University of Waterloo
Department of Psychology
458
Honours Seminar in Cognition: Applied Cognitive Science
Fall 2015
1:00-2:20 MW, PAS4032

Instructor and T.A. Information

Instructor: Evan F. Risko
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Office Hours: Wednesday 11:00-1:00pm (or by appointment)
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Please contact the instructor using the email address provided above. If I need to contact you, then I will do so using your official uWaterloo address. Students are responsible for all e-mail that is sent to the official uWaterloo email address. Check e-mail regularly for important and time sensitive messages.

Course Description

Understanding how we think has the potential to vastly improve our quality of life. From designing user interfaces in order to reduce human error to teaching machines to do some of our thinking for us, research in applied cognitive science is fundamentally changing our day-to-day lives. The goal of this course is to provide a survey of research in the broad area of applied cognitive science. Readings will focus on important topics in applied cognitive science with an emphasis on the wide variety of applications available and their basis in basic research in cognition.

Course Goals and Learning Outcomes

Upon completion of this course, students should be able to:

A. Demonstrate knowledge of major concepts, areas of application, theories, and empirical findings in applied cognitive science
B. Demonstrate the ability to comprehend primary source articles in applied cognitive science. This will involve the ability to understand research methods, interpret basic statistics, understand experimental logic, and be able to understand the applied implications of the research
C. Demonstrate the ability to understand the relation between basic and applied research in cognitive science
D. Demonstrate the ability to think critically and communicate effectively about applied cognitive science

Required Text

Norman, D. A. (2013). The design of everyday things: Revised and expanded edition. Basic books.

Readings Available on LEARN

Many of the readings for the course will consist of primary source material (i.e., journal articles, chapters). While the number of pages of text required each week may not be high, reading primary source material is typically much more challenging than textbooks so you should be prepared to read papers more than once. All readings are available on LEARN.

Course Requirements and Assessment

Assessment	Weighting
Quizzes	50%
Oral Presentation	15%
Creative Project (Product Design)	20%
Participation	15%
Total	100%

Quizzes (50%)

There will be 10 quizzes in the course. These quizzes will correspond to the topics for the previous 2 weeks (accept Quiz 1 which will be based on only the first week). This includes readings and material presented in student presentations. Each quiz is worth an equal portion of your grade. Your worst quiz will not contribute to your grade. Quizzes will be multiple-choice and short answer. The quizzes are timed, with only 15 minutes available for each. The quizzes will be taken in class and tentative quiz dates are listed below. When completing multiple-choice questions you must choose the best answer for each question, even though the other answers may have some qualities of a correct answer. The quiz dates are tentative:

Quiz 1: September 21st
Quiz 2: September 28th
Quiz 3: October 5th
Quiz 4: October 14th
Quiz 5: October 19th
Quiz 6: October 26th
Quiz 7: November 2nd
Quiz 8: November 9th
Quiz 9: November 16th
Quiz 10: November 23rd

Oral Presentation (15%)

Each week will consist of student presentations of weekly topics. Thus, it is critical that you prepare your presentation with great care. The oral presentation component of the course will consist of an approximately 30 minute PowerPoint presentation of an assigned topic in class. There is at least one article/chapter associated with each topic. Your presentation must include discussion of this article/chapter but should NOT be limited to that article/chapter. Your goal is to introduce students to your topic not the article/chapter. To this end, you will be expected to discuss at least one additional

article relevant to the topic of your choosing. The student presenter will be considered the "expert" on the topic and as such should be able to answer questions from other students and the instructor during their presentation. If you are unclear on any aspect of the topic you have been assigned, then you need to discuss it with the instructor BEFORE class. Your presentation slides are due 1 week before your presentation for review by the instructor (with to be negotiated exceptions for presentations scheduled during weeks 1-3). A copy of your slides will be provided to other students.

Using the assigned article/chapter and the article/chapter you decide to present your presentation should (minimally):
(1) provide a basic introduction to your topic
(2) provide a clear explanation of why the topic is important
(3) provide some indication about how basic research has informed work on your topic
(4) provide cogent descriptions of the assigned article/chapter and the work you decided to review
(5) integrate examples that help illustrate 1-4

Creative Project (20%)

Understanding basic principles of human cognition allows us to better design products that individuals use. Through our examination of Norman's "Design of Everyday Things" you will have the opportunity to learn about many of these principles and how they might be put to use in design. Your creative project will consist of the development of a new product (or an approved variant thereof) that integrates some of these ideas. This project should take a human-centered (or user-centered) approach to design (as described in Norman's "Design of Everyday Things" particularly Chapter 6). As such, you should conduct some form of informal observation prior to developing ideas for your specific product and you should produce some form of prototype. You will describe your product in a 5 page written document and a 5-minute presentation to the class. The written document will describe your product, the prototype (please also hand in the prototype), and the observations that shaped it. Lastly, the written document should describe in detail how your design was shaped by basic principles of human cognition either learned in the course or elsewhere with a minimum of two references to primary source material (e.g., research articles).

