class paper. In weekly discussions, you will have opportunities to explain, evaluate, and apply research through the discussion questions that we pose in class. In your class paper, you will write about theories of and research on reasoning in ways that demonstrate your understanding and your abilities to evaluate and apply the research.
Critique research defensibly	Weekly discussions and the class paper. In the weekly discussions, you critique the studies you read both methodologically and theoretically. In your class paper, you will critically evaluate the key pieces of evidence that you review as part of your paper.
Give conference presentations.	In class, you will present one important published paper in the field of reasoning as if it were your own conference presentation, complete with slides and a question and answer session.
Write effective reviews of literature	In the class paper (and in the precursor assignments leading up to the paper), you will write a review of literature in an area of reasoning.
Make your own new theoretical contributions.	In the class paper (and in the precursor assignments leading up to the paper), you will develop new theoretical ideas and defend them.

Evaluation:

- | | |
|----------------------------|-----|
| 1. Weekly questions | 10% |
| 2. Class participation | 15% |
| 3. Leading discussions | 15% |
| 3. Presentation of article | 15% |
| 4. Final paper | 45% |

1. Weekly questions

Each week, by 11:59 p.m. on Monday, post to Sakai two questions about at least one article. Generally, one question should be a question about theory, conclusions, or implications that you would like to discuss. The second is a question of relating to the methodology of one of the studies (this includes methodology of reviews). Questions can certainly include clarification questions. This is an extremely easy 10% of your grade, but you will lose 1/14 of your score for each time missed.

2. Class Participation

Class participation refers to attending class, being well prepared to discuss the readings, asking questions of presenters, and contributing appropriately and relevantly to class discussions. Discussions should include a strong emphasis on the sort of evidence that could be cited in a journal article. Personal experiences are definitely relevant but should not constitute the sole or most prevalent form of evidence.

I expect to see clear, specific evidence that you have read each article. This means making contributions to the discussion about each article—including one or more contributions that show clear evidence of having read the article.

3. Leading Discussions

You will take turns leading discussions in this class. The discussions should encompass the following issues related to each paper:

A. Understanding what was done in the study. (I have found, as I'm sure you have, that there are sometimes questions about what was actually done in a study or in a review article methodology.)

B. Critiquing the methodology. Critically evaluate the methodology used in the study, considering issues of internal and external validity.

C. Developing theory. Discuss what this article says about theories of thinking, reasoning, epistemic cognition, and so on.

D. Come prepared with discussion questions, clarification questions, and questions about methodology. You may bring handouts for everyone if you wish.

Each discussion should include attention to the methodology of the study and (if an empirical study) its internal validity, construct validity, external validity, statistical validity, and theoretical interpretation. Don't spend class time summarizing the article. Discussions should also address big ideas about reasoning and the application of these ideas.

4. Presentation of article

You will develop and present one conference-type presentation of an empirical article that I will provide to you. Your presentation should include the background of the problem, the research questions, the method, the results, and a discussion. You should provide powerpoint handouts. We will not use a projector; bring copies of the presentation (3 slides per page) for the entire class. You will have 12 minutes, with a maximum of one extra minute, and the time limit will be (mercilessly) enforced. You should then be prepared to answer questions for 10 to 15 minutes. You may answer questions either from the author's perspective or your own perspective (or both).

5. Literature review.

You will develop a literature review on a topic of your choice (a topic related in some way to reasoning—but I will be as lenient as I can on this).

For doctoral students: The paper must rigorously follow APA format (except for two things, which we will discuss) and be 20-30 pages in length for doctoral students, excluding the bibliography. If you do not know APA format thoroughly, buy the 6th edition of the APA Style Manual right away, and begin studying it now. I will also provide you with a long list of points to watch out for based on previous students' most common errors; study this carefully and thoroughly. I will not evaluate work that has more than a very few style errors. On the other hand, you need not fret about issues that are not clearly addressed in the style manual, or very rarely encountered issues such as how to format an unusual kind of reference. The review should include 20-30 articles related to reasoning but not yet read as part of this course. There should be few or no indirect citations.

