GEORGE MASON UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT
Instructional Technology Program
EDIT 802 (3 credits)
Cognition and Technology: A Multidisciplinary Approach
Fall 2010
Mondays 7:20-10:00 pm or alternative
Commerce II, Room 100

PROFESSOR(S):
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PREREQUISITES: EDIT 752, EDCI 716, or EDCI 705

COURSE DESCRIPTION:

Examines learning interactions between cognition and technology using multiple disciplinary perspectives including, cognitive science, psychology, neuroscience, education, design theory, instructional design, technology design, anthropology, sociology, information science, philosophy, semiotics, linguistics and other applicable fields.

NATURE OF COURSE DELIVERY:

This course is an interdisciplinary exploration of cognition and technology. Although, central to doctoral study in instructional technology, students from other doctoral programs including education, computer science, psychology, philosophy, sociology, and anthropology are encouraged to participate. The course is designed to provide an opportunity for doctoral students from diverse departments to investigate and discuss the multiple learning sciences disciplines that guide our understanding of human learning and cognition.

The class format will be a mixture of short lectures, discussions, and group work. Delivery medium will include face-to-face and online (approximately 50-50). Participants will share multidisciplinary perspectives through in-class and on-line discussion of the readings, conduct research on technology supported learning environments, contribute to a knowledge base, and work collaboratively on interdisciplinary projects. Special emphasis may be placed on a specific learning sciences discipline in a particular semester. Such emphasis will depend on the individual student or instructor's research area and collaborative interests. A wiki will be used to generate course content and capture student reflections and contributions.

LEARNER OUTCOMES:

This course is designed to enable students to:

- Understand the multidisciplinary nature of human learning and cognition and its impact on technology design
- Examine the interaction between technology and cognition and the learning affordances that this interaction enables
- Examine the cognitive, social, and technological aspects of pedagogical design
- Demonstrate thorough knowledge of the cognitive, socio-cognitive, and socio-cultural approaches to human learning and cognition and their impact on technology design
- Understand how meaning is constructed, shared, internalized, and mediated through each of the perspectives examined
- Define and assess learning in each of the different approaches or perspectives that underlie human learning and cognition
- Analyze a variety of real-world learning environments to determine the demands they place on human learning and cognition and the ways in which the human cognitive system responds in these environments
- Improve formal and informal learning environments in virtual and physical settings by generating design principles based on the theories examined

PROFESSIONAL STANDARDS:

This course adheres to the following Instructional Technology Program Goals and Standards for Programs in Educational Communications and Instructional Technologies established by the Association of Educational Communication and Technologies (AECT) under the National Council for the Accreditation of Teacher Education (NCATE).

Standard 1 – Design

1.1.b Identify theories from which a variety of instructional design models are derived and the consequent implications.
1.1.2.a Demonstrate in-depth synthesis and evaluation of the theoretical constructs and research methodologies related to instructional design as applied in multiple contexts.
1.1.3.b Utilize the research, theoretical, and practitioner foundations of the field in the development of instructional materials.
1.1.4.a Conduct basic and applied research related to technology integration and implementation.
1.1.5.c Articulate the relationship within the discipline among theory, research, and practice as well as the interrelationships among people, processes, and devices.
1.3.a Identify multiple instructional strategy models and demonstrate appropriate contextualized application within practice and field experiences.

REQUIRED TEXTS:

Sawyer, K.R. (editor) (2006). *The Cambridge Handbook of the Learning Sciences.* New York, New York: Cambridge University Press. ISBN 0521607779

Bransford, J. D., Brown. A. L., and Cocking, R. R. (2000). *How People Learn: Brain, Mind, Experience, and School (Expanded Edition).* Washington, DC: National Academy Press. Also available at: http://www.nap.edu/books/0309070368/html/index.html.

Kitsantas, A., & Dabbagh, N. (2010). *Learning to learn with Integrative Learning Technologies (ILT): A practical guide for academic success.* Greenwich, CT: Information Age Publishing.

