

Annotated bibliography of print resources on the scientific method

Koshland, D. E. Jr. “The Cha-Cha-Cha Theory of Scientific Discovery.” *Science*, (2007), 317, 761-762.

A short article discussing different ways scientific discoveries are made, i.e. charge, challenge, chance.

Niewoehner, Rob; Paul, Richard; Elder, Linda. *The Thinker’s Guide to Engineering Reasoning*, The Foundation for Critical Thinking, (2007), 57p.

Available through www.criticalthinking.org. Specifically a brief reading entitled “Intellectual Traits Essential to Engineering Reasoning”.

Overway, Ken. “Empirical Evidence or Intuition? An Activity Involving the Scientific Method.” *J. Chem. Educ.* (2007), 84, p.606.

Available with an institutional subscription at <http://jchemed.chem.wisc.edu/Journal/Issues/2007/Apr/abs606.html>, this “Let’s Make a Deal”-based activity involves students formulating and testing a hypothesis, with emphasis on the statistical nature of experimental results. The supplementary material includes sample game sheets and optional pre- and post-game questions

Paul, Richard; Elder, Linda. *A Miniature Guide for Students and Faculty to Scientific Thinking*, The Foundation for Critical Thinking, (2006), 49p.

Available through www.criticalthinking.org. Especially useful are the sections: “The Logic of an Experiment” and “Post Experiment Analysis”; both are fill-in-the-black checklists to help organize thinking about an experiment as a tool to help write it up.

Science for All Americans, American Association for the Advancement of Science, Project 2061, (1990), 183-187.

Chapter 12: Habits of Mind is a short reading on values, attitudes and skills associated with science education.



- Scientific Method Activity #1: Topics this activity incorporates include the scientific method, literature searches, reading a journal article, role of scientist/engineer in society. This is a more involved activity/project that would require significant out-of-class time from students and could be an ongoing project through the semester.

Choose a science question that has received some mainstream press and is perhaps subject to controversy. A lot of health questions fall under this category, (e.g. How does living near high voltage power lines affect people? Does smoking cause lung cancer? Will ingesting large amounts of vitamin C help to prevent a cold?)

Investigate this topic through a variety of methods, including web searches, online encyclopedias, and scientific journal searches. Can you find scientific journal articles that disagree with one another?

What types of evidence are available on this question? If scientific journal articles come to opposing conclusions, can you pick out flaws in the methods or conclusions of some of these articles? What is the role/responsibility of scientists and engineers to convey their findings to the public? What conclusion do you draw from your literature research, and why?

- Scientific Method Activity #2: This activity uses two pieces of literature/media. The first is from the popular Discovery Channel T.V. show, *MythBusters*. In Episode 57: Mentos and Soda (first aired August 9, 2006), the show investigates the cause of the explosive reaction between these two ingredients. The second piece is an article “Diet Coke and Mentos: What is really behind this physical reaction?” by Tonya Shea Coffey (*American Journal of Physics*, 76(6), (2008) p. 551-557, available in pdf format online). This article is an extension of the experiments performed on the *MythBusters* episode.

Have students watch the *MythBusters* episode and then discuss the approach taken in the video with respect to the scientific method. What aspects of the scientific method are incorporated into their experiments, and what aspects are lacking? Do students agree with the conclusions of the show? Do they have any more questions? Can further research be done?

Assign the Coffey paper for reading out of class, and have students compare and contrast the methods, experiments, and conclusions of this paper with the *MythBusters* study. Does one study or the other better reflect the scientific method? How does presentation style matter to the general public vs. the scientific community (would you choose to highlight one of these studies over the other when discussing the results with a friend or colleague)?

