

Preface

While we share a longtime interest in the philosophy of science in science education, the first thought of writing this book was triggered by a symposium during the 2010 annual meeting of *NARST: A Worldwide Organization for Improving Science Education through Research on Teaching and Learning* in Philadelphia, USA. Among the sentiments strongly voiced in that symposium was an admonition to stop asking what science is, for, it was argued the content of what needs to be taught is already known. What is needed instead, the argument continued, was better ways of incorporating nature of science in science teaching. We disagreed. From our perspective, the question of ‘what’ nature of science to include in science education has been addressed by some researchers but is far from being settled. We became seriously concerned that a critical attitude about nature of science content has been turned off. “Nature of science” seemed beyond questioning. But nothing is beyond questioning especially in science which is an ever developing enterprise. We were also concerned about the promulgation of overly generic accounts of nature of science that did not attend to domain specificity of science disciplines. The idea of this book was thus born, with the aim of fostering a critical and constructive debate about how to reconceptualize nature of science for science education.

Our primary goal was to synthesize new ideas on how nature of science can be considered in science education so that learners of science can be inspired by the awe and wonder of the many faces of science and learn to think scientifically. In the spirit of scientific reasoning, we wanted to have an evidence-based approach in characterizing the nature of science. This notion has led us to the vast philosophy of science literature focused on the various science disciplines. We immersed ourselves in this literature which enriched our understanding of some contemporary debates on the nature of science. As science educators, we were not interested in philosophy of science for philosophy’s sake, but rather we used philosophy of science to achieve conceptual clarity about what we want science lessons to include about nature of science. The experience has taught us that it is vital for science educators to be mindful of first-hand accounts in the philosophy of science and other relevant foundational disciplines such as history, anthropology and psychology of science.

Among the perspectives that we considered, a germ of a fruitful idea in the Family Resemblance Approach proposed by philosophers of science Gürol Irzik and Robert Nola seemed appropriate for our inquiry. We were particularly inspired by their plenary lecture at the *International History and Philosophy in Science Teaching [IHPST]* Conference held in Thessaloniki, Greece, in 2011, in which they had expanded their earlier published account. The Family Resemblance Approach provided us with a unifying yet flexible framework for promoting a relatively broad and inclusive account of nature of science for science education, one that acknowledges common features while at the same time accommodating disciplinary particularities.

We have not only gone beyond Irzik and Nola's depictions of nature of science (for instance, by both expanding their framework and adding more categories to it) but also transformed the ideas into pedagogically sound opportunities. One of the key avenues of transformation was the introduction of visual representations on the various 'family' categories to facilitate not only the communication of some rather deep philosophical issues but also to provide practical toolkits for educators and researchers. We have shared themes from this book with researchers, teacher educators and teachers at professional conferences such as NARST, ESERA, IHPST, ECER, Improving Middle School Science Instruction Using Cognitive Science, Washington, DC; as well in plenary talks at the Annual Science and Math Educators Conference at the American University of Beirut, Lebanon; WCNSTE, Poland; IOSTE Eurasia Regional Conference, Turkey; Frontiers in Mathematics and Science Education Research Conference at Eastern Mediterranean University, Cyprus; and the European Conference on Research in Chemistry Education, Finland.

In working on this book project, we realized that we share similar values about respecting diversity and inclusion of ideas, learners and strategies in educational processes. As individuals whose childhoods were spent in areas of the world torn by political and armed conflict (Erduran in Cyprus and Dagher in Lebanon) we also possess propensity to reconcile different points of view, to move beyond stagnation and to propose constructive dialogue for improving education. Our appreciation of complexity and love for holistic accounts were great motivators although they taxed our time and brains. We took on the challenge of bringing together conventionally disparate ideas, for instance, philosophical reflection and practical teaching concerns. We believe that it is our professional imperative to embrace such challenges and to debate issues openly. Inevitably, work of this kind will be limited by nature. For this reason, we invite colleagues and future researchers to extend our work in order to contribute further to the study of nature of science in science education.

There are many scholars who have shaped our orientation to the field throughout our careers. In addition to our doctoral research mentors, Richard Duschl and George W. Cossman, we acknowledge the writings of Joseph Schwab, Douglas Roberts, Stephen Norris and Michael Matthews that have provided motivation for pursuing scholarship in this field. We continue to draw inspiration from the contributions of other colleagues, too numerous to name here, who are engaged in tireless efforts to develop science education theory and practice from diverse foundational perspectives.

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Limerick, Ireland
Newark, DE, USA

Sibel Erduran
Zoubeida R. Dagher

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Erduran, S.; Dagher, Z.

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