

**Spring 2015**  
**Cognition & Instruction**  
**16:300:582:01**  
**3 Credits**  
**Tuesdays, 4:50pm - 7:30 pm, Bishop House–Room 211**

Instructor Name: Drew Gitomer	Email address: drew.gitomer@gse.rutgers.edu
Phone Number: 848-932-0641	10 Seminar Pl Rm 9
Office Hours: by appointment	Prerequisites or other limitations: none
Mode of Instruction: <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Hybrid <input type="checkbox"/> Online <input type="checkbox"/> Other	Permission required: <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Directions about where to get permission numbers:

**Learning goals:**

1. To become familiar with important issues and research about human cognition and their implications for instruction
2. To understand important historical methodological approaches to the study of human cognition
3. To read original research and syntheses of research carefully and critically and to be able to understand deeply the arguments of the readings.
4. To be able to make connections between related concepts in human cognition.

**Course catalog description:**

This course reviews selected topics in the study of human cognition and their implications for instruction. We review critical ideas that consider how people learn and also explore historical trends in the evolution of theories about human cognition. We will review studies that examine particular instructional approaches suggested by theory and research on human cognition.

**Class materials/Textbooks:**

Readings for each week are presented below in the Course Schedule. In addition, a very valuable reference is *How People Learn*.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school* (Expanded Ed.). Washington, DC: The National Academies Press. Retrieved from [http://www.nap.edu/openbook.php?record\\_id=9853&page=R1](http://www.nap.edu/openbook.php?record_id=9853&page=R1)

**Attendance Policy:**

You are expected to attend all classes during the semester. If there are extenuating circumstances that prevent you from attending the class (or part of the class), please be sure to notify the instructors in advance.

### **Course Organization:**

Each week you will be expected to carefully read 3-4 papers. The classes will be a mix of lecture, small group work, lab-like work (in which you will experience the research methods we are studying), and discussion.

We will use Sakai as the course management system. Assignments and readings (as available) will be posted on the system. All student submissions should be made through the system as well.

### **Grading policy:**

Students will be evaluated on their participation in class, weekly responses and three assignments. Students are expected to carefully read the weekly readings and come to class prepared to discuss the papers. Students are also expected to come to class with thoughtful questions about the readings.

Most weeks I will also give you a question to respond to about the readings on the Sakai site. I will give you the question no later than Wednesday evening. Responses should be on the order of a couple of paragraphs. Please have responses posted by Monday at 6pm. I will often integrate these responses into our class on Tuesday.

Three written papers are required. They will focus on both the class readings and related articles that will help support your argument for each paper. We will review the expectations in detail for each of the papers.

### **Assignments<sup>1</sup>:**

*Assignment 1 - assigned February 3, 2015; due March 3, 2015*

We have been reading about learning theories, memory, knowledge structures. For this assignment, please provide a critical analysis of the attached article on understanding and learning from text. I would like you to write an analysis that includes both a summary and analysis of the article but also connects it with the broader literature we have been reading.

I would like you to not only reference the readings, but also include at least three other references that helps you develop your analysis. Using the references means more than simply saying that "Jones found x." It means explaining the research in sufficient detail (typically a paragraph) in a way that clarifies your argument.

The paper should be no more than 10 double-spaced pages (not including references) and be formatted in APA style with references.

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<sup>1</sup> Including exams, papers etc.

*Assignment 2 - assigned March 10, 2015; due April 7, 2015*

There has been increasing interest in informal education as a way of enhancing student learning - much of this work has been done in STEM. For this assignment, your task is to critically analyze some aspect of research on informal learning using the ideas that we have been exploring in the course.

To start, there is a clearinghouse on STEM informal learning called CAISE. There, you will find a wiki that attempts to capture research that “makes the case” for some aspect of STEM learning. - <http://informal.science.org/research/wiki> As a first step, browse through the topics and find some that interest you. You will then see a brief summary piece that also points you to related research.

