

COGS 200: Foundations in cognitive science

Tues 11:30-1:20 AQ 5008, Thurs 11:30-12:20, AQ 5005

Contact Information

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Office Hours:	Tues 3:30-4:30, or by apt.	Prerequisite:	COGS 100, or by consent

Course description:

This course is an in-depth introduction to important empirical methods and theoretical frameworks for exploring the mind. It introduces students to some of the major results in cognitive science and fleshes out several of the foundational debates that have fueled investigations in the past fifty years. Taking an interdisciplinary approach, the course illustrates how a convergence of ideas from psychology, philosophy, linguistics, and computer science has led to deep explanations of human cognitive capacities, as well as clarified some research questions that are being actively investigated today. Because of the expanded nature of the field, we will build foundations by focusing on a few core theories, including symbolic-computational and connectionist theories of cognitive processes. We will also tend to concentrate on certain core problems in cognitive science, like language processing, human rationality, object processing, concepts, and learning in general.

Required texts:

- *Cognitive science: An introduction to the science of the mind*, José Luis Bermúdez, 2014 (2nd Edition), Cambridge University Press.
- Supplemental readings (see references) available electronically free from the library or the web.

Course requirements and weightings of assignments

Interpretive exercises (several)	10%
Article summaries (two):	20%
50 minute exams (three):	70%

Exams: Jan. 26, Mar. 2, Mar. 30

Missed exams: Please put these dates in your calendar. If you miss an exam for medical reasons, please bring a doctor's note so I can confirm the justification for the absence and excuse the absence. Excused absences will have the result that the missed exam will not factor in your grade. Unexcused absences will result in a zero.

Course philosophy

Discussion-oriented lectures The course is really built on class discussion. Each class has a topic area and a set of questions to start us off. But the answers to the questions, or at least the next steps towards the answers, are fleshed out in class discussion. It is often the case that class discussion identifies new directions for future investigation and reading.

Participate! Active participation really facilitates learning. The fastest way to learn the material is to engage fully in the class activities. There are many different ways to engage, however, so don't be

worried if you are not the first one to answer a question in class discussion. Active listening is also extremely important. You can provide evidence of active listening by incorporating discussion points from class in your exams and other written work. If you find yourself getting stuck, or that there are obstacles to your participation in the class, please come and talk to the instructor about this. A good goal is to try to ask at least one question each class, even if it is something like, ‘Can you restate that last point—it doesn’t make sense to me?’

Working groups: in the beginning of the semester you will be assigned to work groups of approximately five people. You will work in these groups for various small group activities, including the interpretative exercises.

Reading in detail We use a textbook, but we also read detailed treatments of selected problems. Some of this reading will be challenging and hopefully thought-provoking to you. Please ask questions in class or over email if the reading is unclear. Don’t let small obstacles get in the way of understanding.

Assignments

Interpretive exercises There will be several of these, likely one every other week. They are focused assignments designed to flesh out the reading or an assignment built off the reading. You will be asked to give your answers, and then a group answer generated through discussion in your work group. The exams are very similar to interpretative exercises, so they are good practice for the exams. Grades are based on completion.

Article summaries These are short analytical summaries of a selected reading assignment (see below for specific articles to summarize). See the weblinked Guidelines for Writing Analytical Summaries for how to write a good summary. A key thing to remember is that you are asked to give an analytical summary, covering the main points, and not a chronological page-by-page summary. One page single space, with 12 point font.

Lateness policy: all assignments must be completed to pass the course. Late assignments are accepted, but are marked down by one percentage point for every week day that extends beyond the deadline. Assignments are due in class, at the beginning of class. You can miss one interpretive exercise, but subsequent missed exercises result in a zero.

Domains

Language: language acquisition, the language of thought, speech errors, phonology

Learning: language acquisition, concept learning, object processing in infants

Objects: object processing, object identification, object permanence

Concepts: concept learning

Thought: human rationality, the language of thought

Lectures and assigned readings

The lectures will follow the sequence shown below more or less, though we may have to push some dates back or omit some lectures. The readings for each lecture are given and should be read prior to the lecture. JLB = the Bermúdez textbook ‘Cognitive Science’, and all other readings are referred to by normal bibliographic reference. ***Note: the dates for all assignments and exams (in bold) do not change.***

Jan. 5, Course Introduction

Reading: try to skim chapter 2 of JLB if you have time

Jan. 10, 12, Human rationality

Core reading: Samuels et al. (1999)

JLB: 10.2-10.3 (285-305)

Objective: use facts of human rationality as a way of exploring the modularity of mind

Jan. 17, 19, 24, Language acquisition and formal learning

Core reading: Berko (1958)

Assignment: one page article summary of Berko article due on Jan. 17

JLB: 9.1 (240-245), 6.1 (141-151)

Objective: survey problems in language acquisition and establish a framework for acquisition in a formal system.

