

Mansoor Niaz · Arelys Maza

Nature of Science in General Chemistry Textbooks

Nature Of Science In General Chemistry Textbooks

Springerbriefs In Education

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University of Beirut. Faculty of Arts
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Nature Of Science In General Chemistry Textbooks Springerbriefs In Education:

Nature of Science in General Chemistry Textbooks Mansoor Niaz, Arelys Maza, 2011-07-15 Research in science education has recognized the importance of history and philosophy of science HPS Nature of science NOS is considered to be an essential part of HPS with important implications for teaching science The role played by textbooks in developing students informed conceptions of NOS has been a source of considerable interest for science educators In some parts of the world textbooks become the curriculum and determine to a great extent what is taught and learned in the classroom Given this background and interest this monograph has evaluated NOS in university level general chemistry textbooks published in U S A Most textbooks in this study provided little insight with respect to the nine criteria used for evaluating NOS Some of the textbooks however inevitably refer to HPS and thus provide guidelines for future textbooks A few of the textbooks go into considerable detail to present the atomic models of Dalton Thomson Rutherford Bohr and wave mechanical to illustrate the tentative nature of scientific theories an important NOS aspect These results lead to the question Are we teaching science as practiced by scientists An answer to this question can help us to understand the importance of NOS by providing students an HPS based environment so that they too just like the scientists feel the thrill and excitement of discovering new things This monograph provides students and teachers guidelines for introducing various aspects of NOS based on historical episodes

From 'Science in the Making' to Understanding the Nature of Science Mansoor Niaz, 2012-02-06 The Nature of Science is highly topical among science teacher educators and researchers Increasingly it is a mandated topic in state curriculum documents This book draws together recent research on Nature of Science studies within a historical and philosophical framework suitable for students and teacher educators Traditional science curricula and textbooks present science as a finished product Taking a different approach this book provides a glimpse of science in the making scientific practice imbued with arguments controversies and competition among rival theories and explanations Teaching about science in the making is a rich source of motivating students to engage creatively with the science curriculum Readers are introduced to science in the making through discussion and analysis of a wide range of historical episodes from the early 19th century to early 21st century Recent cutting edge research is presented to provide insight into the dynamics of scientific progress More than 90 studies from major science education journals related to nature of science are reviewed A theoretical framework field tested with in service science teachers is developed for moving from science in the making to understanding the Nature of Science

International Handbook of Research in History, Philosophy and Science Teaching Michael R. Matthews, 2014-07-03 This inaugural handbook documents the distinctive research field that utilizes history and philosophy in investigation of theoretical curricular and pedagogical issues in the teaching of science and mathematics It is contributed to by 130 researchers from 30 countries it provides a logically structured fully referenced guide to the ways in which science and mathematics education is informed by the history and philosophy of these disciplines as well as by the philosophy of

education more generally. The first handbook to cover the field it lays down a much needed marker of progress to date and provides a platform for informed and coherent future analysis and research of the subject. The publication comes at a time of heightened worldwide concern over the standard of science and mathematics education attended by fierce debate over how best to reform curricula and enliven student engagement in the subjects. There is a growing recognition among educators and policy makers that the learning of science must dovetail with learning about science. This handbook is uniquely positioned as a locus for the discussion. The handbook features sections on pedagogical, theoretical, national and biographical research setting the literature of each tradition in its historical context. It reminds readers at a crucial juncture that there has been a long and rich tradition of historical and philosophical engagements with science and mathematics teaching and that lessons can be learnt from these engagements for the resolution of current theoretical, curricular and pedagogical questions that face teachers and administrators. Science educators will be grateful for this unique encyclopaedic handbook.

Gerald Holton
Physics Department Harvard University

This handbook gathers the fruits of over thirty years research by a growing international and cosmopolitan community.

Fabio Bevilacqua Physics Department University of Pavia

Reconstruction of Wave-Particle Duality and its Implications for General Chemistry Textbooks

Mansoor Niaz, Cecilia Marcano, 2012-04-26

It goes without saying that atomic structure including its dual wave particle nature cannot be demonstrated in the classroom. Thus for most science teachers especially those in physics and chemistry the textbook is their key resource and their students core source of information. Science education historiography recognizes the role played by the history and philosophy of science in developing the content of our textbooks and with this in mind the authors analyze more than 120 general chemistry textbooks published in the USA based on criteria derived from a historical reconstruction of wave particle duality. They come to some revealing conclusions including the fact that very few textbooks discussed issues such as the suggestion by both Einstein and de Broglie and before conclusive experimental evidence was available that wave particle duality existed. Other large scale omissions included de Broglie's prescription for observing this duality and the importance of the Davisson Germer experiments as well as the struggle to interpret the experimental data they were collecting. Also untouched was the background to the role played by Schrödinger in developing de Broglie's ideas. The authors argue that rectifying these deficiencies will arouse students' curiosity by giving them the opportunity to engage creatively with the content of science curricula. They also assert that it isn't just the experimental data in science that matters but the theoretical insights and unwonted inspirations too. In addition the controversies and discrepancies in the theoretical and experimental record are key drivers in understanding the development of science as we know it today.