For master's students, I will be a little less strict about APA format, and the paper should be 15-30 pages. The review should include 20-30 articles related to reasoning but not yet read as part of this course. There should be few or no indirect citations.

To prepare for this assignment, you will initially prepare a one-paragraph proposal, a bibliography and brief outline, a longer outline, and finally the full paper.

There will be two initial stages in the project.

1. You hand in a two page double-spaced précis—presented as a prose argument, not as an outline.
2. You hand in a four-page double-spaced précis—again presented as a prose argument, not as an outline.

Topics covered in this course:

The course will center around one central aspect of reasoning—explanation-evidence coordination—together with instruction that promotes growth in explanation-evidence coordination. Later readings will be tailored to a degree to class interests and discussions earlier in the semester. If you wish to read more than a week ahead, please check with me in advance.

Placing this course in context.

There are a diverse variety of literatures that a course on thinking can cover. Here is an incomplete list. Many of these topics of course overlap. We will indeed touch on many of these topics, but by no means all of them.

Thinking

Abduction	Language and reasoning	Reasoning and mental representations
Causal reasoning and attribution	Logical reasoning; deduction	Reasoning and problem solving
Coordinating explanations and evidence	Measurement	Reasoning and reading comprehension
Creativity	Mental models in reasoning	Reasoning and writing
Critical thinking	Motivated reasoning	Reasoning biases and heuristics
Data modeling	Nature of theories	Reasoning in different domains: physical sciences, life sciences, psychology, economics, history, political science, law, medicine, engineering, mathematics
Data representation	Observation	Reasoning in groups
Development of any aspect of reasoning	Personal epistemology	Reasoning in nonhuman primates
Diagnostic reasoning and troubleshooting	Reasoning about anomalies and conflicting evidence	Social epistemology
Discourse and reasoning	Reasoning about covariation data	Statistical reasoning
Epistemic beliefs	Reasoning about data	Systems thinking
Epistemic practices	Reasoning about evidence	Theory choice
Epistemology	Reasoning about socioscientific issues	Understanding the nature of science, history, media, math, etc.
Epistemic cognition	Reasoning about uncertainty	Visuospatial reasoning
Experimentation	Reasoning across the life span	
Expert-expert differences	Reasoning and aging	
Expert-novice differences	Reasoning and analogy	
Explanations	Reasoning and concepts	
Explanatory modeling	Reasoning and culture	
Explanatory patterns	Reasoning and decision making	
Hypothesis testing	Reasoning and implicit cognition	
Induction	Reasoning and Individual differences	
Informal reasoning		
Intelligence		

Learning to Think

Case-based learning	Instructional explanations	Reasoning and collaborative learning
Coaching	Learning from worked examples	Scaffolding
Cognitive apprenticeship	Learning to reason and cognitive load	Sociocultural instruction
Constructivist instruction	Metacognition and learning to reason	Specificity of scaffolds
Direct instruction	Modeling	Technology and learning to reason
Discovery learning	Problem-based learning	Transfer
Fading		
Feedback		
Guided discovery		

Writing a Literature Review (melded from previous syllabi written by Ed Psych faculty)

1. Choose a topic on which you would be interested in conducting research.
2. You write a literature review that summarizes and integrates the literature on your topic. The review should include discussion of what important question or questions remain unanswered.
3. It should accomplish these goals:
 - You define and clarifies a problem related to instruction.
 - You summarize previous investigations to inform the reader of the current state of the problem.
 - You identify gaps, contradictions, or flaws in the existing literature.
 - You make clear what knowledge is needed to fill these gaps or resolve these contradictions.
 - Your topic is sufficiently focused that you can address issues adequately.
 - You should provide sound evidence to back up your claims.
 - Your organization should be clear so that the reader can follow your argument easily.
 - Your paper should well written (including grammar and spelling) and well organized.
 - You provide enough detail that any criticisms you make of the existing literature is comprehensible.
4. Avoid what one of my colleagues calls the “beads on a string” literature review.
5. This paper should represent new work.

