

Nature of Science Learning Goals:

- Explain what it is to “do science” and how the idealized steps of the “scientific method” do not do an adequate job of explaining what it is to do science.
- Describe what a generalization is and what it takes to prove and to disprove a generalization or scientific theory.
- Describe the necessity for observations and characterization of patterns to understand the invisible.
- Describe effortful practice and its necessity in becoming an expert.
- Describe differences in the process of scientific discovery as described in Derry text
- Compare and contrast the five examples of scientific pathways presented by Derry: Serendipity and Methodical Work, Detailed Background and Dreamlike Vision, Idealized models and Mathematical Calculations, Exploration and Observation, the Hypothetico deductive method
- Describe the value of a model regardless of whether it models the phenomena exactly.
- Explain the value of comparing and contrasting phenomena to understand the science.
- Explain the value of categorization and its place in science.
- Describe different types of tools scientists might use and whether these limit the value of the scientist’s contribution
- Provide data to show that P-12 students are able to distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.
- Engage students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.

Real science	Psuedoscience
Ideas change over time and build on prior knowledge – old knowledge is not discarded	Static or randomly changing ideas
Goal is to achieve some coherent understanding of our observations.	Vague mechanisms to acquire understanding
Rigorous logic, a strict chain of deductive reasoning with no gaps or weak spots.	Loosely connected thoughts
A new idea is usually presumed wrong until sufficient evidence shows that it’s right.	Lack of organized skepticism. In fact, it’s forbidden.
Evidence virtually always builds on prior work.	Disregard of established results