



Comparison of Nature of Science Profile in Indonesia, Malaysia, and Singapore Secondary Science Textbooks: Case of Electricity Lesson

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Abstract: Nature of Science is a significant element in science education, especially for the linkages to scientific literacy. As one of an educational support for both teachers and students, textbooks become crucial for teaching and learning. Textbooks may elicit NOS understanding for students and guide teacher to deliver NOS understanding. The way to make better process and outcome, integration of NOS into the textbooks comprehensively is crucial. To get a better understanding of NOS within the diverse framework, an inclusive framework is needed to get better understanding, thus, Family Resemblance Approach is chosen. This study aims to identify the profile of NOS integration and NOS quality in secondary science textbooks by comparing different textbook from three neighboring countries (Indonesia, Malaysia, and Singapore). Descriptive research design with content analysis method conducted to identify the documents using the Family Resemblance Approach to NOS as the analytical framework. The results show that Indonesian textbooks presenting most abundance of NOS, but contain most materials delivered and the quality is mainly at low level. Malaysian textbooks contain the least representation but contain well proportion for the quality and materials presented. Singapore textbooks is least materials with abundance of NOS and consist of high-level quality of NOS. This may lead the conformity of the significance of textbooks elicited students understanding of NOS.

Keywords: Nature of Science; Secondary Science Textbooks; Family Resemblance Approach

Introduction

Science educators as well as researchers recognize the significance of the Nature of Science (NOS) so that curricula and standard documents are widely introduced in some countries in the world (NCSS, 2013). At this time, a basic understanding of NOS is also considered as the main pillar of society's scientific literacy (Clough, 2018; NCSS, 2013; Schleicher, 2019). NOS has become the center of attention regarding its relation to scientific literacy, especially with the existence of the PISA science test which was initiated to measure students' scientific literacy (OECD, 2019). Logically, a good understanding of NOS will help these

interactions occur even with a more solid character and a greater potential impact on the world of education (Laherto et al., 2018). Scientific literacy has become one of the main objectives in science education (NCSS, 2013). Different interpretations of Nature of Science lead to a broad and diverse yet functional understanding of science for general educational purposes (Irizik & Nola, 2014). No matter what the target of scientific literacy is, finding out "what constitutes science" and "what kind of science should be taught" has become a major question in science education (Abd-El-Khalick, 2012). The line of research that focuses on these fundamental questions about science is the "Nature of Science".

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Nature Of Science In Science Education

Keith S. Taber



Nature Of Science In Science Education:

Scientific Inquiry and Nature of Science Lawrence Flick, N.G. Lederman, 2007-11-03 This book synthesizes current literature and research on scientific inquiry and the nature of science in K 12 instruction Its presentation of the distinctions and overlaps of inquiry and nature of science as instructional outcomes are unique in contemporary literature Researchers and teachers will find the text interesting as it carefully explores the subtleties and challenges of designing curriculum and instruction for integrating inquiry and nature of science

The Nature of Science in Science Education W.F.

McComas, 2006-04-11 The Nature of Science in Science Education is the first book to blend a justification for the inclusion of the history and philosophy of science in science teaching with methods by which this vital content can be shared with a variety of learners It contains a complete analysis of the variety of tools developed thus far to assess learning in this domain This book is relevant to science methods instructors science education graduate students and science teachers

Nature of Science in Science Instruction William McComas, 2020-08-24 This book offers a comprehensive introduction to Nature of Science NOS one of the most important aspects of science teaching and learning and includes tested strategies for teaching aspects of the NOS in a variety of instructional settings In line with the recommendations in the field to include NOS in all plans for science instruction the book provides an accessible resource of background information on NOS rationales for teaching these targeted NOS aspects and most importantly how to teach about the nature of science in specific instructional contexts The first section examines the why and what of NOS its nature and what research says about how to teach NOS in science settings The second section focuses on extending knowledge about NOS to question of scientific method theory laden observation the role of experiments and observations and distinctions between science engineering and technology The dominant theme of the remainder of the book is a focus on teaching aspects of NOS applicable to a wide variety of instructional environments

Reconceptualizing the Nature of Science for Science Education Sibel Erduran, Zoubeida R.

