Derek Hodson: *Teaching and Learning About Science: Language, Theories, Methods, History, Traditions and Value*


John Settlage

My relationship to “nature of science” (aka NOS) is comparable to a compassionate atheist’s regard for religious beliefs. It is tempting to dismiss it all as fantasy except for the many admirable and respected individuals who are drawn to these ways of thinking. In other words, I have been quiet (intermittently) about my skepticism about NOS, but have been polite about it (at least by my standards) because many friends and colleagues view it as legitimate. Having read Hodson’s latest book, while I may not be a convert, I now appreciate the appeal of Nature of Science as a curricular goal. I remain unsure that all who dabble in NOS view it as deeply as Hodson does. As suggested by the complete title, he covers a great deal of territory but does so in an accessible and insightful fashion. I find it remarkable how adeptly he accomplishes this. The result is a fascinating text that would be the perfect catalyst to spark discussion among science educators.

Hodson’s advocacy about the role of science within the human experience is among the most compelling I have encountered. He accomplishes this by drawing upon an amazing breadth of sources, unifying this wealth of information in convincing fashion. For example, in citing Southerland ([2000](#)) and her concerns about blurring the borders of science, Hodson fearlessly weighs in on this contentious debate:

> By redefining science to include all forms of knowledge about the natural world, we set no limits on the extent and authority of science and we reinforce the scientistic position…. An approach that includes all forms of knowledge about the natural world under the banner of science is not so much about crossing borders as about pretending that the boundaries and barriers in access do not exist. (p. 119)

Here is but one instance where Hodson draws upon wisdom and insight to clarify a muddled situation. I am unaware of NOS discussions that express a strong regard for making science more accessible to populations underrepresented in science courses and careers. In contrast, some advocates attempt to legitimize indigenous ways of knowledge by claiming their cultures include science. This then identifies two factions: one only faintly concerned about equity and the other who equates access with throwing open all the

J. Settlage
University of Connecticut, Storrs, CT, USA
e-mail: john.settlage@uconn.edu

Published online: 11 June 2010
doors. Hodson wades into the disturbance, grabs the perpetrators by the collars, and firmly explains how both sides need to learn to think more clearly.

Time and again throughout this fine book, Derek Hodson cuts through the debris and leads the reader to intellectual summits that enlighten and inform. For example, deliberations about whether process skills should be central to school science teaching have been unproductive. From my perspective, while I endorse the flaws in treating classification as a generalized and readily transferable skill (e.g., Yook 2009) and recognize that process skills science is too readily decontextualized (esp. Ault 2010), I cannot help but wonder whether preservice teachers can benefit from learning a “usefully wrong” process skill framework as a first step toward an enriched appreciation for the dynamism of science. I have misgivings about doing so and yet I typically begin elementary science methods with an activity and discussion about observing and inferring. Again, Hodson rises above the fray:

“It is equally important for the students to recognize, as soon as possible, that commonly used observational terms often include substantial theoretical inference…. The demarcation between observation and inference should be drawn at a point that is appropriate to the theoretical knowledge of the students, at the point where there is reason for students to doubt the theoretical assumptions that are involved. Insisting on a demarcation when there is no cause for doubt is to promote false notions about scientific observations” (pages 90–91).

In this way, Hodson not only speaks to the epistemic considerations but simultaneously offers commentary about implications for the classroom.

What makes this so remarkable? Because, Hodson’s book avoids the many quagmires of NOS research that I have been exposed to in print and in presentations. From my perspective, the typical discourse about “nature of science” evokes the musty obscurity of a club meeting among model railroad enthusiasts. Rather than engage in the realities of actual train travel (for example, the stunning architecture of Grand Central Station or the delight of time spent with a friend during a train trip through the American West), such hobbyists are concerned with miniaturized models and the suspension of reality. Similarly, much of the NOS discourse comes across—at least for me—as wooly, trifling and superfluous. To demonstrate how Hodson’s new book represents such a welcome and powerful contribution, consider a few of my sources of frustration and disappointment related to the NOS project over the past two decades.

