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Umesh Dewnarain Ramnarain & Tarisai Chanetsa

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An analysis of South African Grade 9 natural sciences textbooks for their representation of nature of science

Umesh Dewnarain Ramnarain and Tarisai Chanetsa

Department of Science and Technology Education, University of Johannesburg, Johannesburg, South Africa

ABSTRACT

This article reports on an analysis and comparison of three South African Grade 9 (13–14 years) Natural Sciences textbooks for the representation of nature of science (NOS). The analysis was framed by an analytical tool developed and validated by Abd-El-Khalick and a team of researchers in a large-scale study on the high school textbooks in the USA. The three textbooks were scored on targeted NOS aspects on a scale of −3 to +3 that reflected the explicitness with which these aspects were addressed. The analysis revealed that the textbooks poorly depict NOS, and in particular, there was scant attention given to the social dimension of science, science versus pseudoscience and the 'myth of the scientific method'. The findings of this study are incommensurate with the strong emphasis in a reformed school science curriculum that underlies the need for learners to understand the scientific enterprise, and how scientific knowledge develops. In view of this, the findings of this research reinforce the need for a review on the mandate given to textbook publishers and writers so that a stronger focus be placed on the development of materials that better represent the tenets of NOS.

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Nature of science; natural sciences textbooks; textbook analysis; curriculum documents

Introduction

Textbooks are a crucial resource in ensuring that the goals of the curriculum are met. Research conducted in various education systems has revealed that there is an overreliance on textbooks by science teachers. For example, McKinney (2013) found that textbooks offer teachers the comfort and convenience of having lessons planned out in advance and worksheets easily available on demand. Given this state of affairs, it becomes necessary to analyze textbooks to establish how well textbooks affirm the intent of the curriculum.

The construct 'nature of science' (NOS) has been advocated as an important goal for learners studying science for more than 100 years (Lederman & Lederman, 2014). In fact, one is hard pressed to find rhetoric against its importance. Curriculum documents in post-apartheid South Africa have been rewritten and revised due to political and economic reform, and the influences of worldwide reform to school science curricula. This has culminated in revisions of the South African Natural Sciences curriculum since the advent of democracy in 1994 from NATED 550 to Curriculum 2005 to the Revised National Curriculum Statement (RNCS) to the current Curriculum and Assessment Policy Statement

CONTACT Umesh Dewnarain Ramnarain uramnarain@uj.ac.za Department of Science and Technology Education, University of Johannesburg, Johannesburg, South Africa

(CAPS) that is an amendment to the RNCS. A key imperative in the school science curriculum is for learners to acquire an understanding of NOS. Accordingly, given the importance of the textbook in furthering the aims of the curriculum, and the curriculum emphasis on NOS, the research reported in this article is an analysis and comparison of three Grade 9 (13–14 years) Natural Sciences textbooks for the representation of NOS. The research was guided by the following question:

To what extent do South African Grade 9 Natural Sciences textbooks portray NOS?

NOS refers to the epistemology and sociology of science, science as a way of knowing and understanding the natural world, and the role of values and beliefs of the scientific community in the development of scientific knowledge (Lederman, 1992; Lederman & Lederman, 2004). Related to this conception, McComas, Clough, and Almazroa (1998) aptly define it as a

> hybrid arena which blends aspects of various social studies of science including the history, sociology and philosophy of science combined with research from the cognitive sciences such as psychology into a rich description of which science is, how it works, how scientists operate as a social group and how society itself both directs and reacts to scientific endeavors. (p. 4)

A definition for NOS has been advanced by various scholars over the years. Broadly, NOS refers to the epistemology and sociology of science, science as a way of knowing and understanding the natural world, and the role of values and beliefs of the scientific community in the development of scientific knowledge (Lederman, 1992; Lederman & Lederman, 2004). Related to this conception, McComas et al. (1998) aptly define it as a

> hybrid arena which blends aspects of various social studies of science including the history, sociology and philosophy of science combined with research from the cognitive sciences such as psychology into a rich description of which science is, how it works, how scientists operate as a social group and how society itself both directs and reacts to scientific endeavors. (p. 4)

Clearly, NOS is an encompassing and multifaceted concept and cannot be defined by a single term or a statement.

