

PSYCHOLOGY 370: THINKING AND REASONING

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Email policy: Please send email to **both** email addresses. Please keep all email to no more than five sentences. If a longer email is needed then we should meet during office hours instead. I will respond within 48 hours to email, but 72 hours during peek periods, e.g., one week before assignment due dates. I will **not** read email on Saturday or Sundays and these days do not count towards the 48 or 72 hour return time. Please put your course code into the subject line. I will **not** respond to email that does not have a course code in the subject line.

Office hours TBA

INTRODUCTION

Welcome to PSY 370: Thinking and reasoning. This is a course that will investigate that nature of thinking, understood as our capacity for intelligent problem solving, and reasoning, understood as our ability to change belief through inference. We will see that at the core of problem solving is good problem formulation, and that a central phenomenon in which we can empirically study problem formulation is the experience of insight within problem solving. Fortunately, there is a lot of theoretical debate and experimental competition about insight so that we may investigate it in depth. We will also explore related phenomena such as mindfulness and creativity. We will then investigate reasoning and see one of its most important features is that it is dominated by what are called “content effects.” Formal reasoning works in terms of the **form** of an argument regardless of its content, and this is known as validity. However, human beings regularly are influenced by the content of the argument and reason in an invalid and fallacious manner. This course will examine proposals as to what these content effects are, and why people make use of them.

LEARNING OBJECTIVES

In this course you will learn about the experimental and theoretical methods of Cognitive Psychology. You will learn central concepts and constructs used in the study of the nature and function of the thinking and reasoning that are drawn from both the philosophical heritage and current psychological theorizing and experimentation. You will learn to think critically about experiments, theoretical explanations, and the important relationship between theory and data. You will come to a better understanding of the phenomenon of thinking and reasoning through a critical examination of the explanations of those phenomena offered by Cognitive Psychology and related disciplines such as Cognitive Science and Neuroscience.

LECTURE AND READING SCHEDULE

**Readings will be from the reference list below the schedule.
Please note that the first two lectures will be online and the links will be announced for the recorded lectures.**

PART 1: SEARCH

1st Week (Sept. 9) Course Introduction. The two central metaphors of thinking and reasoning. The search inference framework and the Gestalt heritage (start).

2nd Week (Sept 16) The Gestalt heritage (finish) The response of the search inference framework to the Gestalt heritage and the ensuing debate. Read Weisberg and Alba

3rd Week (Sept 23) Insight: Theories and debates about its existence and nature. Read Metcalfe and Wiebe; Schooler. Ohlsson and Brooks; Kaplan and Simon.

4th Week (Sept 30) Insight and incubation. Read Dodds et al 2002 and Segal.

5th Week (Oct 7) Insight and transfer. Read Lockhart, Lamon, and Gick: Read Adams et al 1988; read Needham and Begg; Read Thomas and Lleras; Slepian et al 2010.

Topic proposal due OCT 7. Three paragraphs. First paragraph explains what your topic is. The second paragraph explains how and why your topic is relevant to the course. The third paragraph gives an overview of how you will pursue your topic in 3000 words. Your topic proposal will also contain a preliminary bibliography of 5 sources indicating how there is relevant material for your topic. Please upload your proposal onto Quercus in PDF format by **5 pm eastern time on October 7.**

6th Week (Oct 14th) Insight research and neuroscience Read Bowden and Jung-Beeman 2003; Read Bowden et al 2005; DeYoung et al 2008; Gihooly and Murphy 2005; Forster and Liberman 2004; Kershaw and Ohlson 2004; Knoblich and Ohlsson et al 1999; Hunt and Carroll 2008

(Oct 21st). **In class test:** The test will consist of two parts. The first part is a short answer section in which you will be given 10 terms or phrases of which you must answer 4. For each answer you will need to provide an explanation of the concept, explain to which theories or debates it is relevant, explain how and why it is relevant, and bring up any relevant criticisms or connections to other course material. Since you may refer to

your short essay answers in your long essay answers it is a good idea to answer these questions strategically. Each answer will be worth 5 marks.

The rubric for the short answers will be as follows:

- a) Definition/explanation of the concept: 1 mark.
- b) Explanation of to which theories and/or debates it is relevant: 1 mark.
- c) Explanation of how and why it is relevant: 2 marks.
- d) Relevant criticisms and/or connections: 1 mark.

