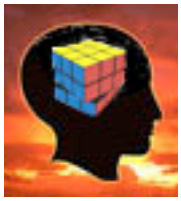
last updated 1/21/09



Human Thinking and Problem Solving

COGS0480
Spring 2009

Course Meeting Time: MWF 2:00 – 2:50
Course Meeting Location: 101 Smith-Buonanno

Instructor: **Kathryn T. Spoehr**
229A Metcalf Research Laboratory
Phone: x32693
Email: Kathryn_Spoehr@brown.edu
Website: http://cog.brown.edu/~spoehr/
Office hours: W 10:00 a.m. - noon, or by appointment

TA: **Sandra Mather**
Phone: 863-1101
Email: Sandra_Mather@brown.edu

Course Goals and Objectives

By the end of the semester students who successfully complete this course should:

- be familiar with the questions and domains of human thinking and problem solving that have been studied by cognitive scientists.
- understand the types of thinking and reasoning people typically employ in these domains including the types of errors people generally make.
- know what methods cognitive scientists use to study human thinking and how they build models of human thought.
- know techniques for improving their own thinking, reasoning, and creative skills in everyday situations.
- have improved their writing.

Books and Materials

- Required Textbook (available at the Brown Bookstore):

  Sternberg, R. J., & Ben-Zeev, T. (2001). *Complex Cognition*. New York: Oxford U. Press.
- Other required reading will consist of articles and book chapters and are listed on the course schedule below under. These are available on the course website.
- Puzzles and problems will be assigned from time to time. These are listed on the course schedule below. and can be downloaded from the website (under *Readings and Assignments* section).

Course Format and Policies

- **Meeting format:** Each class meeting will be a mixture of lecture, discussion, and problem solving (singly and in groups). Because class attendance is expected, no detailed class notes will be provided by the instructor. However, copies of slides and handouts will be posted on the course website after the class is over.
- **Website:** The course has an online *MyCourses* website. Please get in the habit of checking the website at least once a day for announcements or new information. Assignments, announcements, handouts and slides from class meetings, links to supplementary materials, and test/homework grades will be posted there; students will be able to submit electronic assignments through the *Assignments* area on the website (in the left-hand control panel). *Brown.guest* login will be in effect for the first two weeks of class.
- **Intellectual Integrity and the Academic Code:** Everyone in this course is expected to adhere to the standards of intellectual integrity set forth in Brown University's *Academic Code* (http://www.brown.edu/Administration/Dean_of_the_College/curriculum/academic_code.php). All cases in which there is an apparent violation of the *Academic Code* will be referred to the Dean of the College's Office. Here are some specific pointers on matters of collaboration and avoiding plagiarism in this course:
    - *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.
    - *Do your own work* on graded assignments (e.g. papers) and exams. Any work you turn in should be your own, and should not be copied from other students or from printed sources. Discussion with others may influence your thinking, and if such influence is considerable, it is appropriate to acknowledge it in a footnote.
    - *Plagiarism:* 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 credit at any other time or place. If, under special conditions the professor approves the preparation of a paper by two or more students, this should be indicated on the paper.
    - *Give credit* in your written work 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 *Publication Manual of the American Psychological Association (APA)*. Several online guides to APA reference format are listed in the *Readings & Assignments* section of the course website. If you have any questions about whether or how to acknowledge sources, be sure to ask the professor or teaching assistant.
- **Reading Period:** The last class meeting will be on Friday, April 24th. There will be a Reading Period assignment consisting of additional preparatory reading for the final exam.

Course Requirements

- **Final Examination** (35% of course grade): The final examination is scheduled for Thursday, May 7, 9:00 a.m. – noon. Part of the exam will ask you to write essay answers to questions you have prepared in advance. Information about this part of the final will be distributed at the last class meeting on April 24th. Absence from the final exam is excused only by the Dean of the College's office. Use of cell phones and/or PDA's is not permitted during the exam.
- **Mid-term Exam** (20% of course grade): A mid-term exam will be given in class on Friday, March 6th on the topics already covered in the course. Use of cell phones and/or PDA's is not permitted during the exam.

- **Papers** (10% each; 30% in total of course grade): There are three (3) short (3-5) page essay assignments due during the semester. The directions for these can be found at the *Assignments* area of the course website (on the left-hand control panel). Please submit each paper through the course website; you will also be able to pick up your graded papers from the website.*
- **Practice problems and out-of-class exercises:** These are also listed on the Course Schedule and Reading List below. Some of these will be in paper form (distributed in class), but all of them will also be available for download and printing from the course website. Practice problems and out-of-class exercises will not be graded, but completing them (and turning them in) is part of your course participation component for your course grade.