A review of literature by Lederman (1998) found seven common tenets that underlie NOS. These are: science is tentative, creative, subjective, empirical, and sociocultural, and the relationship of theories and laws, and the role of inference in observation. According to Schwartz, Lederman, and Crawford (2004), none of these tenets can be considered apart from the others. For example, tentativeness of scientific knowledge originates from the creation of that knowledge through empirical observation and inference and each of these actions is influenced by the culture and society in which the science is practiced as well as by the theoretical framework and personal subjectivity of the scientist. As new data are considered and extant data reconsidered, inferences made within a specific context may lead to changes in extant scientific knowledge.

An analysis of the CAPS document reveals excerpts that cohere very closely with the tenets of NOS. For example, the tenet that 'science is empirically-based' is reflected in the statement that 'To be accepted as science, certain methods of inquiry are generally used' (Department of Basic Education, 2011, p. 11). The methods highlighted in CAPS include formulating hypotheses, and designing and carrying out experiments to test the hypothesis. The statement from CAPS that 'scientific knowledge changes over time as scientists acquire new information and people change their ways of viewing the world' (Department of Basic

Education, 2011, p. 11) resonates with the tenet that 'scientific knowledge is tentative, yet durable' (Lederman, 2007). Furthermore, the NOS tenet of 'social and cultural embeddedness of science' is affirmed in CAPS through the statement that:

> In all cultures and in all times people have wanted to understand how the world works. Sometimes their lives depend on understanding it and, sometimes, people want to make sense of the physical world and they need explanations that satisfy them. (Department of Basic Education, 2011, p. 11)

An understanding of NOS is invaluable to both the teacher and learner as it promotes the development of scientifically literate citizens. Lederman (2007) proposes that scientific literacy empowers one to make decisions on a personal and societal level. Scientific literacy allows citizens in a democracy to make informed decisions on economic and environmental issues relating to science, such as issues pertaining to climate change or energy and power and many more. However, despite this importance and the strong imperative for teachers to reflect NOS in their practice, this construct is naively understood by in-service and pre-service teachers throughout the world (Akerson, Buzzelli, & Eastwood, 2012; Liang et al., 2009), and this compromises their efforts for them to address it with their learners. Studies in South Africa affirm this development. A study by Linneman, Lynch, Kurup, and Bantwini (2003) investigated NOS understanding of rural and urban science teachers in the Eastern Cape. Overwhelmingly, teachers were found to hold naïve views of NOS. For example, teachers believed that there existed a scientific method by which scientists followed steps in their investigations. Similarly, Dekkers and Mnisi (2003) in their research on Limpopo teachers' understanding of NOS found that the teachers had an inadequate understanding of some of the earlier described tenets on NOS. For example, they maintained that creativity and imagination held only a limited place in the development of scientific knowledge.

International studies on the analysis of science textbooks for NOS shows that all aspects of NOS are not sufficiently addressed (Abd-El-Khalick, Waters, & Le, 2008; Chiappetta & Fillman, 2007; Lumpe & Beck, 1996; McComas, 2003). In South Africa, study of Padayachee (2012) on the representation of NOS in Life Sciences and old Biology textbooks targeted four broad aspects of NOS constructs: science as a body of knowledge, science as a way of investigating, science as a way of thinking and the interaction between science, technology and society. This research used a framework developed by Chiappetta, Sethna, and Fillman (1991). The findings of the study revealed that Life Sciences textbooks still overwhelmingly represent the theme 'Science as a body of knowledge'. Despite significant curriculum reform that underlines a more balanced perspective of science encompassing the acquisition of knowledge through inquiry, limited coverage was given to the themes 'The investigative nature of science', 'Science as a way of thinking' and 'The interaction of science, technology and society' (Padayachee, 2012). The research reported in this article further informs on NOS representation of science textbooks by investigating the extent to which Natural Sciences textbooks portray the tenets of NOS.