Technical Requirements
The paper must be at least 5 pages and no longer than 6 pages
You must use 12 point Times New Roman font, double spaced, 2.5 cm margins. Use APA.
Please submit to the electronic drop box on LEARN on or before midnight December 2nd 2015.
You are responsible for keeping a copy of the final version of your paper.

Participation (15%)

An important part of this class is based on an open exchange of ideas, opinions, questions. It is absolutely essential that you come prepared to discuss the readings. Your participation mark will be determined by the quantity and quality of your contributions to the class. This will include, but is not limited to, asking questions, answering questions, participating in class activities, and paying attention to your classmate's presentations.

Course Outline

Week - Date	Topic(s)	Required Readings
Week 1 - 14-Sept	Organizational Meeting	None
Week 1 - 16-Sept	(1) The Psychopathology of Everyday Things (2) Mental Models Class activity: Norman Doors	(1) Chapter 1 DOET (2) Norman, D. A. (1983). Some observations on mental models. Mental models, 7(112), 7-14.
Week 2 - 21-Sept	(3) Psychology of Everyday Actions	(3) Chapter 2 DOET
Week 2 - 23-Sept	(4) Dual Systems and Medical Reasoning (5) Nudging Class activity: Stovetops	(4) Croskerry, P. (2009). A universl model for diagnostic reasoning. Academic Reasoning, 84, 1022-1028. (5) Thaler, R. H. & Sunstein, C. R. (2008). Nudge. Penguin Books: New York, NY. [Introduction, Chapter 11] (5) Sunstein, C. R. (2014). Nudging: a very short guide. Journal of Consumer Policy, 37(4), 583-588.
Week 3 - 28-Sept	(6) Knowledge in the Head and in the World	(6) Chapter 3 DOET
Week 3 - 30-Sept	(7) Mappings (or why I can't work my stovetop) (8) Forgetting to Do Stuff Class activity: Classroom lights	(7) Ray, R. D. & Ray, W. D. (1979). An analysis of domestic cooker control design. Ergonomics, 22, 1243-1248. (8) Dismukes, R. K. (2012). Prospective memory in workplace and everyday situations. Current Directions in Psychological Science, 21(4), 215-220.
Week 4 - 5-Oct	(9) Knowing what to do: Constraints, Discoverability and Feedback	(9) Chapter 4 DOET

Week - Date	Topic(s)	Required Readings
Week 4 - 7-Oct	(10) Warning Signals	(10) Perry, N. C., Stevens, C. J., Wiggins, M. W., & Howell, C. E. (2007). Cough once for danger: Icons versus abstract warnings as informative alerts in civil aviation. Human Factors: The Journal of the Human Factors and Ergonomics Society, 49(6), 1061-1071.
	(11) Multi-sensory Cues & Product Design	(11) Spence, C. (2010). Sound design: How understanding the brain of the consumer can enhance auditory and multisensory product/brand development. In Audio branding congress proceedings (pp. 35-49).
Week 5 - 12-Oct	No Class	
Week 5 - 14-Oct	(12) Human Error? No Bad Design	(12) Chapter 5 DOET
Week 6 - 19-Oct	(13) Perils of Automation	(13) Parasuraman, R., Molloy, R., & Singh, I. L. (1993). Performance consequences of automation-induced 'complacency'. The International Journal of Aviation Psychology, 3(1), 1-23.
	(14) Situation Awareness in Flight	(14) Endsley, M. R. (1999). Situation awareness in aviation systems. In Garland, D. J., Wise, J. A., & Hopkin, V. D. (Eds.) Handbook of Aviation Human Factors. Mahwah, NJ: Lawrence Erlbaum Associates.
Week 6 - 21-Oct	(15) Design Thinking	(15) Chapter 6 DOET
Week 7 - 26-Oct	(16) Articifial Intelligence – Early (MYCIN)	(16) Yu, V. L., Fagan, L. M., Wraith, S. M., Clancey, W. J., Scott, A. C., Hannigan, J., ... & Cohen, S. N. (1979). Antimicrobial selection by a computer. A blinded evaluation by infectious diseases experts. Jama, 242(12), 1279-1282.

(16) Crevier, D. (1993). AI: The tumultuous history of the search for artificial intelligence. Basic Books: New York, NY. [Chapter 6] |