Optional or Supplemental Text:

O'Donnell, A.M., Hmelo-Silver, C.E., & Erkens, G. (editors) (2006). *Collaborative Learning, Reasoning, and Technology*. Mahwah, N.J.: Lawrence Erlbaum Associates. (**ISBN:** 9780805847789) (**ISBN-10:** 0805847782)

Classic Articles:

Laurillard, D., Stratfold, M., Luckin, R., Plowman, L., Taylor, J. (2000). Affordances for learning in a non-linear narrative medium. *Journal of Interactive Media in Education, v2.* http://www-jime.open.ac.uk/99/laurillard/laurillard.pdf

Thagard, P. (1996). *Mind: Introduction to cognitive science* (Chapt. 1, pp.3-21). Cambridge, MA: MIT Press.

Kempton, W. (1987). Two theories of home heat control. In D. Holland and N. Quinn (Ed.), *Cultural models in language and thought* (pp. 221-242). New York: Cambridge University Press.

Rumelhart, D.E. (1980). Schemata: The building blocks of cognition. In R.J. Spiro, B.C. Bruce and W.F. Brewer (Ed.), *Theoretical issues in reading comprehension* (pp. 33-58), Hillsdale, NJ: Lawrence Erlbaum.

Glaser, R. and Chi, M.T.H. (1988). Overview. In M.T.H. Chi, R. Glaser and M.J. Farr (Eds.), *The nature of expertise* (pp. xv-xxviii). Hillsdale, NJ: Erlbaum.

Greeno, J., Collins, A., Resnick, L. (1996). Cognition and Learning. D. Berliner and R. Calfee (eds.). *Handbook of Educational Psychology*. New York, Macmillan.

Students will be required to contribute additional articles as they conduct related research to help build the knowledge base of this course.

COURSE REQUIREMENTS, PERFORMANCE-BASED ASSESSMENT, AND EVALUATION CRITERIA:

A. **Requirements:** There are three main requirements in this course: (1) class participation (40% of grade); (2) analytical research paper (30% of grade); and (3) analysis project (30% of grade). These requirements are examples of performance-based assessments (PBA) and are described in detail below.

(1) Class Participation (40%): Being an effective class participant is very important in this course because much of what you will learn will be from collaboration with the instructor and the other students in class. Effective class participation involves not only preparation and speaking skills, but also listening skills, contributing to the electronic knowledge base and commenting on peers' contributions both in-class and online. Specifically:

o In-class participation: Students must make significant contributions towards building a shared interpretation of the texts and theories being discussed. This includes participation in class discussion and in textual analysis of the readings. (10%)
o Weekly blogs: Students are expected to read the assigned books and papers and produce brief online notes throughout the semester (using a blog or wiki). These online notes will consist of brief analytic comments on the readings on a weekly basis. (10%)
o Knowledge base: Students must also make significant contributions to an online knowledge-building environment (e.g., a wiki) which will be used as a medium for supporting the evolution of text interpretations. (10%)
o Peer critique: Students must also reflect upon, annotate, and organize the analytic notes that others have entered. (10%)

(2) Analytical Research Paper (30%):

o Must be individually authored and should be 2,500-3,000 words (max.). The student should identify an important issue or controversy in the study of human cognition, critically examine and analyze the scientific literature pertinent to that issue, and argue for an appropriate conclusion to be drawn from the literature vis-à-vis the impact of this principle or concept on the design of technology enabled learning environments. Alternatively, the student can identify a technology or leaning medium, critically examine and analyze the learning and pedagogical affordances that this technology instantiates, and appropriately ground this analysis in the principles of cognition.

(3) Cognitive Analysis of a Technology Supported Learning Environment: (30%):

o In pairs or small teams, students will (a) select an existing (real world) technology supported learning environment developed by cognitive scientists across two or more of the learning sciences disciplines, (b) develop in-depth interdisciplinary cognitive criteria for analyzing the learning environment, (c) develop an analytical review of the learning environment using these criteria, and (d) provide substantiated recommendations for improving the design based on the cognitive analysis.