NOS analytical framework

This research will adopt an analytical framework developed by Abd-El-Khalick, Waters, and Le (2008). The framework was used in a large-scale project on the analysis of high

school chemistry textbooks used in the USA over the past four decades (Abd-El-Khalick, Waters, & Le, 2008). The framework describes 11 key aspects in the NOS that are intricately related to the basic tenets of Lederman (1998) explicated above. The aspects are: Empirical; Inferential; Creative; Theory driven; Tentative; Myth of The Scientific Method; Scientific theories; Scientific laws; Social dimensions of science; Social and cultural embeddedness of science; and Science versus pseudoscience.

Table 1 documents the aspects of NOS that constituted the analytical framework that was adopted in this research.

Methodology

The selection of the textbooks for analysis was based on information provided by the South African Department of Basic Education on the school purchases of textbooks. The three most commonly used Grade 9 Natural Sciences CAPS textbooks were selected for analysis. These will be pseudo-named Book A, Book B and Book C.

Textbook analysis

The analysis of the Grade 9 Natural Sciences textbooks predominantly followed a qualitative approach and, more specifically, a deductive content analysis design in which a predetermined instrument is used by the researcher to capture information. According to Krippendorff (2004), content analysis has been defined as 'a systematic replicable technique for compressing many words of text (or other meaningful matter) into fewer categories based on explicit rules of coding' (p. 17). In applying the NOS framework, preformulated categories were brought into connection with the text by analyzing textural material and identifying the category into which they can be placed. In this case, the categories comprised the aspects of NOS listed above. The units of analysis comprised complete paragraphs, activities, worked examples, figures with captions, tables with captions, charts with captions and marginal comments. The units of analysis were therefore all texts and information on each page of the textbook.

The units were analyzed for their representation, if any, of the pre-formulated categories, namely the aspects of NOS as explicated in Table 1. The units were read and then assessed to establish whether the unit represents an aspect of NOS. The representation, if any, was thereafter assessed for its treatment of the targeted NOS aspect by applying a scoring rubric developed by Abd-El-Khalick (2013).

A scoring rubric

A score ranging from +3 to −3 was assigned to a unit of analysis, depending on the extent to which that unit represented a targeted aspect. The rubric draws a distinction between an explicit versus an implicit representation of the targeted NOS aspect. Research by Abd-El-Khalick, Bell, and Lederman (1998) on implicit versus explicit instructional approaches revealed that implicit strategies, such as engaging in scientific activities, do not translate into an understanding of NOS, whereas an explicit approach is more effective in ensuring comprehension of NOS. An explicit approach would, for example, entail teachers differentiating between observation and inference during activities as opposed to the learners

Table 1. The NOS aspects in the framework for textbook analysis.

