

Syllabus

Conceptually, one can distinguish (at least) three aspects of scientific reasoning: deciding whether one event causes another; deciding whether an explanation seems credible; and deciding whether, and if so how, an explanation should be refined or rejected.

The actual literature in scientific reasoning mirrors these distinctions, although with much less emphasis on explanation than is found in the scientific community.

Furthermore, each researcher typically decides operationally (at least tacitly) what counts as good or sound scientific reasoning. The answer depends on the model (often tacit, as well) that the researcher has of what actual scientific inquiry consists of.

In addition, that actual process of scientific reasoning does not exist in a vacuum; it depends on content, and content can be and is influenced by culture, gender, historical context, etc.

Finally, with regard to deciding whether an explanation should be refined or rejected, there is a large body of literature that argues that people are plagued by a confirmation bias, which suggests that rejecting an explanation will be very difficult for someone to do.

This course will discuss different views of scientific reasoning (the suppressed premise being that scientific reasoning is an instance of good reasoning in general) and will survey the literature that speaks to the three conceptual distinctions described above.

During the initial meetings of the course, we will lay the foundation for the subsequent discussions. Later in the course, students will be paired with one another to make presentations and facilitate discussion in class. Presentations will include mention of literature not covered in class. Before these presentations, student presenters will meet with me to discuss their presentations. For almost every class meeting, students will circulate thought/position papers to all of the members of the seminar by 5:00 pm on the day before the class meeting.

The final research paper, which will involve a literature survey, will consist of a research proposal. It is expected that the research proposal will give evidence of having mastered many of the concepts in the course. In addition, there will be several short quizzes, to make sure that students are grasping the material. Final grade will be based on the final paper, quizzes, presentations, and class discussion.

Please note: During parts of the course, we will be discussing ongoing controversies and how people evaluate and revise explanations for them. Controversies can provoke strong emotions, even though we will be discussing them, not as positions that should or should not be held, but rather as instances of the concepts discussed in the seminar. Emotional (or cognitive) intolerance will not be tolerated. Consider this when deciding whether to enroll.

HD 432 Scientific Reasoning
Prof. B. Koslowski
Fall, 2006

Reading List

I. Deciding whether one event causes another

A. classical approaches

Inhelder, Barbel and Piaget, Jean (1958). Chapter 7 The Growth of Logical Thinking From Childhood To Adolescence pp. 107-122.

Kuhn, D., Amsel, E., & O'Loughlin, M. (1988). Chapters 3 and 4 in The Development Of Scientific Thinking Skills. Orlando, FL: Academic Press.

Kuhn, D (1989) Children and adults as intuitive scientists. *Psychological Review*, 96, (674-689). (skim for overview)

Zimmerman, C. (This article will be emailed to students who want an overview.)

B. examples of real world scientific reasoning

Ancient Graves of Armed Women Hint at Amazons". The New York Times (Tuesday February 25, 1997).

A Reporter at Large "Cannibals of the Canyon". The New Yorker (November 30, 1998), pp. 76-89.

C. other considerations within a largely covariation framework

Masnack, A. M. & Klahr, D. (In press.) Error Matters: An initial exploration of elementary school children's understanding of experimental error.

Klahr, D., & Dunbar, K. (1998). Dual search space during scientific reasoning. Cognitive Science, 12, pp. 1-48.

Koehler, D. (1994). Hypothesis generation and confidence in judgment. Journal of Experimental Psychology: Learning, Memory & Cognition, 20, 461-469.

Koehler, D. (1991). Explanation, imagination, and confidence in judgment. Psychological Bulletin, 110, 499-519.

D. goals and other contextual influences

Tschirgi, J. E. (1980) Sensible reasoning: A hypothesis about hypotheses. Child Development, 51, pp. 1-10.

Wylie, A. (2001) Doing social science as a feminist: The engendering of archeology. In Creager, A. N. H., Lunbeck, E., and Schiebinger, L. (eds.) Feminism in twentieth-century science, technology, and medicine. Chicago: The University of Chicago Press.

Perkins, D. N., Farady, M., & Bushey, B (1991). Everyday reasoning and the roots of intelligence. In J. F. Voss, D. N. Perkins, & J. W. Segal (Eds.), *Informal reasoning and education* (pp. 83-106) Hillsdale, NJ: Erlbaum.

Lombroso, T. (this article will be emailed to students to skim)

II. Evaluating and deciding between explanations

Sodian, B., Zaitchick, D., & Carey, S. (1991). Young children's differentiation of hypothetical beliefs from evidence. Child Development, 62, pp. 753-766.