The second part is a long essay answer. Here you will be given 4 questions and you must answer 1 of these questions. It is important to you state, develop, and defend a particular thesis for you answer. You are making an argument based on lecture material, and the reading as to what the best answer to the essay question is. You may refer to your short answers from section 1 in order to avoid re-explaining a topic. **This is the only internal reference allowed. You may not refer to your long answer in your short answers or to one short answer within another.** It is important when defending your thesis that you consider possible objections to it and respond them. The answer will be out of 30.. The rubric for this answer will be as follows:

- a) 5 marks for clearly stating a clear and challenging thesis.
- b) 10 marks for an argument developing and defending your thesis.
- c) 10 marks for making use of the relevant course material from the lectures and reading.
- d) 5 marks for overall style and clarity of exposition.

7th Week (October 28) Recent theories of insight. Read Vandervert et al 2007; DeBartolo et al 2009; Schilling 2005; Stephan and Dixon 2009: Read Topolinski & Reber 2010; McCaffrey 2012.

8th (Nov 4). Insight and relevance realization. Read Vervaeke et. al 2012 and Vervaeke & Ferraro 2013.

9th Week. Week (Nov 18th) Mindfulness, intuition, creativity and flow. Read Langer et al. 2000; Csikzentmihalyi et al 1989; Apter 1984. Forster and Dannenberg 2010, and Vervaeke et. al. 2018.

PART 2 INFERENCE

10th Week (Nov 25th) Conditional reasoning and content effects. Read Giggs and Cox 1982; Cheng and Holyoak 1985; Gigerenzer and Hug 1992; Liberman and Klar 1996. **Essay due Nov 25th. 3000** argumentative research essay. Using the themes of the course, and drawing upon the critical review and integration of the arguments and evidence of

other researchers, create an argument that establishes a clear and challenging thesis **derived from your topic proposal**. You must develop and defend your thesis. APA format is mandatory, but no running head is needed. Abstract of 100-200 words is mandatory (this does **not** count towards the word count). Proper citation and bibliography also mandatory. **Lateness penalty for this assignment is 5% per day up to a maximum of 50%**. Here is the rubric that will be used for the essay:

- 1) 10 marks for choosing and framing a topic.
- 2) 10 marks for coming up with a clear and challenging thesis.
- 3) 20 marks for critically reviewing relevant empirical research
- 4) 20 marks for critically reviewing relevant theoretical debate
- 5) 20 marks for an integrative argument for your thesis.
- 6) 10 marks for the incorporation of class material and themes.
- 7) 10 marks for proper APA format, abstract and overall style.

You must upload your essay by 5 pm eastern time to Quercus in PDF format.

11th Week (Dec 2nd) More on Conditional Reasoning and Content effects

Final assignment: During final assignment period, and it will be exactly the same format, standard of evaluation, and delivery instructions as first test, i.e. in person, but the content will be cumulative from the whole term.

COURSE REQUIREMENTS

Topic Proposal Oct 7th worth 5%

Test, Oct. 21st worth 20%

Essay Nov. 25 worth 50%.

Final assignment worth 25%.

All students must have the stated UofT St. George Campus prerequisites or their UTM/UTSC equivalents. Visiting students from other universities should have the equivalent prerequisites from their home institutions. Waivers will NOT be considered at any time and students will be removed from the course if proof of possessing the prerequisites is not presented

