Methodology and their Dogmas

This is the third and last of a series of reflections on methodology through<br>biographies of key individuals and relations between organismal relationships and so on. It is clearly evident that students should only suggest that students think about ever-instructing teachers about

Rudolph Tanzi & Ann Parson

(2000, p. 2)
filters. There is no unique algorithm yielding absolute truth. We believe that students need to learn how science can be limited, how some evidence can be complex, and how some questions can be unresolved. That, in turn, helps them understand how (or when) we should trust scientific claims. Such judgment is especially important as more and more public decisions involve complex and/or ongoing science (Anand, 2002). Given that the conventional Scientific Method does not adequately describe the richness of science, we marvel at its hold on the school mindset. Why the entrenched dogma? At one level, the simplicity may be merely convenient. But the dogmas may be deeper. Those who actively defend the Scientific Method (recently in ABT: Lawson, September, 2000; McPherson, April, 2001) seem concerned with the privilege of science. For them, science is special. It is beyond the ordinary. It is exclusive. The Scientific Method demarcates Science with a capital ‘S’. Without discipline, it would seem, no claim is any better than any other. Order seems secured by rule-following and conformism. Portrayed in this way, of course, the promise of the Scientific Method seems grossly overstated. Yet we wonder how prevalent this perspective is.

We agree instead with Albert Einstein (even though he was not a biologist!): “The whole of science is nothing more than a refinement of everyday thinking” (Einstein, 1954, p. 283). Accordingly, a conception of scientific method should grow out of familiar experience. It should complement and extend ordinary discovery processes. And it should highlight how to establish reliable evidence—an aim shared, for example, by journalists and judges. A physician diagnosing an illness, a mechanic troubleshooting a car, a detective tracking a crime all use the same methods as scientists, although in different contexts. Lab work should make sense.

The reasoning shouldn’t seem foreign. Students should see that when we apply these same methods to understanding the natural world, we call it science.

We thus encourage our colleagues to teach the suite of skills in science. ABT is an excellent resource. In just the past two years, articles have featured such skills as:

- framing inquiry questions (Marbach-Ad & Clawesen, 63/6),
- building hypotheses (Hoese & Nowicki, 63/3),
- designing experiments (Deutch, 63/4; Temple, 64/1), and
- integrating and assessing data from multiple methods (Singer, Hagen & Sheehy, 63/7).

In addition, we advocate historical case studies, which allow students to see biology in action (e.g., Hagen, Allchin & Singer, 1996; reviewed in ABT, April, 1999).

If one must characterize method in science concisely, let it be something like this:

Scientists follow hunches, clues, and questions obtained from observations, earlier claims, reading, etc. They explore how to generate relevant information. They consider possible sources of error. They engage others in interpreting evidence. Results usually lead to more questions. Ideas are refined. Some change, some are abandoned.

Yes, teach how to pose hypotheses. Yes, teach controlled experiments. As tools. And don’t stop there. Viewing science as constrained by one privileged method is greatly impoverished. We do science in many ways. Let’s teach the Scientists’ Toolbox.

Dan Wivagg
Douglas Allchin
allchin@pclink.com

References