NOS aspect	Dimensions emphasized in textbook analysis
Empirical	Scientific claims are derived from, and/or consistent with, observations of natural phenomena.
Inferential	There is a crucial distinction between observations and inferences. Observations are descriptive statements about natural phenomena that are accessible to the senses (or extensions of the senses) and about which observers can reach consensus with relative ease (e.g. objects released above ground level tend to fall to the ground). Inferences, on the other hand, are statements about phenomena that are not directly accessible to the senses (e.g. objects tend to fall to the ground because of 'gravity').
Creative	Science is not an entirely rational or systematic activity. Generating scientific knowledge involves human creativity in the sense of scientists inventing explanations and theoretical entities. The creative NOS, coupled with its inferential nature, entails that scientific entities (atoms, force fields, species, etc.) are functional theoretical models rather than faithful copies of 'reality'.
Theory driven	Scientists' theoretical and disciplinary commitments, beliefs, prior knowledge, training and expectations influence their work. These background factors affect scientists' choice of problems to investigate and methods of investigations, observations (both in terms of what is and is not observed) and interpretation of these observations.
Tentative	Scientific knowledge is reliable and durable, but never absolute or certain. All categories of knowledge ('facts,' theories, laws, etc.) are subject to change. Scientific claims change as new evidence, made possible through conceptual and technological advances, is brought to bear; as extant evidence is reinterpreted in light of new or revised theoretical ideas; or due to changes in the cultural and social spheres or shifts in the directions of established research programs.
'Myth of the scientific method'	This myth is often manifested in the belief that there is a recipe-like stepwise procedure that typifies all scientific practice. This notion is erroneous: There is no single 'Scientific Method' that would guarantee the development of infallible knowledge. Scientists do observe, compare, measure, test, speculate, hypothesize, debate, create ideas and conceptual tools, and construct theories and explanations. However, there is no single sequence of (practical, conceptual or logical) activities that will unerringly lead them to valid claims, let alone 'certain' knowledge.
Scientific theories	Scientific theories are well-established, highly substantiated, internally consistent systems of explanations, which (a) account for large sets of seemingly unrelated observations in several fields of investigation, (b) generate research questions and problems and (c) guide future investigations. Theories are often based on assumptions or axioms and posit the existence of non-observable entities. Thus, direct testing is untenable. Only indirect evidence supports and validates theories: scientists derive specific testable predictions from theories and check them against observations.
Scientific laws	In general, laws are descriptive statements of relationships among observable phenomena. Theories, by contrast, are inferred explanations for observable phenomena or regularities in those phenomena. Contrary to common belief, theories and laws are not hierarchically related (the naïve view that theories become laws when 'enough' supporting evidence is garnered, or that laws have a higher status than theories).
Social dimension of science	Scientific knowledge is socially negotiated. This should not be confused with relativistic notions of science. This dimension specifically refers to the constitutive values associated with established venues for communication and criticism within the scientific enterprise, which serve to enhance the objectivity of collectively scrutinized scientific knowledge through decreasing the impact of individual scientists' idiosyncrasies and subjectivities.
Social and cultural embeddedness of science	Science is a human enterprise embedded and practiced in the context of a larger cultural milieu. Thus, science affects and is affected by various cultural elements and spheres, including social fabric, worldview, power structures, philosophy, religion and political and economic factors.
Science vs. pseudoscience	Statements trying to distinguish science from other disciplines of inquiry (e.g. religion, philosophy)

Source: Abd-El-Khalick: NOS textbook analysis methods/University of Illinois at Urbana-Champaign: 20 April 2013.

having to infer this crucial distinction from their activities. The scoring rubric is outlined in Table 2.

In using the scoring rubric, all units of analysis, including paragraphs, diagrams, black boxes, tables and captions in the textbook targeting the same NOS aspect, are grouped together and examined holistically for their representation of NOS. The extract from a scoring sheet illustrates the scoring of the 'social and cultural embeddedness' NOS tenet (Figure 1).

Finally, a cumulative score for each textbook was calculated. As individual scores for NOS tenets range from −3 to +3, for the 11 aspects of the NOS, the cumulative score can range from −33 to +33. The higher the cumulative score, the more explicit, informed and consistent is the representation of NOS in the textbook.

Each textbook has four strands, namely, Life and Living, Planet Earth and Beyond, Energy and Change, and Matter and Materials. Life and Living includes topics such as biodiversity, variation, sexual reproduction, photosynthesis, respiration, cells, organs and systems. Planet Earth and Beyond covers the solar system, Milky Way Galaxy, lithosphere and the atmosphere. Energy and Change encompasses sources of energy, types of energy, heat transfer, static electricity, electrical circuits, visible light and forces. Matter and Materials includes properties of matter, mixtures, acids, bases and neutrals, atoms,

Table 2. Scoring rubric.