READING LIST

- Adams, L. T., Kasserman, J. E., Yearwood, A. A., Perfetto, G. A., Bransford, J. D., & Franks, J. J. (1988). Memory access: The effects of fact-oriented versus problem-oriented acquisition. *Memory & Cognition*, *16*, 167-175. doi:10.3758/BF03213486
- Apter, M. (1984). Reversal theory and personality: A review. *Journal of Research in Personality*, *18*(3), 265-288. doi:10.1016/0092-6566(84)90013-8
- Bowden, E. M., & Jung-Beeman, M. (2003). Aha! Insight experience correlates with solution activation in the right hemisphere. *Psychonomic Bulletin & Review*, *10*, 730-737. doi:10.3758/BF03196539
- Bowden, E. M., Jung-Beeman, M., Fleck, J., & Kounios, J. (2005). New approaches to demystifying insight. *Trends in Cognitive Sciences*, *9*(7), 322-328. doi:10.1016/j.tics.2005.05.012
- Cheng, P. W., & Holyoak, K. J. (1985). Pragmatic reasoning schemas. *Cognitive Psychology*, *17*(4), 391-416. doi:10.1016/0010-0285(85)90014-3
- Csikszentmihalyi, M., & LeFevre, J. (1989). Optimal experience in work and leisure. *Journal of Personality and Social Psychology*, *56*(5), 815-822. doi:10.1037/0022-3514.56.5.815
- De Bartolo, P., Mandolesi, L., Federico, F., Foti, F., Cutuli, D., Gelfo, F., & Petrosini, L. (2009). Cerebellar involvement in cognitive flexibility. *Neurobiology of Learning and Memory*, *92*(3), 310-317. doi:10.1016/j.nlm.2009.03.008
- DeYoung, C. G., Flanders, J. L., & Peterson, J. B. (2008). Cognitive Abilities Involved in Insight Problem Solving: An Individual Differences Model. *Creativity Research Journal*, *20*, 278-290.
- Dodds, R., Smith, S., & Ward, T. (2002). The Use of Environmental Clues During Incubation. *Creativity Research Journal*, *14*, 287-304. doi:10.1207/S15326934CRJ1434_1

- Forster, J. & Dannenberg L (2010): GLOMO: A Systems Account of Global Versus Local Processing. *Psychological Inquiry* 12:3, 175-197.
- Förster, J., Friedman, R. S., & Liberman, N. (2004). Temporal Construal Effects on Abstract and Concrete Thinking: Consequences for Insight and Creative Cognition. *Journal of Personality and Social Psychology*, 87(2), 177-189. doi:10.1037/0022-3514.87.2.177
- Gigerenzer, G., & Hug, K. (1992). Domain-specific reasoning: Social contracts, cheating, and perspective change. *Cognition*, 43(2), 127-171. doi:10.1016/0010-0277(92)90060-U
- Gilhooly, K., & Murphy, P. (2005). Differentiating insight from non-insight problems. *Thinking & Reasoning*, 11, 279-302. doi:10.1080/13546780442000187
- Griggs, R. A., & Cox, J. R. (1982). The elusive thematic-materials effect in Wason's selection task. *British Journal of Psychology*, 73(3), 407-420. doi:10.1111/j.2044-8295.1982.tb01823.x
- Hunt, C., & Carroll, M. (2008). Verbal overshadowing effect: how temporal perspective may exacerbate or alleviate the processing shift. *Applied Cognitive Psychology*, 22(1), 85-93. doi:10.1002/acp.1352
- Kaplan, C. A., & Simon, H. A. (1990). In search of insight. *Cognitive Psychology*, 22(3), 374-419. doi:10.1016/0010-0285(90)90008-R
- Kershaw, T. C., & Ohlsson, S. (2004). Multiple Causes of Difficulty in Insight: The Case of the Nine-Dot Problem. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 30(1), 3-13.
- Knoblich, G., Ohlsson, S., Haider, H., & Rhenius, D. (1999). Constraint Relaxation and Chunk Decomposition in Insight Problem Solving. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 25(6), 1534-1555.

- Kounios, J., & Beeman, M. (2009). The Aha! Moment: The Cognitive Neuroscience of Insight. *Current Directions in Psychological Science*, 18.4, 210-216
- Langer, E. J., & Moldoveanu, M. (2000). The Construct of Mindfulness. *Journal of Social Issues*, 56(1), 1-9. doi:10.1111/0022-4537.00148
- Lieberman, N., & Klar, Y. (1996). Hypothesis testing in Wason's selection task: social exchange cheating detection or task understanding. *Cognition*, 58(1), 127-156. doi:10.1016/0010-0277(95)00677-X
- Lockhart, R. S., Lamon, M., & Gick, M. L. (1988). Conceptual transfer in simple insight problems. *Memory & Cognition*, 16, 36-44. doi:10.3758/BF03197743
- McCaffrey, T. (2012). Innovation Relies on the Obscure: A Key to Overcoming the Classic Problem of Functional Fixedness. *Psychological Science* 23(3) 215-218 DOI: 10.1177/0956797611429580
- Metcalf, J., & Wiebe, D. (1987). Intuition in insight and noninsight problem solving. *Memory & Cognition*, 15, 238-246. doi:10.3758/BF03197722
- Needham, D. R., & Begg, I. M. (1991). Problem-oriented training promotes spontaneous analogical transfer: Memory-oriented training promotes memory for training. *Memory & Cognition*, 19, 543-557. doi:10.3758/BF03197150
- Schilling, M. A. (2005). A "Small-World" Network Model of Cognitive Insight. *Creativity Research Journal*, 17, 131-154. doi:10.1080/10400419.2005.9651475
- Schooler, J. W., Ohlsson, S., & Brooks, K. (1993). Thoughts beyond words: When language overshadows insight. *Journal of Experimental Psychology: General*, 122, 166-183. doi:10.1037/0096-3445.122.2.166

