Reasoning and Problem Solving

COGS 1880 / CRN 21195

Spring 2008

Professor Kathryn Spoehr

Class Meeting Time: Tu, Th 2:30-3:50 p.m.
Location: 002 Sayles

Instructor Information:

Professor Kathryn T. Spoehr
Department of Cognitive and Linguistic Sciences
Box 1978
Office Location: 229A Metcalf Research Laboratory
Phone: x3-2693
Email: Kathryn_Spoehr at Brown.edu
Personal Website: http://cog.brown.edu/~spoehr/
Office Hours: Wednesday 10:00 a.m. -12:00 noon

Course Description:

The course will be a seminar focused on the idea of rationality. How does one define it? How do we decide whether adults are rational or not? What kinds of models capture human performance, rational or otherwise, on reasoning and problem solving tasks? We will examine rationality through a detailed examination of deductive reasoning: propositional reasoning, conditional reasoning, and syllogistic reasoning. Students will have the opportunity to broaden their knowledge by selecting a term project topic in reasoning and problem solving not already on the course syllabus.

Prerequisite: COGS0420 or permission from the instructor. Graduate students welcome.

Course Goals:

By the end of the semester students who take this course should:

- understand the nature of adult human deductive reasoning.
- be able to describe, evaluate, and compare the major theoretical approaches that have been proposed to account for human reasoning ability.
- understand the research methods used to determine how deductive reasoning works.
- have developed an appreciation for what it means to be rational.

Course Format Overview:

Some class meetings will include lectures providing overview and background material; a majority of class time will be spent on discussion of and activities based on the assigned reading. Readings include both textbook material, and published scientific papers (see the section on "Schedule and Reading Assignments" below). During most class meetings there will be student-led presentation and discussion of one or two of the research papers from the assigned reading list. The instructor will provide supplementary information as needed on the topics under discussion.

Required Textbooks (available at Brown Bookstore):

Manktelow, K. (1999). *Reasoning and Thinking* (ISBN 0-86377-709-0, pbk). [Abbreviated *R&T* in Reading Assignments below]

Assignments and Grading Policy:

1. In-class Presentations (20% of course grade): Each student will serve as a presenter/discussion leader for several of the assigned non-textbook readings during the semester. The presentation should highlight the major theoretical contributions made by the presented paper and should outline the data and experimental methods which support the theory. More importantly, the presenter should identify issues left unanswered by the presented paper and prepare discussion questions for use during class.
2. Reading Reaction Papers and Class Participation (20% of course grade): In order to stimulate discussion of the student-presented papers, each class member is required to post, on the Reading Reaction Discussion Board, a 1-page (250 words) evaluation/reaction to each of the presented papers. Here's how this will work:
   a. Reaction papers must be **posted by 9:00 a.m. on the class meeting day** and should be entered under the appropriate category heading on the R-R Discussion Board.
   b. Reactions may be evaluative (e.g., why is/was this an important paper when it was published?) and/or may pose one or more substantive questions or observations. Those providing reactions should be prepared to talk about their posting in class.
   c. Student presenters should consult the reactions before their presentation and may wish to incorporate those comments into their discussion.

   Class Participation: Being an effective class participant is very important in this course because much of what you will learn will be from the other students in class. Effective class participation involves not only preparation and speaking skills, but also listening skills. Here are the guidelines we will use of evaluating participation:

   - *Outstanding contributor*: contributions in class reflect exceptional preparation. Ideas offered areaways substantive, provide one or more major insights as well as direction for the class. Frequent references are made to the readings and/or to knowledge from other sources, often showing the ability to generalize or extend the material under discussion. If this person were not a member of the class, the quality of discussion would be diminished markedly.

- *Good contributor*: contributions in class reflect thorough preparation. Ideas offered are usually substantive, provide good insights, and sometimes direction for the class. Occasional references are made to the readings and/or to knowledge from other sources, sometimes showing the ability to generalize or extend the material under discussion. If this person were not a member of the class, the quality of discussion would be diminished.
- *Adequate contributor*: contributions in class reflect satisfactory preparation. Ideas offered are sometimes substantive, provide some useful insights, but seldom offer new direction for the discussion. Some references are made to the readings and/or to knowledge from other sources, but seldom generalize or extend the material under discussion. If this person were not a member of the class, the quality of discussion would be diminished somewhat.
- *Non-participant*: This person says little or nothing in class. Hence, there is not adequate basis of evaluation. If this person were not a member of the class, the quality of discussion would be unchanged.
- *Unsatisfactory participant*: Contributions in class reflect inadequate preparation. Ideas offered are seldom substantive, provide few insights and no direction for the class. References to readings arrear. If this person were not a member of the class, the quality of discussion would be improved.

