

# PSYCHOLOGY 4302

## Cognitive Psychology Applied to Education

(Tues, Th 4:00 PM – 5:30 PM, , Room 216A/B Psychology Building)

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### Course Syllabus

This course is intended to cover topics in the cognitive psychology of human memory, conceptual learning, and comprehension with special focus on areas, theory, and research that have potential application to education. Thus, the course will provide selective coverage of theoretical and empirical work in cognitive psychology that provides potential to inform and improve educational practice. The applicability of these themes to education will be explicitly developed and evaluated through the primary research literature using educationally oriented experimental paradigms.

The course will be organized around three major integrated goals. First, the relevant basic theory and findings in a particular topic in cognition will be covered. Second, we will critically examine educational implications of this work. An important focus will be to examine the primary research literature bearing directly on education that reflects the themes illuminated by cognitive psychology. Third, we will attempt to develop concrete examples of how the principles that emerge can be integrated into existing curricula and classroom practices.

These goals will be met through lectures, assigned readings, and classroom and small group discussions.

1. **Assigned readings.** The topic of applying cognition to education is an emerging interdisciplinary topic for which there is no textbook. Thus, I have compiled a set of assigned readings that include some textbook chapters and some research articles. These readings cover basic theory, applications to education, and pertinent research findings. NOTE: Additional readings maybe assigned as needed throughout the semester.

In addition, because there is no text, I have provided supplemental reading to support lecture material. These are listed under “lecture support” readings. They are not required, but may be useful for reviewing and learning the course material.

All readings are available through the electronic reserved reading system, with the readings on the system listed under the course number. The password for accessing the readings is “applied”.

2. **Class attendance and participation.** Class attendance is essential in this course for several reasons. First, much of the research that develops, informs, and

demonstrates potential applications of cognitive psychology is not easily accessible in the literature and is not summarized in textbooks. Thus, much of the basic content of the course can only be appreciated and gained through the classroom interaction.

Second, one of the course topics will be the benefits of quizzing for learning. We will practice this in the present course by including short quizzes in class to foster learning.

Third, class and small group discussions will be a main vehicle for considering and developing potential innovations and changes in education suggested by cognitive psychology. This is the practical aspect of the course that is intended to help you implement thoughtful and effective instructional or teaching activities. Class participation (which requires attendance) and quiz performance will count for 19% of your course grade.

**3. Examinations.** There will be three in-class examinations. Each will count toward 27% of the final grade. Exams will be based on material that is covered in class, as well as material that is assigned as reading. **NO** make-up exams will be given (except for written medical excuse). It should be noted that if you miss a class, it is your responsibility to find out about any assignment or exam date that may have been communicated in class.

<u>Week</u>	<u>Class Topic</u>	<u>Reading Assignment</u>	<u>“Lecture support” readings. (NOT required).</u>
1.	<b>I. Encoding Information in Long-Term Memory</b> A. Basic Theory 1. Information processing model of memory  B. Applications to Education: 1. Total time hypothesis and study strategies	Bourne, Bominowski, & Loftus (1979). Acquisition of New Information (Ch. 2), in <u>Cognitive Processes</u> , Englewood Cliffs, NJ: Prentice Hall.	
2.	A. Basic Theory 1. Levels of Processing and Elaboration  B. Applications to Education: Elaborative Learning Techniques.  1. The Keyword Method.	Mayer (2003). Teaching by Fostering Learning Strategies (Ch. 11) in <u>Learning and Instruction</u> , Prentice Hall.	Craik & Tulving (1975). Depth of processing and the retention of words in episodic memory. <u>Journal of Experimental Psychology: General</u> , 104, 268-294.
3.	2. Organization.  3. Elaborative Interrogation- - Self explanation.	Pressley, Symons, McDaniel, Snyder, & Turnure (1988). Elaborative interrogation facilitates acquisition of confusing facts. <u>Journal of Educational Psychology</u> , 80, 268-278.	
4.	4. Generation.  5. Spaced Study	Dewinstanley & Bjork (2004). Processing strategies and the generation effect: Implications for making a better reader. <u>Memory &amp; Cognition</u> , 32, 945-955.	Rea & Modigliani (1987).

		Zechmeister & Nyberg (1982). Distribution of practice (Ch. 9), in <u>Human Memory</u> , Monterey, CA: Brocks/Cole.	The spacing effect in 4 to 9 year old children. <u>Memory &amp; Cognition</u> , 15, 11-18.  Smith & Rothkopf (1984). Contextual enrichment and distribution of practice in the classroom. <u>Cognition and Instruction</u> , 1, 341-358.
5.	6. Desirable Difficulty  <b>EXAM I</b>	Bjork (1994). Memory and metamemory considerations in the training of human beings. In J. Metcalfe and A. Shimamura (Eds.), <u>Metacognition: Knowing about knowing</u> (pp. 185-205). Cambridge, MA: MIT Press.	Schneider, Healy, & Bourne (2002). What is learned under difficult conditions is hard to forget: Contextual interference effects in foreign vocabulary acquisition, retention, and transfer. <u>Journal of Memory and Language</u> , 46, 419-440.
6.	An Expanded Theory: A. Transfer Appropriate Difficulty  Application to Education 1. Improving metamemory  B. Material Appropriate Difficulty Application to Education 1. Embedded questions/outlining. 2. Individual Differences	Thomas & McDaniel (2007). The negative cascade of incongruent generative study-test processing in memory and metacomprehension. <u>Memory &amp; Cognition</u>	Einstein, McDaniel, Owen, & Cote (1990). Encoding and recall of texts: The importance of material appropriate processing. <u>Journal of Memory and Language</u> , 29, 566-581.
7.	<b>II. Retrieval from Long-Term Memory</b> A. Basic Theory 1. Retrieval is cue driven.  B. Application to Education: 1. Contextual cues and	Saufley, Otaka, & Bavaresco (1985). Context effects: Classroom tests	Gick & Holyoak (1983).