Once you select a focal area, please critically analyze the summary piece along with 3-5 papers in order to evaluate the nature of the claims and evidence about how informal learning supports some aspect of student development. In your analysis, you might consider issues such as (you certainly can consider others):

1. What are the targeted knowledge/skills/practices/dispositions etc. that are focused on? To what extent are objectives explicit?
2. How are the roles of students/teachers/others conceptualized?
3. Where does expertise, if any, reside (e.g., experts, masters, community, texts, displays)?
4. What is the nature of interactions envisioned to support learning?
5. What evidence is cited in support of informal learning? What is your analysis of the quality of that evidence?

Your analysis should provide a discussion of the underlying theories of cognition and learning as well as a consideration of the research evidence. As a guideline, the paper should be 8 double-spaced pages (+/-) and include references. The paper should follow APA guidelines.

Please submit your paper in your individual dropbox folder.

Assignment 3 - to come

**Web site:**

<https://sakai.rutgers.edu/portal/site/f3eee1b3-f4f6-4d68-a516-a885c501803d>

**Academic Integrity Policy:**

The Office of Student Conduct supervises issues related to violations of academic integrity

(see <http://academicintegrity.rutgers.edu>). Please familiarize yourself with the university policy on academic integrity at [http://academicintegrity.rutgers.edu/files/documents/AI\\_Policy\\_2013.pdf](http://academicintegrity.rutgers.edu/files/documents/AI_Policy_2013.pdf)

**Office of Disability Services:**

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a

disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

## Course Schedule:

Week	Assignments & Readings
Week 1 (January 20, 2015)	<p><i>Introduction to Course and Fundamental Issues in Cognition and Instruction</i></p> <p>This week we will focus on the basic ideas of cognition and instruction. What do we mean by cognition and how has our understanding changed over time? How might instruction be informed by theories of cognition? Might our understanding of instruction inform theories of cognition? What do we even mean by instruction? What do we mean by cognition? We certainly won't resolve these questions in this class, but we will try to at least introduce these as themes we will explore across the semester.</p>
Week 2 (January 27, 2015)	<p><i>Learning Theory and Education</i></p> <p>This week we focus on how the field has thought about connections between research on human cognition and instruction. We will look at two theoretical pieces that review the research on cognition that characterized the field at the time each piece was written and describe implications for instructions and education. As you read these two papers, consider how major changes in perspectives on cognition lead to different instructional implications.</p> <p><i>Required Readings</i>            Bransford, J., Stevens, R., Schwartz, D., Meltzoff, A. N., Pea, R., Roschelle, J., . . . &amp; Sabelli, N. (2006). Learning theories and education: Toward a decade of synergy. In P. Alexander &amp; P. Winne (Eds.), <i>Handbook of educational psychology</i> (2nd ed., pp. 209–244). Mahwah, NJ: Lawrence Erlbaum Associates.            Retrieved from <a href="http://ilabs.washington.edu/kuhl/pdf/2006_Bransford_Vye_etal.pdf">http://ilabs.washington.edu/kuhl/pdf/2006_Bransford_Vye_etal.pdf</a></p> <p>Glaser, R., &amp; Bassok, M. (1989). Learning theory and the study of instruction. <i>Annual Review of Psychology</i>, 40, 631–666.</p>
Week 3 (February 3, 2015)	<p><i>Memory</i></p> <p>This week we look at conceptions on the nature of human memory. The readings include two classic papers that helped to shape the field of</p>