Dagher, 2014-08-20 Prompted by the ongoing debate among science educators over nature of science and its importance in school and university curricula this book is a clarion call for a broad re conceptualizing of nature of science in science education The authors draw on the family resemblance approach popularized by Wittgenstein defining science as a cognitive epistemic and social institutional system whose heterogeneous characteristics and influences should be more thoroughly reflected in science education They seek wherever possible to clarify their developing thesis with visual tools that illustrate how their ideas can be practically applied in science education The volume s holistic representation of science which includes the aims and values knowledge practices techniques and methodological rules as well as science s social and institutional contexts mirrors its core aim to synthesize perspectives from the fields of philosophy of science and science education The authors believe that this more integrated conception of nature of science in science education is both innovative and beneficial They discuss in detail the implications for curriculum content pedagogy and learning outcomes deploy numerous

real life examples and detail the links between their ideas and curriculum policy more generally

Advances in Nature of Science Research Myint Swe Khine, 2011-09-18 This book consolidates contemporary thinking and research efforts in teaching and learning about the nature of science in science education The term Nature of Science NoS has appeared in the science education literature for many decades While there is still a controversy among science educators about what constitutes NoS educators are unanimous in acknowledging the importance of this topic as well as the need to make it explicit in teaching science The general consensus is that the nature of science is an intricate and multifaceted theme that requires continued scholarship Recent analysis of research trends in science education indicates that investigation of the nature of science continues to be one of the most prevalent topics in academic publications *Advances in Nature of Science Research* explores teaching and assessing the nature of science as a means of addressing and solving problems in conceptual change developing positive attitudes toward science promoting thinking habits advancing inquiry skills and preparing citizens literate in science and technology The book brings together prominent scholars in the field to share their cutting edge knowledge about the place of the nature of science in science teaching and learning contexts The chapters explore theoretical frameworks new directions and changing practices from intervention studies discourse analyses classroom based investigations anthropological observations and design based research

Progressing Science Education Keith S. Taber, 2009-05-29 Exploring one of the central themes in science education theory this volume examines how science education can be considered as a scientific activity within a broad post positivist notion of science Many students find learning science extremely problematic whatever level of education they have reached At the end of the 1970s a new approach to tackling learning difficulties in science was developed drawing on ideas from psychology and cognitive science and centred on the way students build up new knowledge in reference to their existing ideas Constructivism became the dominant paradigm in science education research for two decades spawning a vast body of literature reporting aspects of learners ideas in different science topics However Constructivism came under fire as it was recognised that the research did not offer immediate and simple prescriptions for effective science teaching The whole approach was widely criticised in particular by those who saw it as having anti science leanings In this book the notion of scientific research programmes is used to understand the development limitations and potential of constructivism It is shown that constructivist work in science education fits into a coherent programme exploring the contingencies of learning science The author goes further to address criticisms of constructivism evaluate progress in the field and suggest directions for future research It is concluded that constructivism has provided the foundations for a progressive research programme that continues to guide enquiry into learning and teaching science

A History of Ideas in Science Education George DeBoer, 2019-07-05 By allowing key scientists researchers professors and classroom teachers of science to speak for themselves through their published writings about what is best and needed for the field Dr DeBoer presents a fascinating account of the history of science education in

the United States from the middle of the 19th century to the present The book relates how science first struggled to find a place in the school curriculum and recounts the many debates over the years about what that curriculum should be In fact many of what we consider modern ideas in science education are not new at all but can be traced to writings on education of one hundred years ago The book is aimed at all those interested in science education classroom teachers and science education leaders concerned about the historical justification of the goals and strategies proposed for the field The book should be enjoyed not only by the researcher but also by anyone curious about just how curriculum is decided upon and implemented on a national scale This is without question the finest book of its kind on the market It deserves to be widely read by current and future science teachers supervisors science education faculty in colleges and universities curriculum developers and program officers in funding agencies The Science Teacher Adds a significant dimension to the history of American schooling and curriculum History of Education Quarterly

Issues in Science Teaching John Sears, Pete Sorenson, 2005-08-18 Issues in Science Teaching covers a wide range of important issues which will interest teachers at all phases in the education system The issues discussed include the nature and purposes of science education in a multicultural society including the idea of science for all the role and purposes of investigational work in science education assessment curriculum progression and pupil attitudes to their science experience supporting basic skills development in literacy numeracy and ICT through science teaching supporting cross curricular work through science teaching taking account of individual differences including ability special needs learning style and the case for inclusion The articles are strongly based on current research and are intended to stimulate and broaden debate among the readers Written by practising science educators and teachers this book offers new and interesting ways of developing science education at all levels

