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# Review of Nature of Science in General Chemistry Textbooks

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# Review of Nature of Science in General Chemistry Textbooks

## **Abstract**

This title is an example of a new series of works called “SpringerBriefs” that have been published as eBooks by Springer. This particular eBook is from SpringerBriefs in Education, a series with nine titles currently listed. The essential concept of the overall series (which has 47 content areas, including “molecular science”) is to provide a venue that lies between new research published in an archival journal and large-scale literature reviews. In chemistry education, there really is no journal dedicated to reviews, so this series may serve an important role. The article “Nature of Science in General Chemistry Textbooks” fits this model quite well, both synthesizing some important concepts in the pedagogy related to the nature of science and presenting research about how this field is presented in general chemistry textbooks.

## **Disciplines**

Curriculum and Instruction | Higher Education | Other Chemistry | Science and Mathematics Education

## **Comments**

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## Review of *Nature of Science in General Chemistry Textbooks*

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**Nature of Science in General Chemistry Textbooks** by Mansoor Niaz and Arellys Maza. SpringerBriefs in Education, Volume 2. Springer: Dordrecht, The Netherlands, 2011. pp. ISBN 978-9400719194 (eBook). \$39.46.

This title is an example of a new series of works called “SpringerBriefs” that have been published as eBooks by Springer. This particular eBook is from SpringerBriefs in Education, a series with nine titles currently listed. The essential concept of the overall series (which has 47 content areas, including “molecular science”) is to provide a venue that lies between new research published in an archival journal and large-scale literature reviews. In chemistry education, there really is no journal dedicated to reviews, so this series may serve an important role. The article “Nature of Science in General Chemistry Textbooks” fits this model quite well, both synthesizing some important concepts in the pedagogy related to the nature of science and presenting research about how this field is presented in general chemistry textbooks.

The technology used to deliver the eBook is Amigo Reader, an example of an eb20 eBook reader. Generally, this technology works reasonably well, but there were two occasions when reading the book that the navigation froze, while using Google Chrome (17.0.963.79) as the browser on a MacBook Pro running Mac OS (10.6.8). These problems were short-lived, but access to each book in the series currently shows a list price of \$34.96 (although the initial price was \$49.95), so for a short book, this cost is high and one might expect very reliable technology as a result. The pricing for eBook content continues to be a hot discussion topic in any number of online forums; in comparison though, the average price for full-length nonfiction books is closer to \$10. The price to length ratio appears to be far higher for this series.

Of the nine titles available in SpringerBriefs in Education at the writing of this review, two are the work of Mansoor Niaz and his collaborators. This review concentrates on “Nature of Science in General Chemistry Textbooks”. This type of analysis of textbook content is based on rubrics of content using designations derived from the philosophy and history of science. Niaz and his group note the publication of nine such analyses since 1998, and this work maintains the style and rigor of the previous work. For example, the inter-rater reliability for the assignments made in this eBook are all well within acceptable range for such research.

For this work, the target of interest is the introductory material of general chemistry textbooks, where many books include information about the nature of science (NOS). The analysis includes 75 textbooks. One potential concern lies in the general age of the books. While there was an intent to look at the issue of the presentation of NOS in a longitudinal sense, 73 of the 75 texts have copyright dates of 2003 or earlier. Given the standard practice publishers use for copyright assignment,

that means only 2 books have been published in the past decade.

Drawing on work from both the history of science and the philosophy of science, the authors establish nine components of NOS that might be treated in a general chemistry textbook. These nine categories follow:

1. Scientific theories are tentative in nature.
2. Laws and theories serve different roles in science (they are not hierarchal).
3. There is no universal step-by-step scientific method.
4. Observations are theory-laden.
5. Scientific knowledge relies heavily, but not entirely, on observation, experimental evidence, rational arguments, creativity, and skepticism.
6. Scientific progress is characterized by competition between rival theories.
7. Scientists can interpret the same experimental data differently.
8. Development of scientific theories at times is based on inconsistent foundations.
9. Scientific ideas are affected by their social and historic milieu.

Niaz and Maza then analyze the opening chapter of the selected textbooks to determine whether they have treatments that are either satisfactory (S), mention (M) the component of NOS, or do not (N) mention that component. Of the books analyzed, 19 had no mention of any of the nine traits of NOS. If a score of 2 is assigned to the satisfactory coverage, and 1 to a mention of a category, the highest scoring textbook has a value of 10—derived from satisfactory treatment of five components.

Once the overall results are tabulated, the authors present examples of each type of designation (S), (M), and (N) for each of the nine categories. This method allows the reader to understand some of the nuanced decisions that are made in the categorization and simultaneously gives more insight into how these components of understanding the NOS can be important.

Another interesting analysis relates to determining group scores based on decade of publication. The results of this work are perhaps surprising, in that very little change has occurred. The average score begins at 2.3 prior to 1980, rises to 2.5 through the 1980s and 1990s, and then drops to 2.4 in the 2000s.

The overall impression of this work aligns with the stated objective of the SpringerBriefs series. For those who are interested in how the nature of science is incorporated into the chemistry curriculum and somehow have access to this series, “Nature of Science in General Chemistry Textbooks” is definitely worth taking the time to read. It includes a more extensive literature review than might be commonly expected in

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an archival journal and is thus likely too long for journal publication. The authors do not, however, attempt to synthesize the work of a range of authors on a broad topic as might be expected from a formal review paper. In this sense, the work is interesting and the format is unique. Nonetheless, if a chemistry educator does not already have access to the series, it is not clear how many would be interested in paying essentially \$35 for access to a single, albeit extensive, research paper.

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