	<p>cognitive psychology. We will consider both structural and process views of memory and how those conceptions have had different implications for instruction.</p> <p><i>Required Readings</i> Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. <i>Psychological Review</i>, 63, 81–97. Retrieved from <a href="http://psychclassics.yorku.ca/Miller/">http://psychclassics.yorku.ca/Miller/</a></p> <p>Pages 1–46: Atkinson, R. C., &amp; Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence &amp; J. T. Spence (Eds.), <i>The Psychology of learning and motivation: Advances in research and theory</i> (Vol. 2), 89–195.</p> <p>Ericsson, K. A., &amp; Kintsch, W. (1995). Long-term working memory. <i>Psychological Review</i>, 102, 211–245. Retrieved from <a href="http://users.ecs.soton.ac.uk/harnad/Papers/Py104/ericsson.long.html">http://users.ecs.soton.ac.uk/harnad/Papers/Py104/ericsson.long.html</a></p> <p><i>Recommended (Optional) Readings</i> Rajah, M. N., &amp; D’Esposito, M. (2005). Region-specific changes in prefrontal function with age: a review of PET and fMRI studies on working and episodic memory. <i>Brain</i>, 128, 1964–1983. doi:10.1093/brain/awh608</p> <p>Guenther, R. K. (1998). <i>Human cognition</i> (pp. 1–27). Upper Saddle River, NJ: Prentice Hall.</p>
<p>Week 4 (February 17, 2015)</p>	<p><i>Knowledge Structures</i></p> <p>While earlier models of memory focused on general structures and processes, the importance of knowledge soon became a critical focus of cognitive research. This week we discuss ways that cognitive science has conceptualized how knowledge is structured in memory and used during problem solving. We also explore how researchers think about conceptual change in the knowledge structures of learners.</p> <p><i>Required Readings</i> Bower, G. H., Black, J. B., &amp; Turner, T. J. (1979). Scripts in memory for text. <i>Cognitive Psychology</i>, 11, 177–220. doi:10.1016/0010-0285(79)90009-4</p> <p>Rumelhart, D. E., &amp; Ortony, A. (1977). The representation of knowledge in memory. In R. C. Anderson, R. J. Spiro, &amp; W. E. Montague (Eds.), <i>Schooling and the acquisition of knowledge</i> (pp. 99–135). Hillsdale, NJ: Lawrence Erlbaum Associates.</p> <p>Chi, M. T. H. (2008). Three types of conceptual change: Belief revision,</p>

	<p>mental model transformation, and categorical shift. In S. Vosniadou (Ed.), <i>Handbook of research on conceptual change</i> (pp. 61–82). Hillsdale, NJ: Lawrence Erlbaum Associates. Retrieved from <a href="http://chilab.asu.edu/papers/Chi_concpetualchangechapter.pdf">http://chilab.asu.edu/papers/Chi_concpetualchangechapter.pdf</a></p> <p><i>Recommended (Optional) Readings</i> Anderson, J. R., Reder, L. M., &amp; Simon, H. A. (1996). Situated learning and instruction. <i>Educational Researcher</i>, 25(4), 5–11. Retrieved from <a href="http://www.jstor.org/stable/pdfplus/1176775.pdf?acceptTC=true">http://www.jstor.org/stable/pdfplus/1176775.pdf?acceptTC=true</a></p> <p>Jitendra, A. K., Star, J. R., Rodriguez, M., Lindell, M., &amp; Someki, F. (2011). Improving students’ proportional thinking using schema-based instruction. <i>Learning and Instruction</i>, 21, 731–745. doi: 10.1016/j.learninstruc.2011.04.002</p>
<p>Week 5 (February 24, 2015)</p>	<p><i>Expert Novice</i></p> <p>One of the important lines of research in studying cognition has been to both understand what experts do and how they differ from novices in a domain. This week we will consider the literature on expertise and how that has influenced thinking on what the instructional focus should be as students learn a domain.</p> <p><i>Required Readings</i> Castel, A. D., McCabe, D. P., Roediger, III, H. L., &amp; Heitman, J. L. (2007). The dark side of expertise: Domain-specific memory errors. <i>Psychological Science</i>, 18(1), 3–5. doi: 10.1111/j.1467-9280.2007.01838.x</p> <p>Chi, M. T. H., Feltovich, P. J., &amp; Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. <i>Cognitive Science</i>, 5(1), 121–152. doi: 10.1207/s15516709cog0502_2</p> <p>Ericsson, K. A., &amp; Chase, W. G. (1982). Exceptional memory. <i>American Scientist</i>, 70(6), 607–615. Retrieved from <a href="http://www.jstor.org/stable/27851732">http://www.jstor.org/stable/27851732</a></p> <p>Ericsson, K. A., &amp; Lehmann, A. C. (1996). Expert and exceptional performance: Evidence of maximal adaptation to task constraints. <i>Annual Review of Psychology</i>, 47, 273–305.</p>
<p>Week 6 (March 3, 2015)</p>	<p><i>Situated Cognition and Informal Learning</i></p> <p>As cognitive science has developed, one of the most important changes has been changes in the conceptualize learning. Whereas earlier work was dominated by a view of learning that occurs in the “head” of the student and instruction was focused on formal schooling, later work has</p>