The Language of Science Education , 2014-01-01 The Language of Science Education An Expanded Glossary of Key Terms and Concepts in Science Teaching and Learning is written expressly for science education professionals and students of science education to provide the foundation for a shared vocabulary of the field of science teaching and learning Science education is a part of education studies but has developed a unique vocabulary that is occasionally at odds with the ways some terms are commonly used both in the field of education and in general conversation Therefore understanding the specific way that terms are used within science education is vital for those who wish to understand the existing literature or make contributions to it The Language of Science Education provides definitions for 100 unique terms but when considering the related terms that are also defined as they relate to the targeted words almost 150 words are represented in the book For instance laboratory instruction is accompanied by definitions for openness wet lab dry lab virtual lab and cookbook lab Each key term is defined both with a short entry designed to provide immediate access following by a more extensive discussion with extensive references and examples where appropriate Experienced readers will recognize the majority of terms included but the developing discipline of science education demands the consideration of new words For example the term blended

science is offered as a better descriptor for interdisciplinary science and make a distinction between project based and problem based instruction Even a definition for science education is included The Language of Science Education is designed as a reference book but many readers may find it useful and enlightening to read it as if it were a series of very short stories Cover photo The cover photo was taken by W F McComas at Marsh s Library in Dublin Ireland This amazing library houses more than 25 000 rare and important books including many related to the history of science It was founded in 1701 and has remained essentially unchanged for three centuries Permission to use this image as the cover for The Language of Science Education has been granted by Dr Jason McElligott Keeper of Marsh s Library

Issues and Challenges in Science

Education Research Kim Chwee Daniel Tan, Mijung Kim, 2012-04-27 In contemporary society science constitutes a significant part of human life in that it impacts on how people experience and understand the world and themselves The rapid advances in science and technology newly established societal and cultural norms and values and changes in the climate and environment as well as the depletion of natural resources all greatly impact the lives of children and youths and hence their ways of learning viewing the world experiencing phenomena around them and interacting with others These changes challenge science educators to rethink the epistemology and pedagogy in science classrooms today as the practice of science education needs to be proactive and relevant to students and prepare them for life in the present and in the future Featuring contributions from highly experienced and celebrated science educators as well as research perspectives from Europe the USA Asia and Australia this book addresses theoretical and practical examples in science education that on the one hand plays a key role in our understanding of the world and yet paradoxically now acknowledges a growing number of uncertainties of knowledge about the world The material is in four sections that cover the learning and teaching of science from science literacy to multiple representations science teacher education the use of innovations and new technologies in science teaching and learning and science learning in informal settings including outdoor environmental learning activities Acknowledging the issues and challenges in science education this book hopes to generate collaborative discussions among scholars researchers and educators to develop critical and creative ways of science teaching to improve and enrich the lives of our children and youths

Advances in Nature of Science Research Myint Swe Khine, 2014-11-28 This book consolidates contemporary thinking and research efforts in teaching and learning about the nature of science in science education The term Nature of Science NoS has appeared in the science education literature for many decades While there is still a controversy among science educators about what constitutes NoS educators are unanimous in acknowledging the importance of this topic as well as the need to make it explicit in teaching science The general consensus is that the nature of science is an intricate and multifaceted theme that requires continued scholarship Recent analysis of research trends in science education indicates that investigation of the nature of science continues to be one of the most prevalent topics in academic publications Advances in Nature of Science Research explores teaching and assessing the nature of science as a means of

addressing and solving problems in conceptual change developing positive attitudes toward science promoting thinking habits advancing inquiry skills and preparing citizens literate in science and technology The book brings together prominent scholars in the field to share their cutting edge knowledge about the place of the nature of science in science teaching and learning contexts The chapters explore theoretical frameworks new directions and changing practices from intervention studies discourse analyses classroom based investigations anthropological observations and design based research

Science Teaching Michael R. Matthews, 2015-12-22 *Science Teaching* argues that science teaching and science teacher education can be improved if teachers know something of the history and philosophy of science and if these topics are included in the science curriculum The history and philosophy of science have important roles in many of the theoretical issues that science educators need to address what constitutes an appropriate science curriculum for all students how science should be taught in traditional cultures how scientific literacy can be promoted and the conflict which can occur between science curriculum and deep seated religious or cultural values and knowledge Outlining the history of liberal approaches to the teaching of science Michael Matthews elaborates contemporary curriculum developments that explicitly address questions about the nature and the history of science He provides examples of classroom teaching and develops useful arguments on constructivism multicultural science education and teacher education Teaching and Learning about Science Derek Hodson, 2009-01-01 Findings generated by recent research in science education international debate on the guiding purposes of science education and the nature of scientific and technological literacy official and semi official reports on science education including recommendations from prestigious organizations such as AAAS and UNESCO and concerns expressed by scientists environmentalists and engineers about current science education provision and the continuing low levels of scientific attainment among the general population have led to some radical re thinking of the nature of the science curriculum There has been a marked shift of rhetorical emphasis in the direction of considerations of the nature of science model based reasoning inquiry based learning scientific argumentation and the use of language rich learning experiences reading writing talking to enhance concept acquisition and development These findings arguments and pronouncements seem to point very clearly in the direction of regarding science education as a study of scientific practice This book presents a comprehensive research based account of how such a vision could be assembled into a coherent curriculum and presented to students in ways that are meaningful motivating and successful The author takes what might be described as an anthropological approach in which scientists are studied as a socially economically and politically important community of people This group has its own distinctive language body of knowledge investigative methods history traditions norms and values each of which can be studied explicitly systematically and reflectively This particular approach was chosen for the powerful theoretical overview it provides and for its motivational value especially for students from sociocultural groups currently under served by science education and under represented in science The book which is both timely and important