Facilitating Conceptual Change in Students' Understanding of the Periodic Table

Mansoor Niaz, Marniev Luiggi, 2013-07-16

This book is about how students are taught the periodic table. It reviews aspects of the periodic table's development using the history and philosophy of science. The teaching method presented in this book is ideal for teaching the subject in high school.

and at introductory university level Chemistry students taught in this new experimental way are compared with those taught in the traditional way and the author describes how tests found more conceptual responses from the experimental group than the control group The historical aspects of importance to this teaching method are the role of the Karlsruhe Congress of 1860 the accommodation of the chemical elements in the periodic table prediction of elements that were discovered later corrections of atomic weights periodicity in the periodic table as a function of the atomic theory and the accommodation of argon The experimental group of students participated in various activities including discussion of various aspects related to the history and philosophy of science construction of concept maps and their evaluation by the students PowerPoint presentations and interviews with volunteer students

Evolving Nature of Objectivity in the History of Science and its Implications for Science Education

Mansoor Niaz,2017-10-26 This book explores the evolving nature of objectivity in the history of science and its implications for science education It is generally considered that objectivity certainty truth universality the scientific method and the accumulation of experimental data characterize both science and science education Such universal values associated with science may be challenged while studying controversies in their original historical context The scientific enterprise is not characterized by objectivity or the scientific method but rather controversies

alternative interpretations of data ambiguity and uncertainty Although objectivity is not synonymous with truth or certainty it has eclipsed other epistemic virtues and to be objective is often used as a synonym for scientific Recent scholarship in history and philosophy of science has shown that it is not the experimental data Baconian orgy of quantification but rather the diversity plurality in a scientific discipline that contributes toward understanding objectivity History of science shows that objectivity and subjectivity can be considered as the two poles of a continuum and this dualism leads to a conflict in understanding the evolving nature of objectivity The history of objectivity is nothing less than the history of science itself and the evolving and varying forms of objectivity does not mean that one replaced the other in a sequence but rather each form supplements the others This book is remarkable for its insistence that the philosophy of science and in particular that discipline s analysis of objectivity as the supposed hallmark of the scientific method is of direct value to teachers of science Meticulously yet in a most readable way Mansoor Niaz looks at the way objectivity has been dealt with over the years in influential educational journals and in textbooks it s fascinating how certain perspectives fade while basic questions show no sign of going away There are few books that take both philosophy and education seriously this one does Roald Hoffmann Cornell University chemist writer and Nobel Laureate in Chemistry

Reconstruction of Wave-Particle Duality and its Implications for General Chemistry Textbooks

Mansoor Niaz,Cecilia Marcano,2012-05-06 It goes without saying that atomic structure including its dual wave particle nature cannot be demonstrated in the classroom Thus for most science teachers especially those in physics and chemistry the textbook is their key resource and their students core source of information Science education historiography recognizes the role played by the history and philosophy of science in developing the

content of our textbooks and with this in mind the authors analyze more than 120 general chemistry textbooks published in the USA based on criteria derived from a historical reconstruction of wave particle duality. They come to some revealing conclusions including the fact that very few textbooks discussed issues such as the suggestion by both Einstein and de Broglie and before conclusive experimental evidence was available that wave particle duality existed. Other large scale omissions included de Broglie's prescription for observing this duality and the importance of the Davisson Germer experiments as well as the struggle to interpret the experimental data they were collecting. Also untouched was the background to the role played by Schrödinger in developing de Broglie's ideas. The authors argue that rectifying these deficiencies will arouse students' curiosity by giving them the opportunity to engage creatively with the content of science curricula. They also assert that it isn't just the experimental data in science that matters but the theoretical insights and unwonted inspirations too. In addition the controversies and discrepancies in the theoretical and experimental record are key drivers in understanding the development of science as we know it today. Real Science in Clear English Cathryn Roos, Gregory Roos, 2019-08-07. This book is a timely go to resource for any professionals wishing to communicate with the growing number of readers whose first language is not English. It highlights the potential language difficulties these readers face and provides guidelines and tools for overcoming them. The guidelines show how to convey complicated information clearly without affecting the integrity of the subject matter while the practical before and after examples clearly illustrate how using these guidelines improves scientific texts. The book also includes text evaluation tools that allow writers to rapidly assess the readability of their materials. It is based on theory and the authors' extensive experience in producing highly readable English texts for L2 readers who struggle with materials that were originally prepared for L1 readers.

Understanding the Nature of Science by Chemistry 201 Students at A.U.B. Manahel Mohammad Bitar, American University of Beirut. Faculty of Arts and Sciences. Department of Education, 1986. **Understanding Chemistry** Chintamani Nagesa Ramachandra Rao, 2010. This is the international edition of Prof Rao's popular science book an elementary introduction intended for high school students and others interested in chemistry. Topics such as environment, energy, food and water are included. There are also life sketches of chemists and procedures for a few experiments. The Nature of Chemistry, 1984. **The Nature of Chemistry** Open University. Nature of Chemistry Course Team, 1977.