  When you see a homework assignment labeled "Reading Reaction" you should post no more than one paragraph to the Discussions section of the course website giving your answer to any one of the following three questions: (1) What was the most interesting thing you learned from the reading and why was it interesting? OR (2) What surprised you the most about what you read, and why did it surprise you? OR (3) What is the most important question or confusion you still have about the reading topic, and why is it important? Your reaction should be posted no later than 12:00 noon on the indicated date.
- **Assigned reading:** Assigned reading is listed in the Course Schedule and Reading List below. Readings that are not from the textbook for the course can be accessed through the *Reading and Assignments* link on the website. You should complete the reading listed for each class meeting prior to class because in-class discussion and practice exercises will assume familiarity with the reading.
- **Completion of online surveys:** Surveys, demonstrations of phenomena to be discussed in class, and other information-gathering instruments will be posted on the course website. All students are required to complete these exercises. The surveys can be accessed through the *Assessments* tool in the left-hand control panel.
- **Class participation** (15% of course grade): 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 clear presentation of your ideas, but also listening skills. Here are the guidelines we will use of evaluating participation:
  - *Outstanding contributor:* contributions in class reflect exceptional preparation. Ideas offered are always 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.

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* **Note on Electronic Submission of Work:** You should submit all of your papers electronically through the *Assignments* section of the website (on the left-hand control panel). Please note the following formatting requirements for submitting electronic assignments:

- Make sure your name appears on the first page of the paper
- Number the pages of your document.
- Use the following naming scheme to name the file you submit:

  filename = yourlastname,firstinitial ,monthdate.doc

  [If your instructor was submitting her first assignment, due on February 9th, it would be named:

  spoehrk0209.doc]

- *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 are rare. If this person were not a member of the class, the quality of discussion would be improved.

- **Grading:** The % contribution of each of the course requirements to the final course grade are noted above. Your final letter grade in the course will be lowered by ± (i.e., B+ goes to B, B goes to B-, B- goes to C+, etc.) if you have not completed the surveys/questionnaires.

Course Schedule and Reading List

Date	Topic(s)	Assigned Reading S&B = Your textbook OCW = available on the course website	Other Homework *(bring your homework to class unless otherwise noted)*
1/21	What is thinking? Basic components of cognition		
1/23	Problem Representation	Robertson, S. Ian (2001). *Problem Solving.* Chs. 1, 2 OCW	▪ Maze homework (A1)
1/26	Problem Solving (2): Problem Spaces Protocol analysis	**S&B:** Ch. 7 Click on "Cryptarithmetic Website" (#2.3 in the *Readings & Assignments* section of the course website). Read the sections on "What is Cryptarithmetic" and "How to Solve a Puzzle"	▪ Cryptarithmetic homework (A2)
1/28	Reading journal articles in Cognitive Science and Psychology	Thomas, J. C. (1974). An analysis of behavior in the Hobbits-Orcs problem. *Cognitive Psychology, 6,* 257-269. OCW	▪ Reading Reaction to the paper by Thomas (posting on discussion board by 12:00 noon)
1/30	**No Class Meeting**		▪ **On course website:** Complete Initial Student Survey (under Assessments)

Date	Topic(s)	Assigned Reading S&B = Your textbook OCW = available on the course website	Other Homework *(bring your homework to class unless otherwise noted)*
2/2	Problem Solving: 'Fixedness,' biases, and insight	Robertson, S. Ian (2001). *Problem Solving.* Ch. 3 OCW	
2/4	Logic and Reasoning: Syllogisms & deduction	**S&B:** Ch. 5	▪ Deduction and Contradiction homework (A3)
2/6	Rule-based theories of deduction		
2/9	Mental models and deduction	Johnson-Laird, P.N. (2001) Mental models and deduction. *Trends in Cognitive Science, 5,* 434-442. OCW	**Submit electronically:** 1st short paper (see the *Assignments* section of the course website)
2/11	Journal article: The Wason Selection Task Content effects & biases	Wason, P. C. (1968). Reasoning about a rule. *Quarterly Journal of Experimental Psychology, 20(3),* 273-281. OCW	Check out the website: "Explanation of the Wason Selection Task" and post to the website (by 12:00 noon) two new examples of it – an easy one and a hard one.
2/13	Journal article: Conditional reasoning using pragmatic reasoning schemas	Cheng, P. W., & Holyoak, K. J. (1985). Pragmatic reasoning schemas. *Cognitive Psychology 17(4)*, 391-416. OCW	
2/16	**No Class -- Long Weekend**		
2/18	Conditional reasoning: Probabilistic accounts Social exchange theory	Oaksford, M., & Chater, N. (2001). The probabilistic approach to human reasoning. *Trends in Cognitive Science, 5*, 349-357. OCW	▪ Reading Reaction to the paper by Oaksford & Chater (posting on discussion board by 12:00 noon)
2/20	Causal reasoning	Sloman, S. R. (2005). *Causal models.* New York: Oxford U. Press. Ch. 4 (pp. 36-51) OCW	