B. **Performance-based assessments**

The course includes 3 performance-based assessments (PBA) as described in the requirements section above. These include: (1) course participation through individualized and collaborative contributions both in-class and online; (2) an analytical research paper; and (3) a cognitive analysis of a technology supported learning environment. Each PBA will be evaluated through a rubric provided in the next section.

C. **Criteria for evaluation**

Participation rubric for both in-class and online participation and contributions (40%):

- *Outstanding contributor*: contributions reflect exceptional preparation. Ideas offered are always substantive, providing 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 reflect thorough preparation. Ideas offered are usually substantive, providing 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 reflect satisfactory preparation. Ideas offered are sometimes substantive, providing 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.

- *Unsatisfactory contributor*: Contributions reflect inadequate preparation and/or there is little contributions in class or online. Ideas offered are seldom substantive, providing few insights and no direction for the class. References to readings are rare or non-existent. If this person were not a member of the class, the quality of discussion and knowledge building would be unchanged.

- <u>*Note*</u>: Students who do not participate or contribute will receive zero points in the applicable area.

- Table 1 below provides the point assignment and distribution across the 4 categories of this rubric.

Table 1 – Point Assessment for Course Participation

	Category 1	**Category 2**	**Category 3**	**Category 4**
CRITERIA	**Unsatisfactory Contributor**	**Adequate Contributor**	**Good Contributor**	**Outstanding Contributor**
In-class participation	6	7	8	10
Weekly blogs	6	7	8	10
Knowledge base	6	7	8	10
Peer critique	6	7	8	10
Score	**24**	**28**	**32**	**40 possible**

Rubric for analytical research paper (30%):

	1	**2-3**	**3-4**	**4-5**
Criteria	**No Evidence**	**Beginning (Limited evidence)**	**Developing (Clear evidence)**	**Accomplished (Clear, convincing, substantial evidence)**
Topic addressed is important to the study of human cognition				
Literature examined is pertinent to topic and grounded in the research on cognition and technology				
Conclusions vis a vis the impact of the analysis on the design of technology enabled learning is cogent and cohesive				
Paper adheres to APA style				
Paper aligns with length requirement				
Bibliography is comprehensive				
SCORE				**30 possible**

Comments: (additional comments will also be provided by instructor)

Rubric for cognitive analysis of a technology supported learning environment (30%):

Comment: The selection of the technology supported learning environment should be approved by instructor. Alternatively, the instructor will provide a list to choose from.

Criteria	1-2 No Evidence	3-4 Beginning (Limited evidence)	4-5 Developing (Clear evidence)	5-6 Accomplished (Clear, convincing, substantial evidence)
Evaluation criteria are well developed, comprehensive, interdisciplinary, and grounded in cognitive science research				
Criteria are used to analyze the cognitive and design characteristics of the learning environment				
Results of the cognitive analysis used to provide recommendations for improving the design				
Evidence of team collaboration on every aspect of this project				
Bibliography is comprehensive and related to individual paper				
SCORE				**30 possible**