1 Scuffling Over Semantics

Hodson devotes a chapter to the language of science and does so without becoming entangled in linguistics and labels. Instead, he embeds language within cultural practices, worldviews, and institutional norms. In contrast, some champions of NOS became overzealous about particular terminology. The volatility of the response to a philosophical investigation by Alters (1997) was especially shrill and off-putting (Smith et al. 1997). Similarly, complaints about conflating “knowing” with “believing” under the pretense that those are distinct ways of thinking and being have had a similar effect, namely precluding healthful discussions by establishing scientistic protectionism (Smith 1994; Smith and Siegel 2004). It appeared that a wrong word choice was sufficient to provoke the zealots. In response to the vitriol, fervor and irrationality, I distanced myself. Interestingly, Hodson entirely ignores this particular situation, and makes no mention of it. With some
relief I notice the fanaticism has softened, e.g., Smith (2010). But the damage was done. Along the way, I wonder how many others were repelled and chose to avoid serious engagement with NOS. In this regard, Hodson is a bridge builder and I am beginning to make my way across.

2 Measurement Hegemony

Research on students’ view of nature of science is the focus of Hodson’s Chapter 2. Therein I was reminded that tools for capturing children’s perspectives have been a long-standing effort dating back to the early 1960s—an ancient history on a science education timescale. A common theme throughout the evolution of instrument development has been the persistent dissatisfaction with the tools. On the one hand, the slipperiness of philosophical positions are difficult to reduce to statements to which students can indicate their level of agreement. In contrast, more open-ended tasks such as inviting children to draw a scientist, bedevil interpretation. Nevertheless, efforts to study NOS are propelled by the availability of various instruments (Lederman 2007). Given the perceived need for reliable and valid tools, I worry that studies of NOS are driven not by compelling questions but because a tool is in hand and there are readily available subjects (esp. preservice teachers) who willingly write answers to prompts and gladly fill in the bubbles. Perhaps, because of the distance that has developed between the field and me, I could be mistaken in my belief that the field has become mired in an obsequious application of a single instrument. However, more often than not, each newly released study about nature of science makes use of minor variations of a common assessment tool. It’s difficult to discern whether this tool has power because of its imprimatur, whether it is simply familiar and convenient, or if it is truly revelatory when applied in a variety of contexts. I suspect I am not the only one dissatisfied and was relieved that Hodson again offers solace, if not a few solutions. A handful of recently published approaches described in this book offer alternatives that I intend to pursue.

3 Explicit and Reflective

Hodson provides an important distinction between inert and active understandings about nature of science: “NOS should be regarded as knowledge in action to be learned, applied and redefined in specific contexts of use, particularly in planning lessons and confronting socioscientific issues” (p. 69). This comment is embedded within an extended summary of research that shows that teachers and children learn NOS more substantively when the presentations are explicit and the participants are reflective (e.g., Scharmann et al. 2005). Here is another instance where Hodson more deftly addresses this situation than would I. To his credit, he does not dispute the value of explicit and reflective teaching. Rather, by placing it within even more robust frameworks (contextual, active, issues, etc.) he suggests that to be explicit and reflective is not sufficient. My response would have been aggravating and unhelpful: I might begin by pointing out the reflective learning is not especially novel or unique given its roots in John Dewey and Donald Schön. Further, the centrality of metacognition to subject matter learning is beyond dispute as evident in a host of consensus documents (esp. Donovan and Bransford 2005). Additionally, I might sardonically inquire whether implicit teaching is something any educator would legitimately advocate. As a profession, I thought we had long ago abandoned the notion that exposure to ideas
was a legitimate pedagogical approach. Such is my disappointment with “advances” in NOS research—as a gruff teacher educator I find little in the push for explicit and reflective teaching that is informative or inspiring. Fortunately, readers of this book will benefit from Hodson’s more gentlemanly and generous treatment.

The book contains a few quirks, most of which I ascribe to production and not to the author. For example, Chapter 3 explores explicit and reflective teaching in depth whereas Chapter 4 Making NOS Teaching Explicit and Reflective emphasizes the community and culture aspects of science. The References section runs seventy-five pages; unfortunately, the only way to find any given reference within the text itself is to thumb through the pages or venture online and locate an electronic version of this book. Neither is especially satisfying. Given the breadth of territory Hodson crisscrosses, it will be exceedingly frustrating to rely upon the Index to locate material since it is barely two pages long. I hold onto the hope that the publisher will absorb the costs of indexing in the future rather than burden authors with this tedious yet important task.

One might expect this book will cover a great deal of territory given its subtitle: language, theories, methods, history, traditions and values. Hodson draws upon an impressive lifetime of work that has had a international impact: authoring methods texts, advocating for curricula informed by philosophy, and exploring the tensions between science as done by scientists compared to classroom science. The text reviewed here represents a defining contribution to the philosophical and practical aspects of “nature of science.” Not only should this text be on the shelf of every science educator but would be an important addition to graduate level course about science education.

References