is written for teachers student teachers graduate students in education teacher educators curriculum developers and those responsible for educational policy It has the potential to impact very substantially on both pre service and inservice science teacher education programmes and to shift school science education practice strongly in the direction currently being advocated by prominent science educators

Science Teaching Michael R. Matthews, 2014-09-19 Science Teaching explains how history and philosophy of science contributes to the resolution of persistent theoretical curricular and pedagogical issues in science education It shows why it is essential for science teachers to know and appreciate the history and philosophy of the subject they teach and how this knowledge can enrich science instruction and enthuse students in the subject Through its historical perspective the book reveals to students teachers and researchers the foundations of scientific knowledge and its connection to philosophy metaphysics mathematics and broader social influences including the European Enlightenment and develops detailed arguments about constructivism worldviews and science multicultural science education inquiry teaching values and teacher education Fully updated and expanded the 20th Anniversary Edition of this classic text featuring four new chapters The Enlightenment Tradition Joseph Priestley and Photosynthesis Science Worldviews and Education and Nature of Science Research and 1 300 references provides a solid foundation for teaching and learning in the field

Innovation in Science Education, World-wide Albert V. Baez, 1976 UNESCO pub Monograph on present trends in the educational development of science education with particular reference to the needs of developing countries examines past experience possible strategies and promising innovations and covers secondary education activities educational technology teaching methods the role of the teacher etc Annotated bibliography pp 237 to 249

Good Practice in Science Teaching: What Research Has to Say Jonathan Osborne, Justin Dillon, 2010-05-16 The book has wide appeal in that the issues investigated for example the nature of science practical work the role of language of technology and formative and summative assessment are relevant and pertinent to science teachers work in all school systems Professor David F Treagust Curtin University of Technology Australia This new edition of Good Practice in Science Teaching offers a comprehensive overview of the major areas of research and scholarship in science education Each chapter summarizes the research work and evidence in the field and discusses its significance reliability and implications for the practice of science teaching Thoroughly revised throughout the new edition includes Three new chapters covering the learning of science in informal contexts teacher professional development and technology mediated learning Updates to every chapter reflecting the changes and developments in science education Further reading sections at the end of each chapter Each chapter has been written by science education researchers with national or international reputations Each topic is approached in a straight forward manner and is written in a concise and readable style This invaluable guide is ideal for science teachers of children of all ages and others who work in teaching and related fields It is an essential text for teachers in training and those studying for higher degrees Contributors Philip Adey Paul Black Maria Evagorou John Gilbert Melissa Glackin Christine

Harrison Jill Hohenstein Heather King Alex Manning Robin Millar Natasha Serret Shirley Simon Julian Swain Mary Webb

Science Education: Science, education, and the formal curriculum John K. Gilbert, 2006 Udvalgte artikler fra 1985 2005 fordelt p 8 temaer The relationship between science and science education Aims of the formal science curriculum and the needs of the students Science education in the formal curriculum Assessment in formal science education Teaching in science education Learning in science education The conceptual development of students in science education The professional development of science teachers *Improving Science Education* John Millar, 2000-12-16 This book takes stock of where we are in science education research and considers where we ought now to be going It explores how and whether the research effort in science education has contributed to improvements in the practice of teaching science and the science curriculum It contains contributions from an international group of science educators Each chapter explores a specific area of research in science education considering why this research is worth doing and its potential for development Together they look candidly at important general issues such as the impact of research on classroom practice and the development of science education as a progressive field of research The book was produced in celebration of the work of the late Rosalind Driver All the principal contributors to the book had professional links with her and the three sections of the book focus on issues that were of central importance in her work research on teaching and learning in science the role of science within the school curriculum and the nature of the science education we ought to be providing for young people and the achievements of and future agenda for research in science education **The Nature of Science and Science Education**, 1998

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

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