Chemistry and Our Universe Ron B. Davis, Jr., 2016-08-19. The Iron(III) Thiocyanate Reaction Kevin C. de Berg, 2019-11-13. This Brief presents an historical investigation into the reaction between ferric ions and thiocyanate ions which has been viewed in different ways throughout the last two centuries. Historically the reaction was used in chemical analysis and to highlight the nature of chemical reactions, the laws of chemistry, models and theories of chemistry, chemical nomenclature, mathematics and data analysis and instrumentation which are important ingredients of what one might call the nature of chemistry. Using the history of the iron III thiocyanate reaction as a basis the book's main objective is to explore

how chemistry develops its own knowledge base how it assesses the reliability of that base and how some important tools of the trade have been brought to bear on a chemical reaction to achieve understanding a worthwhile goal of any historical investigation **The Beginning of a New Dawn for Humanity** Sunny N. E. Omorodion, 2017-02-03 The book which is a summary of what is contained in the twelve volumes of The New Frontiers in Sciences Engineering and the Arts about to be seen marks the beginning of a new science for humanity The science in question is the natural sciences mathematics physics and chemistry These three disciplines were already in place long before our universes in which our world is in one of them the Milky Way All other disciplines including religion were created Of the trios the greatest of them all is chemistry Chemistry is the mother of all disciplines Inside chemistry which is the study of the laws of nature in the real and imaginary domains you see mathematics the natural language of communications also both in the real and imaginary domains You also see physics which is the study of the forces of nature both in the real and imaginary domains The forces in questions are sight sound smell taste and feelings These we see in our physics textbooks You also see engineering which is one's ability to copy nature for the comfort of humanity applying four basic fundamental principles of the natural sciences social sciences the arts and most importantly imaginative capabilities Inside chemistry you see all disciplines based on how chemical polymeric and nuclear reactions take place between families of compounds and operating conditions all still unknown to the world The fact that we think we know them makes our world a completely illusionary world full of ignorance and stupidity which the author is the greatest of them all In the book the atom is redefined in particular with respect to what radicals are and also what the nucleus is All chemical reactions take place only radically Some polymeric reactions take place radically while others take place chargedly What radicals and charges are are unknown to scientists but they think that they know What monomers compounds and molecules are are unknown How combustion oxidation hydrogenation and so many phenomena too countless to list work are unknown Yet we think that we know some or all of them What solubility insolubility dissolution miscibility and more are are all unknown How currents flow in some fluids and metals and not in others are all unknown How can one continue to live in this kind of world That is my mission for we have only just begun despite our so called advanced level of technological development all based on the use of laboratory data most of which have wrong interpretations since the missing link in an atom has never been known since antiquity **The Nature of Chemistry**, 1976

The Nature of Chemistry Open University. Faculty of Science, 1976 *Chemistry Science of Change* Oxtoby, 1998-04
Science from Nature E.A. Basson, Nicolaas Johannes Solomon Basson, 1993 **The Nature of Chemistry**, 1984

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web fermat s last theorem also known as fermat s conjecture or wiles theorem states that no three positive integers x y z x y z satisfy $x^n + y^n = z^n$ for any integer $n \geq 2$ although a special case for $n = 4$ was proven by fermat himself using

infinite descent and fermat famously wrote in the margin of one of his books in

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web this theorem showed that the area of a pythagorean triangle having integral sides cannot be a square integer this theorem leads to the proof of fermat s last theorem for the case n 4 that is $x^4 y^4 z^4$ has no solutions fermat claimed to be able to prove the conjecture for n 3 but published no proof

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web though a hole in the proof was discovered it was patched by wiles and richard taylor in 1994 at last fermat s conjecture had become a theorem presentation suggestions students often find it amazing that such a great unsolved problem

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web fermat s last theorem overview the pythagorean equation $x^2 y^2 z^2$ has an infinite number of positive integer solutions for x y and z mathematical history in ancient times it was known that a triangle whose sides were in the ratio 3 4 5 would have a relationship to other problems and

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web mathematical preliminaries fermat s last theorem states that no three positive integers a, b, c can satisfy the equation $a^n + b^n = c^n$ for any integer value of n greater than two for n equal to 1 the equation is a linear equation and has a solution for every possible a, b

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web fermat s last theorem also called fermat s great theorem the statement that there are no natural numbers $1, 2, 3, \dots, x, y, z$ such that $x^n + y^n = z^n$ in which n is a natural number greater than 2

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web fermat s last theorem is a theorem first proposed by fermat in the form of a note scribbled in the margin of his copy of the ancient greek text arithmetica by diophantus the scribbled note was discovered posthumously and the original is now lost

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web fermat s little theorem is the basis for the fermat primality test and is one of the fundamental results of elementary number theory the theorem is named after pierre de fermat who stated it in 1640 it is called the little theorem to distinguish it from fermat s last theorem 3 history pierre de fermat

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web fermat s last theorem is a theorem which pierre de fermat wrote down in the margins of a book he had back in the 1600s it is called his last theorem because this writing was discovered some 30

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