Electronic Devices

Please turn cell phones (etc.) off or set to vibrate. Please limit use of laptops to taking notes, reading our article, or looking up immediately relevant information.

Policy on Academic Integrity

The Policy on Academic Integrity will apply to term papers. The Rutgers Policy on Academic Integrity is described in the GSNB and GSE catalogs. To paraphrase this policy, graduate students who commit plagiarism will be expelled from the university. Plagiarism includes failure to attribute key ideas to scholars who developed those ideas and failure to quote, with page numbers, any sentence, clause, or extended phrase that appears in another’s work. I reserve the right to request that any or all students submit an electronic copy of either draft of your term paper to be checked for plagiarism.

Schema for Analyzing Articles

1. Introduction.
 - A. Has the author established the existence of a theoretical problem, or a gap in theoretical knowledge?
 - B. Has the author established the existence of a practical problem, or a gap in practical knowledge?
2. Empirical results and conclusions
 - A. What are the dependent and independent variables?
 - B. what did the participants in each condition do?
 - C. What is the pattern of results? (Consider tables and figures.)
3. Conclusions
 - A. What are the main conclusions that the author draws about this sample?
 - B. How far does the author generalize these conclusions?
 - C. What theoretical interpretations are offered?
4. Validity. Evaluate the following kinds of validity:
 - A. Internal validity.
 - B. Construct validity
 - C. Statistical validity
 - D. External validity
 - E. Theoretical interpretation

Course Schedule

DATE	General Topic	Specific Topic	READINGS DUE	PRESENTATIONS	HAND IN....
Jan 22	Experts & novices	Biases in reasoning			
Jan 29		History, psychology	Wineburg (1991) Schunn & Anderson (1999)	Perkins et al. (1983) Perkins (1985)	
Feb 5		Epistemic cognition (EC) I	Chinn et al. (2011) Porsch & Bromme (2011)	None	
Feb 12		History, chemistry	Gottlieb & Wineburg (2012) Samarapungavan et al. (2006)	Wineburg (1998)	One-paragraph proposal
Feb 19		Sociology of knowledge	Collins and Pinch (1993) Sulloway (1996)	Tetlock et al. (1985)	
Feb 26		Social world	Dawes (1996) Bishop & Trout (2005) Tetlock (2005)		
Mar 5		Culture, Mathematics	Nisbett et al. (2001) Schoenfeld (1985)	Mahoney (1977)	
Mar 12		EC II: Reliable processes & criteria	Bishop & Trout (2008) Chinn & Rinehart (2013) Wise et al. (2009) Goldman (2011)	Gigerenzer & Todd (1999).	Two page précis
Mar 26	Instruction	Direct instruction	Klahr & Nigam (2004) Dean & Kuhn (2007) Schwartz et al. (2012)	Schwartz & Bransford (1998)	
Apr 2		Discovery		Choi et al. (2003).	Four page précis
Apr 9		Discourse	TBA	TBA	
Apr 16		Constructivist instruction	TBA	TBA	Bayesian Reasoning
Apr 23		Constructivist instruction	TBA	TBA	
May 7		Constructivist instruction	TBA	TBA	
May 14		Changing epistemic cognition	TBA	TBA Lord, Ross, & Lepper (1979)	Final paper

Leaders:

- Carol for Gottlieb & Wineburg (2012)
- Katie for Samarapungavan (2006)
- Ron for Collins and Pinch
- John for Sulloway
- Roberta for Dawes, Bishop & Trout
- Rob for Nisbett
- Clark for Tetlock
- Sylvia for Schoenfeld
- Clark for Week 8
- Isabella for Klahr ???

Presenters:

- Wineburg: Lars
- Tetlock: John
- Mahoney: Ron?
- Gigerenzer: Sylvia?
- Schwartz & Bransford (1998):
- Culture and reasoning: ???