D. **Grading scale: A = 94-100; A - = 90-93; B+ = 86-89; B = 83-85; B- = 80-82; C = 70-79;   F = <70**

PROPOSED CLASS SCHEDULE

Date	Topic/Learning Experiences	Readings and Assignments
Week 1 Aug. 30 **F2F**	Intro to human learning and cognition	o Thagard, P. (1996). Mind: Introduction to cognitive science (Chapt. 1, pp.3-21). o Rumelhart, D.E. (1980). Schemata: The building blocks of cognition. o Executive Summary and Chapter 1 in How People Learn (Bransford, Brown, Cocking)
Week 2 Sept. 6 **Labor Day No Class**	Learners and Learning ***Setup individual blog on course knowledge base or wiki***	o Chapters 2-5 in How People Learn (Bransford, Brown, Cocking) o Glaser, R. and Chi, M.T.H. (1988). Overview. In M.T.H. Chi, R. Glaser and M.J. Farr (Eds.), *The nature of expertise*
Week 3 Sept. 13 **Online**	The Learning Sciences ***Blogging contribution due on weeks 1&2 readings due (Blogs should be analytic, find themes to frame your blogs)***	o Chapters 1, 2, & 7 in Sawyer o Laurillard, et al paper (2000).
Week 4 Sept. 20 **F2F**	Cognitive Learning Theories and Models ***Peer critique on blogs due*** ***Discuss Sawyer readings in class*** ***Contribute cognitive criteria to wiki***	o Greeno, J., Collins, A., Resnick, L. (1996). Cognition and Learning. o Kempton, W. (1987). Two theories of home heat control.
Week5 Sept. 27 **F2F**	Cognitive Learning Theories and Models ***Discuss Greeno et al. and Kempton readings in class*** ***Contribute cognitive criteria to wiki***	o Chapters 15, 16, 17, 18 in Sawyer
Week 6 Oct. 4 **F2F**	Technology, Design, and Cognition ***Student led presentation/discussion on chapters 15, 16, 17, & 18 (key points, prompting questions posted to wiki)***	o Chapter 5, 24, 25 in Sawyer o Chapter 6 in How People Learn
Week 7 Oct. 11 **Online**	Technology, Design, and Cognition ***Blogging contribution due on week 6 readings due (Blogs should be analytic, find themes to frame your blogs)***	o Chapters 19 & 20 in Sawyer o Chapter 7 in How People Learn
Week 8 Oct. 18 **Online**	Technology, Design, and Cognition ***Blogging contribution due on week 7 readings due*** ***Peer critique on blogs due*** ***Outline for research paper due***	o Chapters 1, 2, 3, 4, 5 in Kitsantas-Dabbagh
Week 9 Oct. 25 **F2F**	Technology, Design, and Cognition ***Discuss chaps 1-5 Kitsantas-Dabbagh*** ***Contribute cognitive criteria to wiki***	o Chapters 26 & 27 in Sawyer o Chapters 6, 7, 8 in Kitsantas-Dabbagh
Week10 Nov. 1 **Online**	Design Research as Methodology ***Blogging contributions on week 9 readings due*** ***Criteria for analysis project due***	o Chapters 8, 9, 10 in Sawyer o Chapters 11, 12, 13 in Sawyer

Week11 Nov. 8 F2F	Design Research as Methodology *Student led presentation/discussion on readings of week 10*	
Week12 Nov. 15 **Online**	Future Directions *Work on paper* *Work on analysis project*	o Chapter 10 in How People Learn o Chapters 33, 34 in Sawyer
Week13 Nov. 22 **Online**	Future Directions *Draft of research paper due*	o Chapters 9 & 10 in Kitsantas-Dabbagh
Week 14 Nov. 29 F2F	*Discuss readings of week 12 & 13 in class*	
Week15 Dec. 6 F2F	*Analysis of TSLE (Technology Supported Learning Environment) presentation*	
Week16 Dec. 13	*Research Paper due*	

COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT STATEMENT OF EXPECTATIONS:

All students must abide by the following:

Students are expected to exhibit professional behavior and dispositions. See http://gse.gmu.edu/facultystaffres/profdisp.htm for a listing of these dispositions.

Students must follow the guidelines of the University Honor Code. See http://www.gmu.edu/catalog/apolicies/#Anchor12 for the full honor code.

Students must agree to abide by the university policy for Responsible Use of Computing. See http://www.gmu.edu/facstaff/policy/newpolicy/1301gen.html. Click on responsible Use of Computing Policy at the bottom of the screen.

Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See http://www.gmu.edu/student/drc/ or call 703-993-2474 to access the DRC.