Week - Date	Topic(s)	Required Readings
Week 7 - 28-Oct	(17) Articifial Intelligence – Recent (Watson)	(17) Ferrucci, D. A., Levas, A., Bagchi, S., Gondek, D., & Mueller, E. T. (2013). Watson: beyond jeopardy!. Artificial. Intelligence, 199, 93-105.
	(18) Intelligent Tutoring	(18) Graesser, A. C., Lu, S., Jackson, G. T., Mitchell, H. H., Ventura, M., Olney, A., & Louwerse, M. M. (2004). AutoTutor: A tutor with dialogue in natural language.Behavior Research Methods, Instruments, & Computers, 36(2), 180-192.
Week 8 – 02-Nov	(19) Affective Computing	(19) D'Mello, S., Lehman, B. & Graesser, A. C., (2011). A Motivationally Supportive Affect-Sensitive AutoTutor. In R. Calvo and S. D'Mello (Eds.). New Perspectives on Affect and Learning Technologies (pp. 113-126). New York: Springer.
Week 8 - 04-Nov	(20) Brain Training - Pro	(20) Jaeggi, S. M., Buschkuehl, M., Jonides, J., & Perrig, W. J. (2008). Improving fluid intelligence with training on working memory. Proceedings of the National Academy of Sciences, 105(19), 6829-6833.
	(21) Brain Training - Con	(21) Owen, A. M., Hampshire, A., Grahn, J. A., Stenton, R., Dajani, S., Burns, A. S., ... & Ballard, C. G. (2010). Putting brain training to the test. Nature, 465(7299), 775-778.
Week 9 - 09-Nov	(22) Noninvasive Brain Stimulation	(22) Parasuraman, R., & McKinley, R. A. (2014). Using noninvasive brain stimulation to accelerate learning and enhance human performance. Human Factors: The Journal of the Human Factors and Ergonomics Society, 0018720814538815.
Week 9 - 11-Nov	(23) Eyewitness Testimony	(23) Wells, G. L., Steblay, N. K., & Dysart, J. E. (2015). Double-blind photo lineups using actual eyewitnesses: An experimental test of a sequential versus simultaneous lineup procedure. Law and human behavior, 39(1), 1.
	(24) Instructional Design	(24) Mayer, R. E. (2003). The promise of multimedia learning: using the same instructional design methods across different media. Learning and instruction, 13(2), 125-139.

Week - Date	Topic(s)	Required Readings
Week 10- 16-Nov	(25) Human-Robot Interaction	(25) Brezeal, C. (2003). Social interactions in HRI: The robot view. IEEE Transactions in Systems, Man, and Cybernetics, Part C, 34, 181-186.
Week 10 - 18-Nov	Computer Lab	Card, S. K., Newell, A., & Moran, T. P. (1983). The psychology of human-computer interaction. [Chapter 2 p. 23-65] Kieras, D. (2001). Using the keystroke-level model to estimate execution times.University of Michigan, 555.
Week 10 – 21 - Nov	Computer Lab	No Reading
Week 11 - 23-Nov	Computer Lab	No Reading
Week 11 - 25-Nov	Computer Lab	No Reading
Week 12 - 30-Nov	Product Presentations	No Reading
Week 12 - 02-Dec	Product Presentations	No Reading

Electronic Device Policy
Please limit the use of electronic devices in class to course related activities (e.g., taking notes).

Attendance Policy
You are expected to attend all classes. Your attendance will contribute to your participation grade.

Academic Integrity
Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility.

Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline.

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70 - Student Petitions and Grievances](), Section 4.

Appeals: A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read [Policy 72 - Student Appeals]().

Other sources of information for students:
[Academic Integrity website (Arts)]()
[Academic Integrity Office (UWaterloo)]()

Accommodation for Students with Disabilities

Note for students with disabilities: The [AccessAbility Services]() office, located on the first floor of the Needles Hall extension, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.

Concerns About the Course or Instructor (Informal Stage)

We in the Psychology Department take great pride in the high quality of our program and our instructors. Though infrequent, we know that students occasionally find themselves in situations of conflict with their instructors over course policies or grade assessments. If such a conflict arises, the Associate Chair for Undergraduate Studies (Richard Eibach from July 1, 2015 through June 30, 2016) is available for consultation and to mediate a resolution between the student and instructor. Contact information is as follows:
Richard Eibach Email: [reibach@uwaterloo.ca](); Ph 519-888-4567 ext 38790

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. See Policy 70 and 71 above for further details.

Students requesting accommodation for course requirements (assignments, midterm tests, final exams, etc.) due to illness should do the following:

- seek medical treatment as soon as possible and obtain a completed uWaterloo Verification of Illness Form: [https://uwaterloo.ca/health-services/student-medical-clinic/services/verification-illness]()
- submit that form to the instructor within 48 hours.
- (preferably) inform the instructor by the due date for the course requirement that you will be unable to meet the deadline and that documentation will be forthcoming.

In the case of a missed final exam, the instructor and student will negotiate an extension for the final exam which will typically be written as soon as possible, but no later than the next offering of the course.

In the case of a missed assignment deadline or midterm test, the instructor will either:

1. waive the course component and re-weight remaining term work as he/she deems fit according to circumstances and the goals of the course, or
2. provide an extension.

In the case of bereavement, the instructor will provide similar accommodations to those for illness. Appropriate documentation to support the request will be required.

Students who are experiencing extenuating circumstances should also inform their academic advisors regarding their personal difficulties.

Official version of the course outline

If there is a discrepancy between the hard copy outline (i.e., if students were provided with a hard copy at the first class) and the outline posted on LEARN, the outline on LEARN will be deemed the official version. Outlines on LEARN may change as instructors develop a course, but they become final as of the first class meeting for the term.