Points allocated	Description of representation
Three points = Explicit, informed and consistent representation of the target NOS aspect	Explicit statements that convey an informed representation, Consistency across the selected chapters or sections in addressing the target NOS aspect, and Consistency in addressing other directly related NOS aspects.
Two points = Explicit, partially informed representation of the target NOS aspect	Explicit statements that convey an informed, but incomplete representation, and Consistency across the selected chapters or sections in representing the target NOS aspect. An incomplete representation derives from the textbook materials remaining silent in terms of addressing other related NOS aspects that ensure a complete informed representation.
One point = Implicit, informed and consistent representation of the target NOS aspect	An informed representation of the target NOS aspect could be *inferred* from the textbook materials (e.g. relevant explanations, activities, examples, or historical episodes *lacking* structured, reflective prompts or explicit statements), and Absence of other explicit or implicit messages, which are inconsistent with the inferred implicit representation.
Zero points = The target NOS aspect is not addressed	No explicit or implicit treatment of the target NOS aspect, or Not enough materials (statements, examples, historical vignettes, etc.) to make an informed judgment or to convey to the textbook reader a sense about the target aspect of NOS one way or the other.
Negative one point = Implicit misrepresentation of the target NOS aspect	A naïve representation could be *inferred* from the textbook materials.
Negative two points = The textbook materials convey mixed explicit and/or implicit messages about the target NOS aspect	Implicit, informed representations that could be inferred from some parts of the textbook materials are countered by explicit, naïve statements in other parts, or Explicit statements that convey conflicting messages about the same NOS aspect.
Negative three points = Explicit, naïve representation of the target NOS aspect	Explicit statement or statements that clearly communicate a naïve representation of the target NOS aspect.

Source: Abd-El-Khalick: NOS textbook analysis methods/University of Illinois at Urbana-Champaign: 20 April 2013.

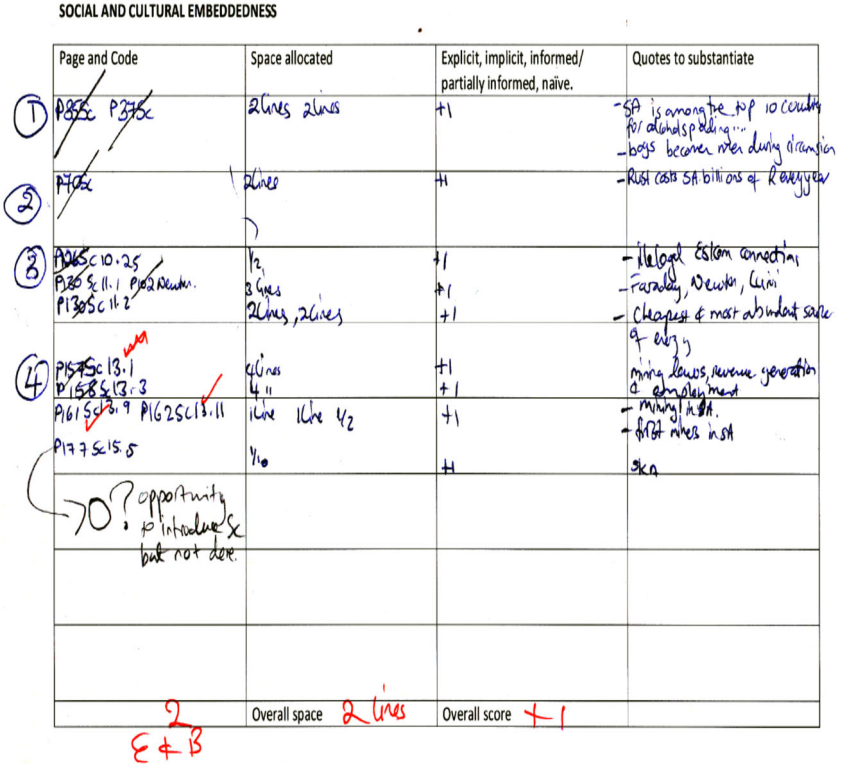

Figure 1. Extract from scoring sheet for 'Social embeddedness' NOS tenet.

compounds, particle model of matter and chemical reactions. A comparison was made between strands to establish the extent to which NOS was represented.

The raters

It should be noted, however, that text analyzed may present a multiplicity of meanings to different researchers which they may interpret differently (Grbich, 2007). In addressing this issue, the textbooks were analyzed independently by three raters following intensive training on the scoring process. All three rates have well-informed views on the NOS. One rater has a Master of Science degree in chemistry, with extensive laboratory project experience. Another rater has been a physics and chemistry teacher for over 10 years. The third researcher has a PhD in science education, and has been lecturing at the post-graduate level on themes on NOS.

Preceding the actual research, it was deemed necessary to conduct a pilot study so as to provide pre-testing of the research instrument. This pilot study also constituted the training for the three raters. For the pilot, a Natural Sciences textbook currently out of circulation was used. This training was conducted to ensure uniform understanding of the application of the analytical instrument for the analysis of the textbooks. The instrument was considered to be user-friendly, and hence it was adopted without any modifications as the analytical framework for the research.