Date	Topic(s)	Assigned Reading S&B = Your textbook OCW = available on the course website	Other Homework *(bring your homework to class unless otherwise noted)*
2/23	Induction Analogical Reasoning How does it work?	**S&B:** Ch. 6	
2/25	Journal article: Structure-mapping theory	Gentner, D. & Markman, A. B. (1997). Structure mapping in analogy and similarity. *American Psychologist, 52(1),* 45-56. **OCW**	▪ Reading Reaction to the paper by Gentner & Markman. (posting on discussion board by 12:00 noon)
2/27	Analogical Reasoning Is it distinctly human?	Oden, D. L., Thompson, R. K. R., & Premack, D. (2001). Can an ape reason analogically? In Gentner, D., Holyoak, K. J., & Kokinov, B. N. (Eds.), *The analogical mind*. Cambridge, MA; MIT Press. (Ch. 14, pp.471-497.**OCW**	
3/2	Probabilistic Reasoning Estimating Probabilities	**S&B:** Ch. 8	▪ Check out the two Monty Hall problem websites and write a paragraph on the discussion board on why you think people have such trouble with it.
3/4	Heuristics & Decision Making	Sloman, S. R. (2005). *Causal models.* New York: Oxford U. Press. Ch. 7 (pp. 83-100)**OCW**	
3/6	**Mid-term Exam**		
3/9	Language and Thought: The Whorf-Sapir Hypothesis	**S&B:** Chs. 9-10	▪ ***On course website:*** Complete Mid-Course Checkup (under *Assessments*)
3/11	Language and Thought: Rethinking it	Steven Harnad's rebuttal of Whorf (#6.1 in the *Readings & Assignments* section of the course website).	▪ Reading Reaction to the paper by Harnad (posting on discussion board by 12:00 noon)
3/13	Visual Thinking	Arnheim, R. "The Images of Thought" In Arnheim R, (1974). *Visual Thinking*. pp. 97-115. **OCW**	▪ Tangram homework (A4)

Date	Topic(s)	Assigned Reading S&B = Your textbook OCW = available on the course website	Other Homework *(bring your homework to class unless otherwise noted)*
3/16	Concept Maps	Novak, J. D., & Cañas, A. J. (2006). The theory underlying concept maps and how to construct them. Technical Report IHMC CmapTools 2006-01. Florida Institute for Human and Machine Cognition.OCW	▪ Draw a concept map of the ideas we have studied so far in this course and attach it to a posting on the discussion board by 12:00 noon.
3/18	Mental Representation and the Brain	Wharton, C. M., Grafman, J. (1998). Deductive reasoning and the brain. *Trends in Cognitive Sciences, 2,* 54-59. OCW	▪ **Submit electronically:** 2nd short paper (see the *Assignments* section of the course website)
3/20	**No Class Meeting**		
3/23 - 3/27	**Spring Break – No Class!**		
3/30	Expertise What is it? How do you get it?	**S&B:** Ch. 13	
4/1	Creativity: Definition & Theories	**S&B:** Ch. 12	
4/3	Creativity: The creative person	Weisberg, R. W. (1986). *Creativity: Genius and other myths.* New York: W. H. Freeman. (Chs. 2-4, pp. 15-69) OCW	▪ Reading Reaction to the chapters by Weisberg (posting on discussion board by 12:00 noon)
4/6	Creativity: Role of motivation	Hennessey, B.A. (2003). The social psychology of creativity. *Scand. J. Educational Research, 47(3)*, 253-271.	
4/8	Creativity: How to be creative	deBono, E. (1970). *Lateral Thinking* New York: Harper Colophon. (Chs. 1-4, pp. 25-55)OCW	▪ Lateral Thinking Homework (A5)
4/10	Intelligence (1): Defining & Measuring it	**S&B:** Ch. 11	

Date	Topic(s)	Assigned Reading S&B = Your textbook OCW = available on the course website	Other Homework *(bring your homework to class unless otherwise noted)*
4/13	Intelligence (2): Special topics	Flynn, J. R. (1999). Searching for justice: The discovery of IQ gains over time. *American sychologist, 54(1)*, 5-20.	
4/15	Alternative Theories of intelligence	Walters, J. M., & Gardner, H. (1986). The theory of multiple intelligences: Some issues and answers. In R. Sternberg & R. K. Wagner (Eds.), *Practical Intelligence: Nature and origins of competence in the everyday world.* (Ch. 8, pp. 163-182). Cambridge: Cambridge U. Press. **OCW**	▪ Reading Reaction to the chapter by Walters & Gardner (posting on discussion board by 12:00 noon)
4/17	**No Class Meeting**		▪ **Submit electronically:** 3rd short paper (see the *Assignments* section of the course website)
4/20	Intelligence: Wisdom Practical intelligence	Sternberg, R. J. (1998). A balance theory of wisdom. *Review of General Psychology, 2(4)*, 347-365.**OCW** Sternberg, R. J. (2001). Why schools should teach for wisdom: The balance theory of wisdom in educational settings. *Educational Psychologist, 36(4)*, 227–245.**OCW**	▪ Reading Reaction to Sternberg's paper, "A balance theory of wisdom." (posting on discussion board by 12:00 noon)
4/22	Human and Artificial Intelligence	Turing, A. M. (1950) Computing Machinery and Intelligence. *Mind, 49*, 433-460. **OCW**	
4/24	Course review *(Information about the Final Exam will be distributed at this class meeting)*		

Final Exam: Thursday, May 7, 9:00 a.m. – noon