	<p>focused on learning as a social process that is not bounded by formal educational structures. This week we begin to explore situated and sociocultural views of learning.</p> <p><i>Required Readings</i> Lave, J., &amp; Wenger, E. (1991). <i>Situated learning: Legitimate peripheral participation</i>. New York, NY: Cambridge University Press.</p> <p>Brown, J. S., Collins, A., &amp; Duguid, P. (1989). Situated cognition and the culture of learning. <i>Educational Researcher</i>, 18(1), 32–42. Retrieved from <a href="http://www.jstor.org/stable/1176008">http://www.jstor.org/stable/1176008</a></p>
<p>Week 7 (March 10, 2015)</p>	<p><i>Knowledge Building</i></p> <p>How is knowledge developed? There have been strong arguments about the extent to which learners should be given guidance and support. This week we explore different theories of knowledge building, all having varying implications for how instruction and learning environments are organized.</p> <p><i>Required Readings</i> Scardamalia, M., &amp; Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), <i>Cambridge handbook of the learning sciences</i> (pp. 97–118). New York, NY: Cambridge University Press. Retrieved from <a href="http://ikit.org/fulltext/2006_KBTheory.pdf">http://ikit.org/fulltext/2006_KBTheory.pdf</a></p> <p>Chandler, P., &amp; Sweller, J. (1991). Cognitive load theory and the format of instruction. <i>Cognition and Instruction</i>, 8(4), 293–332. Retrieved from <a href="http://www.jstor.org/stable/3233596">http://www.jstor.org/stable/3233596</a></p> <p>Stull, A. T., &amp; Mayer, R. E. (2007). Learning by doing versus learning by viewing: Three experimental comparisons of learner-generated versus author-provided graphic organizers. <i>Journal of Educational Psychology</i>, 99(4), 808–820. doi: 10.1037/0022-0663.99.4.808</p>
<p>Week 8 (March 24, 2015)</p>	<p><i>Motivation</i></p> <p>Obviously, there is a relationship between motivation and learning. This week we review studies of the relationship between motivation and learning and also examine how researchers are developing and studying learning environments that are designed to increase student motivation, particularly through gaming.</p> <p><i>Required Readings</i> Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. <i>Journal of Educational Psychology</i>, 95(4), 667–686. doi: 10.1037/0022-0663.95.4.667</p>