3. Two reflective writing exercises: (each 10% of course grade; 20% total): At two points during the semester class sessions will be replaced by short writing exercises which students will complete online. The writing exercises will be based on a short reading assignment, and are aimed at helping students sort out and evaluated the ideas they have recently been discussing in class. The topic/question for each exercise, along with the associated reading, will be posted in the *Assignments* area of the course website. Each exercise will become available two days before the exercise is due; each exercise is due by 4:00 p.m. (the end of the course period) on the day for which it is assigned. These assignments are "open book," but each student should complete the exercise by her/himself.
4. Term Project (40% of course grade for both the in-class and written parts together): There will be one required term project. Students should submit their project electronically through the course website.
   a. The term project can be either a traditional research paper or a research proposal.
   b. *Research paper option*: Must be individually authored (no collaborative projects) and should be 2,500-3,000 words (max.). The paper should identify an important issue or controversy in the study of adult reasoning and problem solving, critically examine the scientific literature pertinent to that issue, and argue for an appropriate conclusion to be drawn from the literature.
   c. *Research proposal option*: Must be individually authored (no collaborative projects) and should be 2,500-3,000 words (max.). In a research proposal you should analyze one of the course topics (or a closely related one) insufficient detail to be able to identify a key theory or controversy/question, and propose one or more experiments that would test the theory, solve the controversy, or answer the question you have identified.
   d. Students will present their projects in class April 22nd or 24th. The in-class presentation will count for 15% of the course grade.
   e. Written versions of the papers are due on Monday, May 12 at 9:00 a.m. The written version of the project will count for 25% of the course grade.

5. Late Policy: A student's letter grade on any course exercise will be lowered by ± (i.e., B+ goes to B, Bogs to B-, B-goes to C+, etc.) for every day, or part thereof, that the exercise is turned in late.
6. Special Circumstances: Students who have special physical or learning needs should inform the instructor as soon as possible at the beginning of the semester, and should provide official notification from the appropriate dean or service office detailing the type of accommodation required.
7. Some Advice: You will do your best in this course if you come to class regularly, turn in your assignments punctually, contribute your best efforts in a cooperative fashion to your group, and attend class having prepared the reading assignment and/or exercises.

Academic Integrity and Plagiarism Policy:

Most of the work in this course, as well as how much you will benefit from the course, depends upon your personal integrity and intellectual honesty. All assignments are based on an honor system wherein your submitted work implies that you did not receive any unauthorized help. Here are a few general guidelines:

1. Interact. Feel free to discuss your reading and ideas with other students and with the professor as much as seems helpful. Discussion exposes gaps in understanding and flaws in reasoning, and aids in learning the material.

2. Do your own written work. Any work you turn in should be your own, and should not be copied from other students or from digital or printed sources without proper bibliographic citation. Discussion with others may influence your thinking, and if such influence is considerable, it is appropriate to acknowledge it in a note. It is not necessary to mention assistance given by the professor. Also, most papers can be improved by having a friend or classmate read and critique a draft. Such help with writing need not be acknowledged. Do not submit as your own work a paper or other written assignment that was written by someone else, or submit a paper or part of a paper for which you have received or expect to receive credit at any other time or place.

3. Give credit for ideas or expressions obtained from published sources by proper citation of the source: exact quotes must be enclosed in quotation marks and sources given for ideas expressed in new words (i.e., your paraphrases of someone else's words). The preferred form for citation is that suggested by the Style Manual of the American Psychological Association. If you have any questions about whether or how to acknowledge sources, be sure to ask the professor.

4. Your work on the electronically administered exercises must be your work and your work alone. You may not receive help on these exercises from any other person or source in this course or outside of it.

5. Students are expected to adhere to the standards of intellectual integrity set forth in Brown University's Academic Code. Violations of the Code will be referred to the Dean of the College's or Dean of the Graduate School's office, as appropriate.

Schedule & Reading Assignments:

Note: * indicates readings available digitally on course website.
√ indicates a paper to be presented by a student

Date	Topic	Assigned Reading
1/24	Course Overview	
1/29	Logic, Reasoning & Rationality ***In class: Initial sign-ups for class presentation of assigned papers***	*R&T:* Ch. 1 (pp. 1-11)
1/31	Reasoning with propositions • Introduction	*R&T:* Ch. 3 (pp. 37-61) & Ch. 4 (pp. 63-93)
2/5	Reasoning with propositions • Mental Models	*√ Johnson-Laird, P.N., Byrne, R. M., & Schaeken, W. (1992) Propositional reasoning by model. *Psychological Review, 99(3)*, 418-439.
2/7	Reasoning with propositions • Mental Logics I ***Complete Initial Student Survey by Friday 2/3 (5 p.m.)***	*√ Rips, L. J. (1983) Cognitive processing in propositional reasoning. *Psychological Review, 90(1),* 38-71.
2/12	Reasoning with propositions • Mental Logics II	*√ Braine, M. D.S., & O'Brien, D. P. (1998). The theory of mental-propositional logic: Description and illustration. Ch. 6 In M. D. S. Braine & D. P. O'Brien (Eds.), *Mental logic*. Mahwah, NJ: Lawrence Erlbaum. (pp. 79-90) *√ Braine, M. D.S., Reiser, B. J., & Rumain, B. (1998). Evidence for the theory: Predicting the difficulty of propositional logic inference problem. In M. D. S. Braine & D. P. O'Brien (Eds.), *Mental logic*. Mahwah, NJ: Lawrence Erlbaum. (pp. 91-144)

