GEORGE MASON UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT
Instructional Technology Program
EDIT 802 (3 credits)
Cognition and Technology: A Multidisciplinary Approach
Fall 2011
Mondays 7:20-10:00 pm or alternative
Commerce II, Room 100

Professor: Dr. Nada Dabbagh
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PREREQUISITES: Completion of LTDR specialization area or equivalent

COURSE DESCRIPTION:

This course 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.

COURSE GOALS:

The course focuses on the multidisciplinary 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 different academic programs to investigate and discuss the multiple learning sciences disciplines that guide our understanding of human learning and cognition.

NATURE OF COURSE DELIVERY:

The class format is a mixture of short lectures, discussions, and group activities. Course delivery is both face-to-face and online (approximately 60-40%). Students will share multidisciplinary perspectives through in-class and online discussion/blogs of readings, conduct research on the affordances of technology supported learning environments, contribute to an online 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 or collective interests. An LMS and/or a wiki will be used to generate course content and document student learning 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 the design of learning technologies
- Examine the interactions between technology and cognition and the learning and cognitive affordances that this interaction enables
- Examine the cognitive, social, and technological aspects of learning
- Demonstrate thorough knowledge of the cognitive, socio-cognitive, and socio-cultural approaches to human learning and cognition and their impact on technology
- 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 technology supported 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.

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

Supplemental Texts:

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 (see course website for additional options to access this resource)

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

Norman, Donald. (2002). *The Design of Everyday Things*. Basic Books, Perseus Books Group.

Classic Articles (see course website for links):

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

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

Affordance-Based Design (see course website for links):

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.*

Hartson, H. (2003). Cognitive, physical, sensory, and functional affordances in interaction design. *Behaviour & Information Technology*, 22(5), 315-338.

Gaver, W.W. (1991). Technology Affordances. *CHI '91 Proceedings of the SIGCHI conference on Human factors in computing systems: Reaching through technology.* New Orleans, USA.

Additional articles are available on the course website. Students are required to contribute additional articles 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 and contributions (30% of grade); (2) revision and further development of the cognitive affordances of technologies scale (CATS) (30% of grade); and (3) cognitive affordances analysis review (40% of grade). These requirements/assignments align with performance-based assessments (PBA) and are described in detail below.

(1) **Class Participation and Contributions (30%):** 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 other students in the class. Effective class participation involves not only preparation and communication skills, but also listening skills, contributing to the online knowledge base and commenting on peers' contributions both in-class and online. Specifically, students must make significant contributions towards building a shared interpretation of the texts and theories being discussed individually and collaboratively. This includes participation in class discussion and in critical analysis of the readings. Students are also expected to contribute brief analytic comments on the readings throughout the semester using a blogging platform (e.g., WordPress) and reflect upon, annotate, and organize the analytic notes of other students as assigned.

(2) **Cognitive Affordances of Technologies Scale (CATS) (30%):** In small teams students will refine, revise, and further develop CATS (http://classweb.gmu.edu/ndabbagh/cats/), a tool developed in the first (fall 2010) offering of EDIT 802 to facilitate the affordance-based design and evaluation of technology supported learning environments (TSLEs). Revision of CATS should be grounded in the principles of cognition and affordance-based design gleaned from the course readings and the broader literature base. Teams are expected to prepare mini presentations and arguments that articulate and substantiate their revisions/edits of CATS. These presentations and substantiations will be considered contributions to the overall course knowledge base. Additionally, teams are required to develop a scale that can be used to apply CATS to the design and evaluation of TSLEs. The scale must be empirical in nature and accompanied by a method for establishing its reliability and validity in a variety of educational contexts.

