



## Exploring Visual Representations of Multiplication and Division in Early Years South African Mathematics Textbooks

Tammy Booysen  
Rhodes University  
<t.booysen@ru.ac.za>

Lise Westaway  
Rhodes University  
<l.westaway@ru.ac.za>

Early years mathematics textbooks are support material for teachers and learners as they contain visual representations which communicate and clarify mathematical concepts. There seems to be a reliance on textbooks amongst teachers in South Africa as they assist in providing pedagogic content knowledge.

A visual representation has the ability to assist learners in making connections between and across mathematics concepts (Presmeg, 2006). The visual representations in a textbook may assist non-expert readers in understanding a mathematical concept (Fotakoupoulou & Spiliotopoulou, 2008). The research from which this paper emerged was a document analysis of multiplication and division visual representations in early years South African textbooks (Grade 1-3).

The framework used to analyse the visual representations was the Visual Representation Framework by Fotakoupoulou and Spiliotopoulou (2008). The framework examines the type of VR, the relation to content, the relation to reality, the function of the visual representation and the dimension of the visual representation. For the purpose of this paper, I only focused on the type and function of the VR. The type of VR refers to the nature of the visual representation whether it is an image, numberline, multiplication grid, equal groups, array, table, graph, function diagram, unifix cubes, beads or counters.

The function of a visual representation refers to the purpose of the visual image and its relation to what is taught. The different functions include a decorative function, explanatory function, exemplifying function, complementary function and organising function. A decorative function is a visual representation that serves aesthetic purposes. An explanatory function assists in expanding the concept to assist learners in completing the exercise. An exemplifying function provides an example of how to solve the problem. A complementary function is a visual representation accompanying the exercise to be completed. It provides the learner with additional information that might not be required to solve the problem. An organising function assists the learner in structuring their thought processes (Fotakopoulou & Spiliotopoulou, 2008).

The findings indicate that the most dominant type of visual representations across all three textbook series and all three grades are equal groups and majority of visual representations have an exemplifying function.

### References

- Fotakopoulou, D., & Spiliotopoulou, V. (2008). Visual representations in secondary school textbooks of economics. *Paper presented at the Conference on Applied Economics - ICOAE School of Pedagogical and Technological Education (A.S.P.E.T.E.)*, Division of Patras: Patras
- Presmeg, N. (2006). Research on Visualization in Learning and Teaching Mathematics. *Handbook of Research on the Psychology of Mathematics Education*. [https://doi.org/10.1163/9789087901127\\_009](https://doi.org/10.1163/9789087901127_009)