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A content analysis of presentations of electrostatics in South African upper secondary school textbooks

Lycoudi, Maria

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ABSTRACT

The reality of South African education leaves little doubt that the school science textbook is the primary means by which the 'what is taught and learnt' in science classrooms is determined. Reports from different countries suggest the same trait. The possibility that not all learners' 'naïve ideas' originate in everyday life has also emerged in the literature along with allusions to the quality of textbooks. If school textbooks are to be blamed, even partially, for learners' naïve ideas, a systematic analysis of their subject content becomes requisite.

The present study is a systematic content analysis of presentations of foundational aspects of Electrostatics, in approved South African physical sciences textbooks in use after the first democratic elections of 1994, thus representing and addressing three curricula school education has gone through since. The study was perceived as a first step to an anticipated analysis of the entire topic Electromagnetism to which Electrostatics is part of, given its difficulty as has been widely reported in the literature and its status in school curricula. Using the conceptual framework of the Classical Electromagnetic Theory, six foundational aspects of Electrostatics were demarcated for the analysis, targeting the concept charge, its origins, transfer and conservation, the distinction between conductors and insulators, the attraction between charged and uncharged objects, as well as global perceptions of Electrostatics and its place within Electromagnetism. Categorisation tables with theoretically grounded indicators were developed as the primary constructs against which texts were analysed, but inductive categorisation tables emerged from the texts as well. An additional construct was necessitated and developed, the "Organisation of the science educator's thought", based on the notion of a scientific explanation and the nature of scientific models, for analysing links between macro and micro.

The analysis revealed that the subject matter content of Electrostatics in South African textbooks is of major concern, giving learners no reason to make sense or develop an appreciation for science, physics in particular. In fact it is not science.

The analysis suggests that the long lists of problems revealed, have their origin in two main drawbacks: Firstly, inadequate author understanding of the concept *charge*, disregarded or misused in the texts, and secondly, author unawareness of the inferred nature of science models, affecting purpose of accounts, explanations and reasoning. Furthermore, certain