	<p>Garris, R., Ahlers, R., &amp; Driskell, J. E. (2002). Games, motivation, and learning: A research and practice model. <i>Simulation &amp; Gaming</i>, 33(4), 441–467. doi: 10.1177/1046878102238607</p> <p>Duckworth, A. L., &amp; Carlson, S. M. (2013). Self-regulation and school success. In B. W. Sokol, F. M. E. Grouzet, &amp; U. Müller (Eds.), <i>Self-regulation and autonomy: Social and developmental dimensions of human conduct</i> (pp. 208–230). New York, NY: Cambridge University Press.</p> <p><i>Recommended (Optional) Readings</i></p> <p>Pintrich, P. R., &amp; Schunk, D. H. (1996). The role of expectancy and self-efficacy beliefs. In D. H. Schunk, P. R. Pintrich, &amp; J. L. Meece, <i>Motivation in education: Theory, research, and applications</i> (Chapter 3). Englewood Cliffs, NJ: Prentice Hall. Retrieved from <a href="http://www.uky.edu/~eushe2/Pajares/PS.html">http://www.uky.edu/~eushe2/Pajares/PS.html</a></p>
<p>Week 9 (March 31, 2015)</p>	<p><i>Transfer</i></p> <p>Much of what we do in education is teach for transfer -learning things in one situation (e.g., the classroom) that can then be transferred to other contexts. Yet, in a great deal of research it has been difficult to demonstrate transfer of what has been learned to new contexts. This week we will study that research and the conditions of learning that are associated with promoting transfer. We will also explore situations in which transfer can be problematic.</p> <p><i>Required Readings</i></p> <p>Perkins, D. N., &amp; Salomon, G. (1990). <i>The science and art of transfer</i>. Retrieved from <a href="http://learnweb.harvard.edu/alps/thinking/docs/trancost.pdf">http://learnweb.harvard.edu/alps/thinking/docs/trancost.pdf</a></p> <p>Barnett, S. M., &amp; Ceci, S. J. (2002). When and where do we apply what we learn? A taxonomy for far transfer. <i>Psychological Bulletin</i>, 128(4), 612–637. doi: 10.1037//0033-2909.128.4.612</p> <p>Palincsar, A. S., &amp; Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. <i>Cognition and Instruction</i>, 1(2), 117–175. Retrieved from <a href="http://www.jstor.org/stable/3233567">http://www.jstor.org/stable/3233567</a></p> <p>Lobato, J., Rhodemal, B., &amp; Hohensee, C. (2012). “Noticing” as an alternative transfer of learning process. <i>The Journal of the Learning Sciences</i>, 21, 433–482. doi: 10.1080/10508406.2012.682189</p> <p><i>Recommended (Optional) Readings</i></p> <p>Lobato, J. (2006). Alternative perspectives on the transfer of learning: History, issues and challenges for future research. <i>The Journal of</i></p>

	<p><i>the Learning Sciences</i>, 15(4), 431–449. Retrieved from <a href="http://www.jstor.org/stable/25473530">http://www.jstor.org/stable/25473530</a></p> <p>Bransford, J., &amp; Schwartz, D. (1999). Rethinking transfer: A simple proposal with multiple implications. <i>Review of Research in Education</i>, 24, 61–100. Retrieved from <a href="http://www.jstor.org/stable/1167267">http://www.jstor.org/stable/1167267</a></p> <p>Brown, A. L., Kane, M. J., &amp; Long, C. (1989). Analogical transfer in young children: Analogies as tools for communication and exposition. <i>Applied Cognitive Psychology</i>, 3, 275–293. doi: 10.1002/acp.2350030402</p>
<p>Week 10 (April 7, 2015)</p>	<p><i>Feedback</i></p> <p>This week we explore research on the nature and characteristics of feedback that are associated with different learning outcomes. How should feedback be organized? What kind of feedback is most useful? How are brain scientists studying neural patterns under different feedback conditions?</p> <p><i>Required Readings</i></p> <p>Kluger, A. N., &amp; DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. <i>Psychological Bulletin</i>, 119(2), 254–284. doi: 10.1037/0033-2909.119.2.254</p> <p>Hattie, J., &amp; Timperley, H. (2007). The power of feedback. <i>Review of Educational Research</i>, 77(1), 81–112. doi: 10.3102/003465430298487</p> <p>van Duijvenvoorde, A. C. K., Zanolie, K., Rombouts, S. A. R. B., Raijmakers, M. E. J., &amp; Crone, E. A. (2008). Evaluating the negative or valuing the positive? Neural mechanisms supporting feedback-based learning across development. <i>The Journal of Neuroscience</i>, 28(38), 9495–9503. Retrieved from <a href="http://www.jneurosci.org/content/28/38/9495.full.pdf+html">http://www.jneurosci.org/content/28/38/9495.full.pdf+html</a></p>
<p>Week 11 (April 14, 2015)</p>	<p><i>Metacognition</i></p> <p>Metacognition refers to knowledge about cognition, a concept that has helped us understand how and why learners employ different processes and strategies for learning. It is an idea that has been used to understand how people engage in conscious and active control of their own cognition. This week we explore the concept generally and how it has been used to discuss learning in different domains.</p> <p><i>Required Readings</i></p> <p>Jacobs, J. E., &amp; Paris, S. G. (1987). Children’s metacognition about reading: Issues in definition, measurement, and instruction.</p>

