

## PHILOSOPHY, SCIENCE, EDUCATION AND CULTURE.

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2005

Springer Academic Publishers

xvi+ 488 pp.

ISBN 10 1-3020-3769-4 (hard cover)



The book consists of fourteen chapters, an introduction, acknowledgments, an epilogue, references, name index and a subject index. Thematically it is organized in four sections. In the first section, the authors set out their philosophical position about the nature of knowledge and its relation to education. In the second section, they summarise some theories of method as examples of critical inquiry in science. The third section develops a case against sociological and postmodernist approaches to knowledge and science. In the fourth section, the authors concentrate on issues of culture and politics in science with a sizable discussion on various versions of multiculturalism. The overall argument underlying the book is that the recent debates around constructivism, multiculturalism and postmodernism have promoted a version of science that have imparted negative influences on how science and science education are conceptualized. The authors want to place critical inquiry at the core of education in general and science education in particular. In promoting critical inquiry, the authors draw from Plato's views on knowledge and Socratic method. In a similar vein in emphasis on logic, the authors propose logical analyses to illustrate self-refutation of relativism (pp.125-126). In short, the authors question the abandonment of ideas such as universalism, trans-cultural rationality, scientific method and objective truth.

Overall the book provides a good review of some key concepts from philosophy of science. The emphasis on recovering the rationality of science and cautioning science educators of the perils of relativism are particularly important ideas to promote. A key strength of the book is the range of useful conceptual

distinctions it provides. For example, in relation to constructivism, the authors review the cognitive, semantical, epistemic and ontological constructivism in Chapter 5. The discussion on the culture and politics of science provide some interesting insights into how multiculturalism is contextualized in different country case studies such as India and Turkey (pp. 446-459). However, the link made to the applications of philosophy of science in science education tend to be mainly on the basis of criticism and thus the book is limited in its framing of science educators' work in this area. The authors do state that "the book is about philosophical theories of knowledge and science that impinge on science education. Empathetically it is not about techniques for the classroom teaching of science nor is it an empirical study concerning science teaching and learning." (p.3). However, even at the level of review of the theoretical discussions stemming from

science education, the relation of the authors discussion of science education literature to philosophy of science remains restricted and unsubstantiated as a balanced argument. For example, the authors state: "It is fair to say that the most definitions (of science) in the literature are either too narrow or too wide. Instead of trying to substantiate our impression, we will simply provide our own definition and then let each science educator to compare it with his or her favorite characterization" (pp. 201-202). The authors then proceed to confine their definition of science in terms of six aspects: Activity, Aim, Product, Method, M-Rule and Attitude. It is difficult to understand the authors' criticism of how some science educators' definitions could be different from these aspects – their definition-of science given they do not cite particular references to

science educators in this respect. Considering the substantial body of literature on the nature of science in science education and the wide range of researchers in this area, the work appealed to is rather limited. The work cited (e.g. articles by Michael Matthews, William McComas, Rosalind Driver) while useful, does not represent an even wider range of perspectives on how history and philosophy of science can be applied in science education. For example, there is no citation of some key contributors such as Richard Duschl and Norm Lederman.

The tone of the text in relation to issues of education appears rather naïve from a science educators' perspective. For example, in the section titled "Applying the Hypothetico-Deductive Method in the Classroom" (pp.253-258), there is surprisingly no insight into how this method could indeed be applied in the classroom. The recommendations are minimal -e.g. "ask them to give an explanation for this" (p.254) - which is not useful for any educator (researcher or teacher alike) who would need to know exactly how this sentence needs to be translated into classroom actions, resources and timings of events. Indeed, the overall tone of the educational aspects of this book would benefit from some incorporation and reflection on teaching and teacher education literature (e.g. Shulman, 1992) in order to warrant a more substantial criticism of science educators' work. A further example of short-sightedness about educational issues appears in Chapter 1 where the authors distinguish between different sense of learning: learning how to, learning why and learning that. In a similar vein, the second chapter clarifies different senses of knowledge and knowing. The authors thereby criticize the work of some science education researchers in being vague about some of the distinctions that lie among these key concepts (pp.86-88). While such clarifications are useful and provide important distinctions for science education, they do not capture the more complex meanings of various terms such as learning and knowing from a pedagogical point of view.

The overemphasis of the authors' take on educational issues from a logical angle is, in this respect, both a strength and a weakness of the book. It is a strength in terms of providing science educators with logical and philosophical insights into some concepts that form the basis of their endeavour although then reverting the logical emphasis to criticize the way in which science educators mean these concepts seems unfounded. The inflation in logical analysis is limiting in usefulness to application in real life science learning environments or indeed their theoretical study from a science education disciplinary perspective. For instance, the notion of learning does not seem to encapsulate a real learner, how this learner's idiosyncratic learning process might feed into the way in which learning is perceived. In short, from the authors' perspective, the

learner is not a real person but a decontextualised and hypothetical entity.

The authors' interpretation of some concepts such as disunity of science, thus, takes on a unidimensional interpretation which does not acknowledge the multitude of senses of the philosophical concepts that can be applied in science education. In tackling with the disunity of the sciences issue, the authors conclude: "We think that the claims for disunity in the sciences are overplayed to no clear end." (p.409). In one sense the disunity of the sciences relates to the reaction against the positivist characterizations of the unity of the sciences and the role of reductionism in defining physics as the paradigmatic science. In another sense, the "disunity of science" argument need not be at odds with the rational and objectivist accounts of science. For instance, the disciplinary ways of reasoning might indeed pose domain-specific features of science that are important to capture to represent in the classroom (Erduran, 2007).

Despite its limitations in its usefulness for science education researchers, overall the book is a good contribution to the literature in raising awareness of some fundamental philosophical issues and particularly in guarding the rational, evidential and critical nature of science. The book would be a useful resource for researchers in philosophy of education, philosophy of science as well as science education.

### References

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