

# The Myth of the Scientific Method

The National Science Standards key recommendation in 1996 is that children become engaged in active inquiries that include opportunities to reflect on their own investigations. The Standards suggested that classroom activities and investigations should be less like cookbook recipes and more like open ended investigations. The danger of teaching the “old school” list of steps for the scientific method without students actually internalizing how to study something scientifically is that students often come away with the misconception that one just goes through the steps, and the answers will appear at the end. They do not grasp the real nature of the work: reviewing previous work and input of colleagues, the false starts, dead ends, and trial and error, or the value of failure as a part of science. When they do an investigation with results different from their hypothesis (assuming they have one), they conclude, “It didn’t work!” and think they have failed.

Most scientific discoveries occurred without the use of the scientific method. On a Friday night in 1928, Alan Fleming was examining infectious bacteria. When he left the lab for the weekend he mistakenly left the lid open. Upon arriving in his lab Monday morning he discovered his error. Upon closer examination he saw something else was growing in the dish. Under the microscope he discovered a mold, commonly known today as penicillin. Following several years of production, the first antibiotic was produced from this discovery. Each one of us has been saved by an antibiotic of some kind. Imagine how many lives might have been saved in the Civil War! This life changing discovery that affected every human and many animals on this planet was not discovered by using the scientific method.

The popular show “Myth Busters” is inquiry and problem based science. Through trial and error, they test to determine if myths are confirmed, plausible, or busted. Often they come across with new ideas, new questions, new problems, and/or realize there were other variables that weren’t accounted for. Myth Busters is inquiry and problem solving science. Real science.

The word *experience* comes from the Latin *experientia*, meaning “to try”, whereas the word *aware* comes from the Greek *horan*, meaning “to see”. Experience implies participation in an event, whereas awareness implies observation in an event. The two words can be substituted in ordinary conversation without much damage, but they are differently inflected. One

gives the sense of being engaged whereas the other gives the sense of being cognizant of that engagement. We can be reading a book while thinking of something unrelated to the text. If a camera were to track our eye movements it will record that we did in fact read every word and therefore we did experience the reading but recall none of it. We may not recall reading but if we were aware or engaged in our reading our recall would be much better. The nature of science is when students use the tools, take the measurements, and organize and analyze their data, compare and collaborate with other students, critique their work and call attention to the process of the investigation. This metacognitive activity in awareness is instrumental in student's epistemological development.

- Scientific knowledge, though durable, has a tentative character.
  - Scientific knowledge relies heavily, but not entirely, on observation, experimental evidence, rational arguments, and skepticism.
  - There is no one way to do science (**therefore, there is no universal step by step scientific method**)
  - Science is an attempt to explain natural phenomena.
  - Laws and theories serve different roles in science; therefore, students should know that theories do not become laws even with additional evidence.
  - People from all cultures contribute to science.
  - New knowledge must be reported clearly and openly.
  - Scientists need accurate record keeping, peer review, and replicability.
  - Observations are theory laden.
  - Scientists are creative.
  - The history of science reveals both an evolutionary and a revolutionary character.
  - Science is part of social and cultural traditions.
  - Science and technology influence each other.
  - Scientific ideas are affected by their social and historical milieu.
- (McComas et. al., 1998, p.513)

**Sources:**

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