Murphy, G., and Medin, D. (1985). The role of theories in conceptual coherence. Psychological Review, 92, (3): pp. 289-316 (skim).

Schauble, L. (1996). The development of scientific reasoning in knowledge-rich contexts. Developmental Psychology, 32, pp. 102-119.

III. Deciding to revise or relinquish an explanation

A. three approaches in the cognitive literature to framing the question of what counts as revision/when it should happen using content-free tasks

Koslowski, B. (1996) Theory and Evidence: The Development of Scientific Reasoning. Cambridge, MA: MIT Press. Chapter 3 (skim for overview).

Kuhn, D., Amsel, E., & O'Loughlin, M. (1988). Chapter 10 The Development of Scientific Thinking Skills. Orlando, FL: Academic Press.

Mynatt, C. R., Doherty, M.E., & Tweeney, R.D., (1977). Confirmation bias in a simulated research environment: an experimental study of scientific inference. Quarterly of Experimental Psychology, 29, pp. 85-95.

Koslowski, B., & Maqueda, M. (1993). What is confirmation bias and when do people have it? Merrill-Palmer Quarterly, 39, (1): pp. 104-130.

Wetherick, N. E. (1962). Eliminative and enumerative behaviour in a conceptual task. *Quarterly Journal of Experimental Psychology*, 14, 246-249.

Klayman, J., & Ha, Y. (1987). Confirmation, disconfirmation, and information in hypothesis-testing. *Psychological Review*, 94, pp.211-228.

B. approaches in the cognitive literature to questions about belief revision using content-rich but largely cognitive tasks in which belief revision occurs, albeit not consistently

Koslowski, B. & Thompson, S.L. (2002) Theorizing is important, and collateral information constrains how well it is done. In Carruthers, P., Stich, S., and Siegal, M. *The Cognitive Basis of Science*. Cambridge: Cambridge University Press (skim for overview).

Chapman, L., & Chapman, J. (1967). Genesis of popular but erroneous diagnostic observations. *Journal of Abnormal Psychology*, 72, pp. 193-204.

Chapman, L., & Chapman, J. (1969). Illusory correlation as an obstacle to the use of valid psychodiagnostic *Journal of Abnormal Psychology* 74, pp. 271-280.

Abelson, R. P., (1959) Modes of resolution of belief dilemmas. *Conflict Resolution*, 3, pp. 343-352.

Masnick, Amy, "Reflection Alone Can Increase Inconsistency of Beliefs" Cornell University.

Swiderek, Melanie, "Disconfirming Evidence and Beliefs about Capital Punishment". Cornell University.

C. literature on confirmation bias, using content-rich tasks that involve emotion, and in which belief revision does not occur or occurs rarely

Lord, C.G., Ross, L. & Lepper, M.R. (1979) Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, 37, pp. 2098-2109.

Miller, A. G., McHoskey, J. W., Bane, C. M., & Dowd, T. G. (1993) The attitude polarization phenomenon: Role of response measure, attitude change, *Journal of Personality and Social Psychology*, 64, pp. 561-574.

Kuhn, Deanna, Weinstock, Michael, & Flaton, Robin, (1994). "How Well Do Jurors Reason?" Competence Dimensions of Individual Variation in a Juror Reasoning Task. *Psychological Science* Vol 5 No. 5 Sept. pp. 289-296.

Baron, J. (1995) Myside bias in thinking about abortion. *Thinking and Reasoning*, 7, 221-235.

Ross, L., Lepper, M. R., & Hubbard, M. (1975). Perseverance in self perception and social perception: Biased attributional processes in the debriefing paradigm. *Journal of Personality and Social Psychology*, 32, 880-892.

Pitz, G. F., Downing, L., & Reinhold, H. (1967). Sequential effects in the revision of subjective probabilities. *Canadian Journal of Psychology*, 21, 381-393. (1967)

Snyder, M. (1981). Seek and ye shall find: Testing hypotheses about other people. In E. T. Higgins, C. P. Heiman, & M. P. Zanna (Eds.), *Social cognition: The Ontario symposium on personality and social psychology* (pp. 277 – 303). Hillsdale, NJ: Erlbaum.

Snyder, M., & Swann, W. B. (1978). Behavioural confirmation in social interaction: From social perception to social reality. *Journal of Experimental Social Psychology*, 14, 148-162.