- Segal, E. (2004). Incubation in Insight Problem Solving. *Creativity Research Journal*, 16, 141-148. doi:10.1207/s15326934crj1601_13
- Slepian M. L., Weisbuch M., Rutchick, A. M., Newman, L. S. & Ambady, N. (2010). Shedding light on insight: Priming bright ideas. *Journal of Experimental Social Psychology*, 46, 696-700.
- Stephen, D., & Dixon, J. (2009). The Self-Organization of Insight: Entropy and Power Laws in Problem Solving. *The Journal of Problem Solving*, 2(1).
- Teresa M., A. (1993). Motivational synergy: Toward new conceptualizations of intrinsic and extrinsic motivation in the workplace. *Human Resource Management Review*, 3(3), 185-201. doi:10.1016/1053-4822(93)90012-S
- Thevenot, C., & Oakhill, J. (2008). A generalization of the representational change theory from insight to non-insight problems: The case of arithmetic word problems. *Acta Psychologica*, 129, 315-324.
- Thomas, L. E., & Lleras, A. (2009). Covert shifts of attention function as an implicit aid to insight. *Cognition*, 111, 168-174.
- Topolinski, S. & Reber, R. (2010) Gaining Insight Into the “Aha” Experience. *Current Directions in Psychological Science* 19:402 DOI : 10.1177/0963721410388803.
- Vandervert, L. R., Schimpf, P. H., & Liu, H. (2007). How Working Memory and the Cerebellum Collaborate to Produce Creativity and Innovation. *Creativity Research Journal*, 19, 1-18. doi:10.1080/10400410709336873
- Vervaeke, Lillcrap, & Richards (2012). Relevance realization and the emerging framework in Cognitive Science. *Journal of Logic and Computation*. doi:10.1093/logcom/exp067.

- Vervaeke, J., & Ferraro, L. (2013). Relevance realization and the neurodynamics and neuroconnectivity of general intelligence in *SmartData: Privacy Meets Evolutionary Robotics*. Springer: New York.
- Vervaeke, J., Ferraro, L., & Herrera-Bennett, A. (2018). Flow as spontaneous thought: Insight and Implicit Learning in *The Oxford Handbook of Spontaneous Thought*. Oxford University Press: New York.
- Weisberg, R. W., & Alba, J. W. (1981). An examination of the alleged role of “fixation” in the solution of several “insight” problems. *Journal of Experimental Psychology: General*, 110(2), 169-192. doi:10.1037/0096-3445.110.2.169

COURSE POLICIES

Academic Integrity

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring a degree from the University of Toronto is a strong signal of each student’s individual academic achievement. As a result, the University of Toronto treats cases of cheating and plagiarism very seriously. The University of Toronto’s Code of Behaviour on Academic Matters (www.governingcouncil.utoronto.ca/policies/behavaeac.html) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see www.utoronto.ca/academicintegrity/resourcesforstudents.html).

Missed Assignments:

You are expected to make every possible effort to complete the scheduled assignments and hand on time. **Failure to hand in a scheduled assignment may result in a zero.** Please contact me if you miss an assignment due to illness. If you have missed the assignment for a reason *other than illness*, an official email from your **College Registrar’s office or Accessibility Services** may also be considered acceptable documentation. If you miss the assignment for legitimate reasons and submit the required documentation, then you will be given an extension to complete the assignment without penalty.

LATENESS PENALTY: 5% per day up to a maximum of 50% off for the essay. If a test is missed for legitimate reasons then a following assignment will be reweighted to compensate.