	<p>knowledge access</p> <p>2. Problem solving and transfer</p> <p>A. Basic Theory: Transfer appropriate processing.</p> <p>B. Application to Education</p> <p>1. Make Testing Appropriate</p>	<p>and context independence. <u>Memory &amp; Cognition</u>, 13, 522-528.</p>	<p>Schema induction and analogical transfer. <u>Cognitive Psychology</u>, 15, 1-38.</p> <p>Einstein &amp; Hunt (1980). Levels of processing and organization: Additive effects of individual-item and relational processing. <u>Journal of Experimental Psychology: Human Learning and Memory</u>, 6, 588-598.</p>
8.	<p>A. Basic Theory</p> <p>1. Retrieval enhances memory.</p> <p>B. Application to Education: Test-enhanced learning.</p> <p>1. Quizzes as learning devices.</p> <p>2. Expanded Retrieval</p>	<p>McDaniel, Roediger, &amp; McDermott (2007). Generalizing test-enhanced learning from the laboratory to the classroom. <u>Psychonomic Bulletin &amp; Review</u></p> <p>Rea &amp; Modigliani (1985). The effect of expanded versus massed practice on the retention of multiplication facts and spelling lists. <u>Human Learning</u>, 4, 11-18.</p>	<p>McDaniel &amp; Masson (1985). Altering memory representations through retrieval. <u>Journal of Experimental Psychology: Learning, Memory, and Cognition</u>, 11, 370-384.</p> <p>Leeming (2002). The exam-a-day procedure improves performance in psychology classes. <u>Teaching of Psychology</u>, 29, 210-212.</p> <p>Sptizer (1939). Studies in retention. <u>Journal of Educational Psychology</u>, 30, 641-656.</p>
9.	<p><b>III. Comprehension</b></p> <p>A. Basic Theory: Process model of discourse comprehension.</p> <p>B. Applications to Education: Improved comprehension.</p> <p>1. Text design.</p> <p>2. Reading strategies (SQ3R)</p>	<p>Reed (2000). Kintsch's model of comprehension (Ch. 11, pp. 340-347) in <u>Cognition</u>, Wadsworth.</p> <p>Mayer (2003). Teaching by guiding cognitive</p>	<p>Kintsch &amp; van Dijk (1978). Toward a model of text comprehension and production. <u>Psychological Review</u>, 85, 363-394.</p> <p>Britton &amp; Gulgoz (1991). Using Kintsch's computational model to</p>

		<p>processes during learning (Ch. 10) in <u>Learning and Instruction</u>, Prentice Hall.</p> <p>McNamara (In press). Discourse Processes</p>	<p>improve instructional text: Effects of repairing inference calls or recall and cognitive structure. <u>Journal of Educational Psychology</u>, 83, 329-345.</p>
10.	<p>A. Expanded Theory: Construction-Integration Model.</p> <p><b>EXAM II</b></p>		<p>Bransford &amp; Johnson (1972). Contextual prerequisites for understanding: Some investigations of comprehension and recall. <u>Journal of Verbal Learning and Verbal Behavior</u>, 11, 717-726.</p>
11.	<p>B. Applications to Education: Improve Schema formation.</p> <p>1. Schematic illustrations</p> <p>2. Summarizing</p>	<p>Mayer &amp; Gallini (1990). When is an illustration worth ten thousand words? <u>Journal of Educational psychology</u>, 82, 715-726.</p> <p>DEMONSTRATION: Kintsch's "SummarizeStreet" tutor</p>	
12.	<p><b>IV. Semantic Memory—Representation of knowledge</b></p> <p>A. Basic Theory: Network-Node Model.</p> <p>B. Applications to Education:</p> <p>1. Individual differences in structure</p> <p>2. Assessment of knowledge structure.</p>	<p>Howard (1983). Network theories of long-term memory (Ch 6, pp. 190-196) in <u>Cognitive Psychology</u>, Macmillan</p> <p>Acton, Johnson, &amp; Goldsmith (1994). Structural knowledge assessment: Comparison of referent structures. <u>Journal of Educational Psychology</u>, 86, 303-311.</p>	<p>Potts &amp; Peterson (1985). Incorporation versus compartmentalization in memory for discourse. <u>Journal of Memory and Language</u>, 24, 107-118.</p>

13.	<p><b>V. Concept Learning</b></p> <p>A. Basic Theory: Concepts as prototypes.</p> <p>B. Applications to Education:</p> <p>1. Training allowable variation.</p> <p>A. More Basic Theory: Rule abstraction and exemplars.</p>	<p>Bourne, Bominowski, &amp; Loftus (1979). Concepts and prototypes (Ch. 7, pp. 197-205), in <u>Cognitive Processes</u>, Englewood Cliffs, NJ: Prentice Hall.</p>	<p>Posner &amp; Keele (1968). On the genesis of abstract ideas. <u>Journal of Experimental Psychology</u>, <u>77</u>, 353-363.</p>
14.	<p>B. Applications to Education:</p> <p>1. Individual Styles in complex conceptual learning</p>	<p>Trumpower, McDaniel, Morrisette, &amp; Williams (2004). Spontaneous analogical problem solving: Who does it? Manuscript under review.</p>	
15.	<p><b>EXAM III</b></p>		