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Niaz, Mansoor (2011). *Innovating Science Teacher Education: A History and Philosophy of Science Perspective*. NY: Routledge.

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*If “teachers teach as they have been taught” then
innovating teacher training programs is all the
more important. (p. 2)*

According to an August 2011 Rasmussen Reports poll of 1,000 likely American voters, 61% said education was Very Important in terms of how they will vote in the next congressional election, well ahead of such hot button issues such as Immigration (46%) and National Security (39%) (Rasmussen Report, 2011). The importance of education and the key role teachers play in the education process gives innovating teacher training programs added significance. In this book, Mansoor Niaz—Professor in the Chemistry department at Universidad de Oriente, Cumana, Venezuela—is focusing on improving science teachers’ skills by ascertaining and improving their understanding of

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the nature of science. He takes an action research-based approach by designing curriculum, documenting the learning of in-service teachers in a Master's degree program, and making evidence-based inferences and subsequent curricular decisions based on student learning.

The book is organized into three main sections. Chapters 1-3 set up the philosophical background of the book, focusing primarily on 1) the contrast between how Thomas Kuhn's "paradigms" & Imre Lakatos' "research programs" influence teachers' views of the nature of science and 2) the rationale for mixed methods research programs in science education. Chapters 4-7 summarize in-service teachers' understanding of educational research methods, conceptual change, and the nature of science. Chapters 8-11 illustrate how the nature of science can be introduced into the classroom and offer the most immediately applicable information in the book for science teachers and science teacher educators. Ten of the twelve chapters are reprints of Niaz's papers published in peer-reviewed journals. Nonetheless, the introductory chapter and transition sections at the end of each chapter weave the separate papers into a coherent story line, a real strength of the book.

The best way to evaluate this book is to analyze what the title does and does not say. Niaz clearly justifies the need to innovate science teacher education. He provides a framework for doing so by summarizing, and in some cases generalizing, the action research he has done in his own teacher education courses. However, this book focuses on in-service teachers in a master's degree program. Pre-service teachers in an undergraduate or post-baccalaureate initial certification or in an alternative certification program have a different set of initial experiences. This book does not adequately address the ways to innovate their science teacher preparation.

While the book's subtitle is "a history and philosophy of science perspective", the actual scope of the perspective is much narrower, just two main aspects. The primary philosophical focus is how the Kuhnian theory of scientific progress by one paradigm replacing another with a scientific "revolution" strongly influences science education and textbooks. Niaz believes that the Kuhnian view is inadequate and argues that teaching Lakatos'

theory of research programs where science progresses by conflicting frameworks evaluating rival hypotheses in the light of new evidence is more effective for preparing teachers. Niaz calls the Lakatosian perspective “science in the making” in contrast with Kuhnian “normal science”.

The primary scientific methodological focus is on the role of mixed methods in science education research, primarily the relationship between quantitative and qualitative research methods. Niaz concludes that mixed methods research programs are the most effective provided researchers let the problem dictate the methodology. In short, the title of the book promises more than the content of the book provides. Even though the title is "innovating science teacher education", the book focuses on a subset of the teacher professional continuum. And even though the subtitle is "a history and philosophy of science perspective", the book focuses primarily on research methods. These limited foci are not necessarily a problem with the book. But they need to be better acknowledged.

Every action research project on which Niaz bases his chapters follows a similar pattern. The subjects are in-service teachers taking an intensive Saturday course from Niaz in a Master's degree program. Each course has a different set of required readings selected to address the research questions of that specific study. Subjects discuss the readings for a few Saturdays. During the last week of the course, groups make formal presentations about the readings and lead a discussion with their classmates about the readings. Every study uses a similar set of data sources including student notes from the formal presentation question-answer sessions, instructor notes from the class discussions and formal presentations, and final exams.

This consistency provides an effective template for other instructors to use if they teach similar courses. On the other hand, it also gives the reader the feeling of “haven't I just read this?”. In fact, in the action research-based chapters, many sections such as “Rationale and Design of the Study”, “Course Organization and Activities”, and “Evaluation” have nearly been copied and pasted from chapter to chapter with minimal changes in format. Niaz's overemphasis on the role of qualitative research in education detracts from the book's thesis of innovating teacher education using a history and philosophy of

science perspective. Despite qualitative research playing a small role in the actual history of science, Niaz devotes large sections of four chapters to qualitative research. Throughout these chapters, for example, page 35, 46, 49, and 86, he describes how Yvonna Lincoln and Egon Guba's qualitative research position supports Kuhn's views of the nature of science. Although this discussion may be useful for science education researchers, it is not immediately applicable to innovating science teacher education.

The chapters of the most immediate use to science teacher educators are chapters 8-11. Here Niaz gives specific research-based advice on how to improve teachers' views of the nature of science, as well as how to help those teachers improve their own students understanding of science. The educational implications listed on page 125 are essentially an extended list of the Key Findings of *How People Learn* (Bransford, Brown, and Cocking, 2000). On page 147, Niaz offers a general teaching strategy for introducing students to different aspects of the nature of science. On page 164, he provides an overview of what "Ideas-About-Science" (Niaz's phrase) should be taught. Niaz concludes the action research-based portion of the book with a warning against applying constructivism as a general educational template.

In conclusion, this book is a valuable overview of certain aspects of science education and the history of science: namely the contrast between Kuhnian and Lakatosian views of science and the role of mixed methods of research in educational research. The first two thirds of the book effectively model the action research method Niaz uses to learn his students views. The last third of the book contains many specific applications for teachers and teacher educators. The main drawbacks of the book are the limited scope, as compared to the promise of the title, and the author's overemphasis on certain themes that are only tangentially related to the thesis. If the reader approaches the book simply as a story of how to discover, evaluate, and remediate inservice teachers' shortcomings with respect to certain aspects of the history and philosophy of science, she or he will not be disappointed.

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