Classroom Behaviour

Please be respectful of your fellow classmates while in the townhalls. Do not do anything that may disturb them such as carrying on a conversation, texting, playing games, checking social media, etc. Such behaviour is unacceptable. **Mute** your mike unless you wish to speak.

Lecture recordings and course materials

Lectures and course materials are the intellectual property of the instructor and should be respected as such. You are ***not*** allowed to put course materials into the public domain (you may send links to episodes of the video series), sell the materials, or give materials to a person or company that is using them to earn money. The University will support me in asserting and pursuing my rights, and my copyrights, in such matters.

Re-marking policy - timeline and protocol

If you would like to make a case for receiving a different mark on a graded assignment, please note that you have one week from the date an assignment is returned to you to submit the assignment for remarking. Absolutely no assignments will be re-graded beyond this time limit. Material submitted for remarking must be accompanied by a one-page written explanation emailed directly to me detailing your reasons for why you think you should receive a different grade. Be as specific as possible (e.g. correction of addition errors in calculating a grade, a specific point or step that the grader missed, etc.). Note that in agreeing to resubmit your work for remarking, you are agreeing to a re-evaluation of the entirety of your work; your grade may go up, go down or stay the same.

Accommodations:

Religious accommodation:

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of backgrounds, cultural traditions, and spiritual beliefs. For my part, I will make every reasonable effort to avoid scheduling essays, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity (like a test, or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

Learning Disability or Accommodation Requirement

Students with diverse learning styles and needs are welcome in this course. If you have

an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) (accessibility.utoronto.ca) at the beginning of the academic year. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your medical situation, develop an accommodation plan with you, and support you in requesting accommodation for your course-work. Remember that the process of accommodation is private: AS will not share details of your condition with any instructor, and your instructors will not reveal that you are registered with AS.

Accommodation for Personal Reasons

There may be times when you are unable to complete course work on time due to non-medical reasons. If you have concerns, speak to me. It is also a very good idea to speak with an advisor in your College Registrar's office; they can support you in requesting extensions or accommodations, and importantly, connect you with other resources on campus for help with your situation.

ACADEMIC RESOURCES

Accessibility Needs:

(See above, under Learning Disability or Accommodation Requirement)

English Language Learners (ELL) Program

<http://www.artsci.utoronto.ca/current/advising/ell>

ELL offers a range of programs/workshops/resources to assist all Arts & Science students who wish improve their English language skills (including reading, listening, speaking, and writing). Please see their website for more information about these resources.

Programs include:

- the Communication Cafe, which meets weekly at five different times and locations for the first seven weeks of each term for practice with oral skills like class discussion and presentations
- Reading eWriting, an online program that helps students engage course readings more effectively.

Writing Help

As a student here at the University of Toronto, you are expected to write well. The university provides its students with a number of resources to help them achieve this. For more information on campus writing centres and writing courses, please visit <http://www.writing.utoronto.ca/>.

- More than 60 Advice files on all aspects of academic writing are available at <http://advice.writing.utoronto.ca>
- There is also a series of workshops on different aspects of writing that may be especially helpful for your essays. Check out the dates at: <http://writing.utoronto.ca/writing-plus/>
- **NOTE: Writing Centres offer ONE-ON-ONE consultations – use the schedule at <http://www.writing.utoronto.ca/> to book your appointments for the semester now, as they get filled up quickly!**

Resources for Writing in APA Style

- Students are encouraged to acquire a copy of the Publication Manual of the American Psychological Association: 7th Edition.
- Free online resources from APA (e.g., FAQs, tutorials, etc.):
 - <http://www.apa.org/pubs/apastyle/>
 - <http://www.apastyle.org/learn/>
- Purdue Online Writing Lab (OWL) APA website:
 - <https://owl.english.purdue.edu/owl/resource/560/01/>

Additional Student Life Resources <http://www.studentlife.utoronto.ca/>

In addition to Accessibility Services, there are many other programs, services, and resources that are available to U of T students to help with every aspect of “Student Life” This includes family resources, academic support, extracurricular activities, and more. Resources of particular interest may include:

- Health & Wellness: <http://www.studentlife.utoronto.ca/hwc>
- Academic Success: <http://www.studentlife.utoronto.ca/asc>