Date	Topic	Assigned Reading
2/14	Conditionals • Introduction to the Wason Selection Task • Pragmatic reasoning schemas	*R&T:* Ch. 5 (pp. 95-119) * ***Classic paper:*** Wason, P. C. (1968). Reasoning about a rule. *Quarterly Journal of Experimental Psychology, 20(3)*, 273-281. * Cheng, P. W., & Holyoak, K. J. (1985). Pragmatic reasoning schemas. *Cognitive Psychology 17(4)*, 391-416.
2/19	**No Class – Long Weekend**	
2/21	Conditionals • Natural selection and social exchange	* Cosmides, L. (1989). The logic of social exchange: Has natural selection shaped how humans reason? Studies with the Wason selection task. *Cognition, 31(3)*, 187-276. *√ Carlisle, E., & Shafir, E. (2005). Questioning the cheater detection hypothesis: New studies with the selection task. *Thinking & Reasoning, 11(2)*, 97-122.
2/26	Conditionals • Bayesian models	*√ Oaksford, M., & Chater, N. (1994). A rational analysis of the selection task as optimal data selection. *Psychological Review, 101(4)*, 608-631
2/28	**No Class Meeting** ***Students should use class time to do the first reflective writing exercise.***	***1st reflective writing exercise is based on the course readings up to this point plus the following article:*** * Cheng, P. W., & Holyoak, K. J. (1989) On the natural selection of reasoning theories. *Cognition, 33*, 285-313.
3/4	Conditionals • Matching bias	*√ Evans, J. St.B.T. (1972). Interpretation and matching bias in a reasoning task. *Quarterly Journal of Experimental psychology, 24(2)*, 193-199. *√ Oaksford, M. Chater, N., & Larkin, J. (2000). Probabilities and polarity biases in conditional inference. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 26(4), 883-899.*

Date	Topic	Assigned Reading
3/6	Conditionals • Dual process theory	*√ Verschueren, N., Schaeken, W., & d'Ydewalle, G. (2005) A dual-process specification of causal conditional reasoning. *Thinking & Reasoning, 11(3)*, 239-278.
3/11	Conditionals • Mental models revisited • Suppositional theory	*√ Johnson-Laird, P. N., & Byrne, R. M. J. (2002). Conditionals: A theory of meaning, pragmatics, and inference. *Psychological Review, 109*, 646–678. *√ Evans, J. St.B.T., & Over, D. E. (2004). Towards a suppositional theory of *if*. Ch. 9 in Evans, J. S. B. T., & Over, D. E. (Eds.), *If*. Oxford: Oxford University Press.
3/13	Introduction to Syllogisms • Biases & content effects	*R&T:* Ch. 2 (pp. 13-36) * ***Classic paper:*** Woodworth, R. S., & Sells, S. B. (1935). An atmosphere effect in formal syllogistic reasoning. *Journal of Experimental Psychology, 18*, 451-460
3/18	Syllogisms • Mental models	*√ Johnson-Laird, P.N. (1983). Mental Models. Cambridge, MA: Harvard. pp. 94-125.
3/20	**No Class Meeting** ***Students should use class time to do the second reflective writing exercise.***	***2nd "in-class" writing exercise is based on the course readings (excluding syllogisms) up to this point plus the following article:*** * Oberauer, K. (2006). Reasoning with conditionals: A test of formal models of four theories. *Cognitive Psychology, 53,* 238-283.
3/25 and 3/27	**No Class- Spring Break**	
4/1	Syllogisms • Language- vs. image-based reasoning	* Stenning, K., & Yule, P. (1997). Image and language in human reasoning: A syllogistic illustration. *Cognitive Psychology, 34,* 109-159.
4/3	Syllogisms • The Probability Heuristics Model	*√ Chater, N., & Oaksford, M. (1999). The probability heuristics model of syllogistic reasoning. *Cognitive Psychology, 38(2),* 191-258.

Date	Topic	Assigned Reading
4/8	Rationality • Dual systems	*R&T:* Ch. 10 (pp. 217-231) * Evans, J.St.B., & Over, D. E. (1996) *Rationality and reasoning.* East Sussex, UK: Psychology Press. (pp. 1-21 and 141-161) *√ Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Review, 119(1)*, 3-22.
4/10	Rationality • Bounded rationality	*√ Gigerenzer, G., & Goldstein, D.G. (1996). Reasoning the fast and frugal way: Models of bounded rationality. *Psychological Review, 103(4),* 650-669.
4/15	Rationality • Individual differences	* Stanovich, K. E, & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? *Behavioral and Brain Sciences, 23*, 645-726.
4/17	**No Class** ***Students should work on projects***	
4/22	In class presentations of final paper topic	
4/24	In class presentations of final paper topic	

Reading Period: April 25 – May 6

Written version of projects due: Monday, May 12, 2008 at 9:00 a.m.