	<p><i>Educational Psychologist</i>, 22(3&amp;4), 255–278.</p> <p>Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. <i>American Psychologist</i>, 34(10), 906–911.</p> <p>Fleming, S. M., &amp; Dolan, R. J. (2012). The neural basis of metacognitive ability. <i>Philosophical Transactions of the Royal Society</i>, 367(1594), 1338–1349. doi:10.1098/rstb.2011.0417</p> <p>Grainger, C., Williams, D. M., &amp; Lind, S. E. (2014). Metacognition, metamemory, and mindreading in high-functioning adults with autism spectrum disorder. <i>Journal of Abnormal Psychology</i>, 123(3), 650–659. doi: 10.1037/a0036531</p>
<p>Week 12 (April 21, 2015)</p>	<p><i>Self-Regulation</i></p> <p>This week we focus on the more affective side of learning. How do learners self-regulate their behaviors to be productive learners and what is the genesis of self-regulatory problems? What do we know about helping learners develop better self-regulatory skill.</p> <p><i>Required Readings</i></p> <p>Muraven, M., &amp; Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? <i>Psychological Bulletin</i>, 126(2), 247–259. doi: 10.1037//0033-2909.126.2.247</p> <p>Metcalf, J., &amp; Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. <i>Psychological Review</i>, 106(1), 3–19. Retrieved from <a href="http://jpkc.ecnu.edu.cn/fzxlx/pdf/a%20hot-cool%20system%20analysis%20of%20delay%20of%20gratification.pdf">http://jpkc.ecnu.edu.cn/fzxlx/pdf/a%20hot-cool%20system%20analysis%20of%20delay%20of%20gratification.pdf</a></p> <p>Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. <i>Psychophysiology</i>, 39, 281–291. doi: 10.1017.S0048577201393198</p>
<p>Week 13 (April 28, 2015)</p>	<p><i>Modern Syntheses</i></p> <p>This week we consider some more recent pieces that attempt to synthesize the research over the last several decades and suggest agendas for both research and practice.</p> <p>Koedinger, K. R., Corbett, A. T., &amp; Perfetti, C. (2012). The Knowledge-Learning-Instruction (KLI) framework: Bridging the science-practice chasm to enhance robust student learning. <i>Cognitive Science</i>, 36(5), 757–798. doi: 10.1111/j.1551-6709.2012.01245.x</p>

	<p>Sawyer, R. K. (2008). Optimising learning: Implications of learning sciences research. In <i>OECD, Innovating to Learn, Learning to Innovate</i>. Paris, France: OECD Publishing. doi: 10.1787/9789264047983-4-en</p> <p>Pashler, H., Bain, P., Bottge, B., Graesser, A., Koedinger, K., McDaniel, M., &amp; Metcalfe, J. (2007). <i>Organizing instruction and study to improve student learning</i> (NCER 2007-2004). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Retrieved from <a href="http://ies.ed.gov/ncee/wwc/pdf/practice_guides/20072004.pdf">http://ies.ed.gov/ncee/wwc/pdf/practice_guides/20072004.pdf</a></p>
Week 14 (May 5, 2015)	<b><i>Final Assignments - GSE Room 11</i></b>