WHO STILL NEEDS TO DO IT?

- Trudy
- Isabella
- Darrick
- Lars

Carol

Articles to be Presented in Class

Please rank your top 7 preferences from 1 (most preferred) to 7. Please include at least some articles that are not in your area of current expertise.

	Schraagen, J. M. (1993). How experts solve a novel problem in experimental design. <i>Cognitive Science, 17</i> , 285-309.
	Mahoney, M. J. (1977). Publication prejudices: An experimental study of confirmatory bias in the peer review system. <i>Cognitive Therapy and Research, 1</i> , 161-175.
	Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. <i>Journal of Personality and Social Psychology, 37</i> , 2098-2109.
	Klaczynski, P. A. (2000). Motivated scientific reasoning biases, epistemological beliefs, and theory polarization: A two-process approach to adolescent cognition. <i>Child Development, 71</i> , 1347-1366.
	McNeill, K. L., & Krajcik, J. (2007). Middle school students' use of appropriate and inappropriate evidence in writing scientific explanations. In M. C. Lovett & P. Shah (Eds.), <i>Thinking with data</i> (pp. 233-265). New York: Erlbaum.
	Klahr, D., & Nigam, M. (2004). The equivalence of learning paths in early science instruction. <i>Psychological Science, 15</i> , 661-667.
	Kuhn, D., Shaw, V., & Felton, M. (1997). Effects of dyadic interaction on argumentative reasoning. <i>Cognition and Instruction, 15</i> , 287-315.
	Bell, P., & Linn, M. C. (2000). Scientific arguments as learning artifacts: Designing for learning from the web with KIE. <i>International Journal of Science Education, 22</i> , 797-817.
	Yeh, S. S. (1998). Empowering education: Teaching argumentative writing to cultural minority middle-school students. <i>Research in the Teaching of English, 33</i> , 49-83.
	Smith, K., Johnson, D. W., & Johnson, R. T. (1984). The effects of controversy on learning in cooperative groups. <i>Journal of Social Psychology, 122</i> , 199-209.

Breakdown of articles by topic:

science	19
history	5
other social world	9
Statistics / mathematics	6
General	4

References

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- Collins, H., & Pinch, T. (1993). *The golem: What everyone should know about science*. Cambridge: Cambridge University Press.
- Dawes, R. (1996). *House of cards: Psychology and psychotherapy built on myth*. New Haven: The Free Press.
- Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology, 37*, 2098-2109.
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- Perkins, D. N. (1985). Postprimary education has little impact on informal reasoning. *Journal of Educational Psychology, 77*, 562-571.
- Perkins, D. N., Allen, R., & Hafner, J. (1983). Difficulties in everyday reasoning. In W. Maxwell (Ed.), *Thinking: The expanding frontier* (pp. 177-189). Philadelphia: The Franklin Institute Press.
- Porsch, T., & Bromme, R. (2011). Effects of epistemological sensitization on source choices. *Instructional Science, 39*, 805-819.
- Schunn, C. D., & Anderson, J. R. (1999). The generality/specificity of expertise in scientific reasoning. *Cognitive Science, 23*, 337-370.
- Sulloway, F. J. (1996). *Born to rebel: Birth order, family dynamics, and creative lives*. New York: Vintage Books.
- Tetlock, P. E., Bernzweig, J., & Gallant, J. (1985). Supreme Court decision making: Cognitive style as a predictor of ideological consistency of voting. *Journal of Personality and Social Psychology, 48*, 1227-1239.
- Wineburg, S. (1998). Reading Abraham Lincoln: An expert/expert study in the interpretation of historical texts. *Cognitive Science, 22*, 319-346.
- Wineburg, S. S. (1991). Historical problem solving: A study of the cognitive processes used in the evaluation of documentary and pictorial evidence. *Journal of Educational Psychology, 83*, 73-87.