(3) **Cognitive Affordances Analysis of a TSLE (40%):** Students will select an existing and functional TSLE developed by cognitive scientists across two or more of the learning sciences disciplines or a TSLE known to or experienced by the student and will use CATS to analyze the cognitive affordances of the TSLE resulting in a comprehensive analytical review of the TSLE and the provision of substantiated recommendations for improving the design of the TSLE based on the analysis. The analysis should include 7 sections: (1) brief introduction to analysis, (2) description of the TSLE, (3) description of the technology(s) used in the TSLE, (4) description of observation process and method, (5) results of applying CATS, (6) analysis of results, and (7) conclusions and recommendations.

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) revision and further refinement and development of CATS, and (3) a cognitive affordances analysis of a TSLE. Each PBA will be evaluated through a rubric provided in the next section.

C. Criteria for evaluation (includes rubrics and assessments):

Participation rubric for both in-class and online participation and contributions (30%):

- *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 and knowledge building 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.

Point assessment for class participation:

CRITERIA	Category 1 Unsatisfactory Contributor	Category 2 Adequate Contributor	Category 3 Good Contributor	Category 4 Outstanding Contributor
In-class participation	5-6	7	8	9-10
Weblogs	5-6	7	8	9-10
Peer critique	5-6	7	8	9-10
Score	**15-18**	**21**	**24**	**27-30**

Rubric for revision of CATS (30%):

- o *Excellent/Good revisions*: revision of CATS demonstrates exceptional and thorough insight and interpretation of the interdisciplinary literature of the learning sciences and the comprehensive and evidence-based examination of the categories and cognitive criteria of CATS and related empirical scale resulting in a significantly improved version.

- o *Adequate/Satisfactory revisions:* revision of CATS demonstrates satisfactory insight and interpretation of the interdisciplinary literature of the learning sciences and the evidence-based examination of the categories and cognitive criteria of CATS and related empirical scale resulting in an improved version.

- o *Inadequate/Unsatisfactory revisions*: revision of CATS reflects insufficient insight and interpretation of the interdisciplinary literature of the learning sciences and the revision is not comprehensive or evidence-based.

Point assessment for revision of CATS:

	Category 1 **Unsatisfactory Inadequate Revisions**	Category 2 **Adequate Satisfactory Revisions**	Category 3 **Excellent Good Revisions**
CRITERIA			
CATS categories	5-6	7-8	9-10
CATS criteria	5-6	7-8	9-10
CATS scale	5-6	7-8	9-10
Score	**15-18**	**21-24**	**27-30**

Rubric for cognitive affordances analysis of a TSLE (40%):

- o *Excellent analysis:* analysis of TSLE demonstrates a comprehensive and exceptionally thorough examination of its cognitive affordances as depicted by CATS. All engendered affordances of the TSLE are accounted for and the design features that enabled these affordances are explained with significant detail and visual representations. The empirical process of applying CATS to the TSLE is clearly articulated and grounded in research methods. Recommendations for improving the design of the TSLE are justified and substantiated with evidence and additional resources and literature reviews.

- o *Good analysis:* analysis of TSLE demonstrates a comprehensive and thorough examination of its cognitive affordances as depicted by CATS. All engendered affordances of the TSLE are accounted for and the design features that enabled these affordances are explained in detail. The empirical process of applying CATS to the TSLE is described and grounded in research methods. Recommendations for improving the design of the TSLE are justified and substantiated with evidence.

o *Unsatisfactory analysis:* analysis of TSLE lacks comprehensiveness or is not thorough. Not all engendered affordances are accounted for and the design features that enabled these affordances are not explained in sufficient detail. The empirical process of applying CATS to the TSLE is not clearly articulated or grounded in research methods. Recommendations for improving the design of the TSLE lack evidence.

Point assessment for cognitive affordances analysis of TSLE:

	Category 1 Unsatisfactory Analysis	Category 2 Good Analysis	Category 3 Excellent Analysis
CRITERIA			
Application of CATS	5-6	7-8	9-10
Research method	5-6	7-8	9-10
Clarity of Evidence	5-6	7-8	9-10
Recommendations	5-6	7-8	9-10
Score	**20-24**	**28-32**	**36-40**

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

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.