

The Science of Everyday Life

What is Science? (Richard Feynman)

- Course overview: there are two elements of the course
 - Practical—the things that we see and are all around us
 - Pensive—Science as a way of thinking
- You may be most familiar with science in the form of distinct areas embodied by the courses we offer (e.g. biology, physics, chemistry), but we want to challenge you to think of science in a broader sense...

The Scientific Method is not only the paradigm of how science is done, but it is a manner of thinking. The basic steps of the scientific method include (source-http://teacher.pas.rochester.edu/phy_labs/AppendixE/AppendixE.html):

1. Observation and description of a phenomenon or group of phenomena.
2. Formulation of a hypothesis to explain the phenomena. In physics, the hypothesis often takes the form of a causal mechanism or a mathematical relation.
3. Use of the hypothesis to predict the existence of other phenomena, or to predict quantitatively the results of new observations.
4. Performance of experimental tests of the predictions by several independent experimenters and properly performed experiments.

If the experiments bear out the hypothesis it may come to be regarded as a theory or law of nature (more on the concepts of hypothesis, model, theory and law below). If the experiments do not bear out the hypothesis, it must be rejected or modified. What is key in the description of the scientific method just given is the predictive power (the ability to get more out of the theory than you put in; see Barrow, 1991) of the hypothesis or theory, as tested by experiment. It is often said in science that theories can never be proved, only disproved. There is always the possibility that a new observation or a new experiment will conflict with a long-standing theory.

- Critical thinking plays a crucial role in the scientific method Defining Critical Thinking (www.criticalthinking.org) (A statement by Michael Scriven & Richard Paul for the National Council for Excellence in Critical Thinking Instruction)

Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.

- Some examples of Critical Thinking include:
 - Budgeting money
 - Taking a vacation
 - Selecting a University

- Another example that is a heavy user of critical thinking and the scientific method is forensics or “crime scene science” (e.g. CSI) and the approach to arguing a case in a court of law (“beyond a reasonable doubt”)
- We will illustrate how the scientific method works in “the game of science” which we will play on Thursday. We will find that the “rules” of the game are analogous to the laws of Physics

Science and Society: How science has shaped the world we live in today

- Science has allowed us to “master nature” to a certain extent
- Science has evolved over time
- Our knowledge of the physical universe has greatly expanded over the millennia

Science and everyday activity: How science has permeated our daily world