Jan. 26, Exam 1 entire class

Jan. 31-Feb. 2, The language of thought

Core reading: Camp (2007)

JLB: 6.2 (151-159)

Objective: understand how the language of thought as a formal system and how it can be extended

Feb. 7-9 Spelke objects

Core reading: Scholl and Leslie (1999)

JLB: 9.3 (254-261)

Objective: use the FINST theory of visual indexing to account for both the infant’s object concept and adult knowledge of object tracking.

Feb. 21, 23, 28, Connectionism 101 and the English past tense debate

Core reading: McClelland and Rumelhart (1986)

Assignment: one page article summary of McClelland and Rumelhart article due on Feb. 21

JLB: 8.1-8.2 (209-227) and 9.2 (245-254)

Objective: to reexamine a formal rule at the microstructure level and see how it can account for detailed facts in language development.

Mar. 2, exam 2 entire class

Mar. 7, 9, Connectionism and concept learning

Core reading: McClelland and Rumelhart (1985)

JLB: 8.308.4 (227-235)

Objective: to understand how a connectionist network can learn both general and specific category labels

Mar. 14, 16, Connectionism and speech production

Core reading: Dell (1986)

Objective: understand out a connectionist network can be couched within a hybrid model with symbolic and numerical computation to explain certain psychological effects in speech errors

Mar. 21-23, Connectionist neuroscience

Core reading: Hanson (1999)

JLB: 3.1-3.3 (60-76)

Objective: understand how connectionism relates to brain-like computation

Mar. 28, Object recognition

Core reading: Dickinson (1999)

Objective: understand object recognition as a computational problem

Mar. 30, Exam 3 entire class

Apr. 4, 6, Embodied cognition

Core reading: Browman and Goldstein (1995)

Objective: explore the dynamics and embodied cognition of speech gestures

Bibliography

Berko, Jean. 1958. The child's learning of English morphology. *Word* 14.150-77.

Browman, Catherine & Louis Goldstein. 1995. Dynamics and articulatory phonology. *Mind as motion. Explorations in the dynamics of cognition*, ed. by R.F. Port & v. Gelder, 175-93. Cambridge, MA: The MIT Press.

Camp, Elisabeth. 2007. Thinking in maps. *Philosophical perspectives* 21.145-82.

Dell, Gary S. 1986. A spreading-activation theory of retrieval in sentence production. *Psychological Review* 93.283-321.

Dickinson, Sven J. 1999. Objection representation and recognition. *What is cognitive science?*, ed. by E. Lepore & Z. Pylyshyn, 172-207. Malden, MA: Blackwell.

Hanson, Stephen José. 1999. Connectionist neuroscience: Representational and learning issues for neuroscience. *What is cognitive science?*, ed. by E. Lepore & Z. Pylyshyn, 401-27. Malden, MA: Blackwell.

McClelland, James L. & David Rumelhart. 1985. Distributed memory and the representation of general and specific information. *Journal of Experimental psychology: General* 114.159-88.

McClelland, James L. & David E. Rumelhart. 1986. On learning the past tenses of English verbs. *Parallel Distributed Processing: Explorations in the microstructure of cognition, Volume 2: Psychological and biological models*, ed. by J.L. McClelland, D.E. Rumelhart & T.P.R. Group, 216-71 Cambridge, MA: The MIT Press.

Samuels, Richard, Stephen Stich & Patrice D. Tremoulet. 1999. Rethinking rationality: From bleak implications to Darwinian modules. *What is cognitive science?*, ed. by E. Lepore & Z. Pylyshyn, 74-120. Malden, MA: Blackwell.

Scholl, Brian J. & Alan M. Leslie. 1999. Explaining the infant's object concept: Beyond the perception/cognition dichotomy. *What is cognitive Science?*, ed. by E. Lepore & Z. Pylyshyn, 26-73. Malden, MA: Blackwell.