Initially, the raters assessed the textbooks individually and allocated scores for the tenets of NOS that were represented. They supported each score by citing relevant units of analysis. Next, a meeting was convened at which the raters compared and contrasted their scores. The inter-rater reliability was calculated at 84%. The differences in scoring were resolved through discussions and by further reference to the textbook materials until a consensus was reached.

Results

Table 3 presents results on the scoring of the 11 NOS tenets for the three textbooks. This table also provides a representative quote on the unit in order to illustrate the scoring.

The cumulative scores ranged from +4 to +7 out of a possible score of +33. This reveals that all three textbooks poorly portrayed the aspects of NOS. Only three of the NOS aspects were addressed explicitly by all three textbooks, and these were 'empirical', 'tentative' and 'social and cultural embeddedness', while the aspects 'myth of scientific method', 'scientific theories' and 'science vs. pseudoscience' were completely disregarded by all the analyzed textbooks.

The deductive content analysis of the textbooks also revealed the prevalence of NOS aspects. In textbook A, there were 26 occurrences of NOS in 634 pages. Four of the 11

Table 3. Textbook scores on the aspects of NOS.

	Textbook A Score	Textbook B Score	Textbook C Score	Representative quote
Empirical	+1	+1	+1	'The more you observe the world around you, the more you realise that nothing works on its own.' (+1, Planet Earth and Beyond, Textbook B)
Inferential	0	+1	+1	'… we cannot see forces but we can see the results of their action' (+1, Energy and Change, Textbook C)
Creative	+1	0	0	'… discovered how food is digested in the stomach. He dropped food, attached to silk threads, into the stomach of a patient … and examined what happened' (+1, Life and Living, Textbook A
Theory driven	+1	0	+1	'He decided to call the microscopic shapes that he saw in a slice of cork "cells" because the shapes reminded him of the cells that the monks in the nearby monastery lived in.' (+1, Life and Living, Textbook A)
Tentative	+1	+1	+1	'The microscope was improved by … ' (+1, Life and Living, Textbook C)
Myth of scientific method	0	0	0	
Scientific theories	0	0	0	
Scientific laws	+1	0	+1	'the potential difference across a conductor and the electric current are directly proportional (Ohm`s law)' (+1, Energy and Change, Textbook A)
Social dimension	+1	0	0	'The International Space Station (ISS) is situated at 370 km in the thermosphere. This is an international facility in space that is used for research purposes' (+1, Planet Earth and Beyond, Textbook A)
Social and cultural embeddedness	+1	+1	+1	'I would like to adopt a child but my husband wants us to try in vitro fertilisation, but that's so expensive and there is only a 30% chance of success.' (+1, Life and Living, Textbook B)
Science vs. pseudoscience	0	0	0	
Cumulative score	+7	+4	+6	

Table 4. Distribution of NOS aspects across strands.

NOS tenet	Life and Living	Planet Earth and Beyond	Energy and Change	Matter and Materials
Empirical	3	5	0	0
Inferential	0	2	1	9
Creative	1	1	1	1
Theory driven	2	0	0	1
Tentative	8	3	4	0
'Myth of the scientific method'	0	0	0	0
Scientific theories	0	0	0	0
Scientific laws	0	0	5	0
Social dimensions of science	0	2	0	1
Social and cultural embeddedness of science	4	3	0	0
Science vs. pseudoscience	0	0	0	0
Total	18	16	11	3

