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Modes of reasoning in explanatory texts and worked out examples on Linear Functions in two Grade 9 Mathematics textbooks

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Abstract

Mathematical reasoning is argued to be amongst the important learning goals (for instance, problem-solving, communicating mathematically and mathematical language) that should be learned across all grades. This research uses qualitative and textbook content analysis method to study reasoning opportunities in expository texts in two Grade 9 Mathematics textbooks on linear functions. Furthermore, the extent to which the modes of reasoning made available for learners to develop mathematical reasoning is explored.

The theoretical framework of this research is developed from the amalgamation of the following theoretical frameworks: modes of reasoning, multiple representational translations model and components of functional grammar analysis. In accordance with the developed theoretical framework, the findings reveal that the modes of reasoning through deduction are dominant across the two textbooks. Moreover, deduction using a specific case is dominant amongst the identified modes of reasoning that are deductive. It has been argued that modes of reasoning that are deductive have intentions that are intrinsic to mathematical reasoning. However, they can lead to learning without meaning since they are characterised by algorithms that are often difficult for learners to learn from.

Nonetheless, the two textbooks employ textual explanations that supplement the algorithms by explaining the mathematical principles using the everyday language. The *Mind Action Series* (MAS) textbook uses representational translations that encourage aspects of mathematical reasoning such as pattern discovery and interpretation of graphs. On the contrary, the *Platinum* textbook overlooks this aspect, and presents representational translations that encourage procedural computation. However, textual explanations in the *Platinum* textbook consider learners as active participants in doing mathematics, while the MAS does not highlight this aspect. The two textbooks, thus, display differing strengths and weakness to fulfill the desired mathematics reasoning.