tenets (inferential, myth of the scientific method, scientific theories and science vs. pseudoscience) were not represented. The 'tentative' NOS was revealed in 11 instances, whilst the 'theory driven' and the 'social dimensions of science' appeared only once. In textbook B, there were 12 occurrences of NOS aspects in 346 pages. In particular, the 'creative', 'theory driven', 'myth of the scientific method', 'scientific theories', 'scientific law' and 'science vs. pseudoscience' NOS tenets are not represented at all in textbook B. The 'empirical', 'inferential' and 'social and cultural embeddedness' NOS aspects are portrayed equally in three instances, whilst the 'tentative' tenet is displayed in only two instances. Textbook C represents NOS 10 times in 180 pages. Out of a possible total of 11 tenets of the NOS, only 6 are represented and these are 'empirical', 'inferential', 'theory driven', 'tentative', 'scientific laws' and the 'social and cultural embeddedness of science'. The 'tentative' NOS aspect was displayed three times in the entire book, whilst the 'empirical' and the 'social and cultural embeddedness of science' were found in two instances. 'Scientific laws', 'empirical' and 'theory driven' each featured only in one instance. It is clear that in relation to the number of pages, all three textbooks show a relatively small occurrence of NOS aspects.

Table 4 shows the distribution of the NOS aspects across the four strands in the three textbooks.

It is evident from this result that the strand 'matter and materials' has the least representation, while the other strands although having a higher representation are poorly represented.

Discussion

The analysis revealed that all textbooks poorly depict NOS, and in particular, there was scant attention given to the social dimension of science, science versus pseudoscience and the 'myth of the scientific method'. The findings of this study are incommensurate with the strong emphasis in a reformed school science curriculum that underlies the need for learners to understand the scientific enterprise, and how scientific knowledge develops. Textbooks are considered to play a pivotal role in driving such reform, especially in a climate where teachers reportedly have a limited capacity to design curriculum material.

The three textbooks analyzed were at the Grade 9 level. Grade 9 is a crucial year for learners in South Africa as it is an exit year from science for those who will not select science in the Further Education and Training (FET) phase. Given the role of the textbook in science learning, it is quite conceivable that these learners will not have acquired an appreciation of the NOS or its importance. It has already been pointed out that an understanding of NOS is indispensable in promoting the development of scientifically literate citizens who are empowered to make informed decisions on issues related to science and technology. The findings of this study therefore highlight a serious deficit in the science education of learners in a crucial phase of their schooling.

Furthermore, the findings of this research cohere well with another South African study by Padayachee (2012) on the analysis of Life Sciences textbooks that were used in the FET phase. Similarly, it was found that these textbooks are silent on keys aspects of the NOS. This situation is not peculiar to South Africa but is also manifested in textbooks in other countries where research conducted on the analysis of science textbooks shows that all aspects of the NOS are not sufficiently addressed (Abd-El-Khalick, Waters, & Le, 2008; Chiappetta & Fillman, 2007; Lumpe & Beck, 1996; McComas, 2003).

The limited emphasis given to the tenets of the NOS possibly could be attributed to the authors of the textbooks not inferring the importance of the NOS from the curriculum documents. In view of this, the findings of this research reinforce the need for a review on the mandate given to textbook publishers and writers so that a stronger focus be placed on the development of materials that better represent the tenets of NOS.

While it is acknowledged that well-informed teacher conceptions of NOS are indispensable for teaching of NOS, this is insufficient because it does not necessarily impact on classroom practice (Lederman, 1999). Amongst other factors such as priority given to NOS as a learning goal, teacher perceptions of learner interest, and situational and contextual factors, teachers struggle to translate their understanding of NOS into instructional practice (Abd-El-Khalick, Waters, & Le, 2008) due to a lack of pedagogical knowledge on how to achieve this. According to Lederman and Lederman (2014), research acknowledges the importance of an explicit and reflective instructional approach in addressing the tenets of NOS in the classroom. They state that this is an approach that makes aspects of NOS 'visible' through hands-on activities and discussions. The authors contend that this form of instruction, given the textbook dependency of South African sciences teachers, can be supported if textbooks more effectively represent the NOS aspects in activities.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Umesh Ramnarain is a professor of science education in the Department of Science and Technology Education, Faculty of Education at the University of Johannesburg in South Africa. He is an established researcher on the nature of science and inquiry-based science education at the school level. He has many publications in high impact factor science education journals, and his work has also been disseminated at international conferences.

Tarisai Chanetsa teaches Mathematics and Physical Sciences at a high school in Johannesburg, South Africa. She is interested in teacher development and is pursuing a PhD study that focuses on the nature of science and the professional development of teachers.

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