Using a Visual Representation Framework with Pre-Service Teachers to Analyse Place Value Representations

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Numerous studies in teacher education programmes have revealed that pre-service teachers do not have sufficient knowledge to teach primary school mathematics (Taylor, 2021). For example, pre-service teachers enter their mathematics education courses with knowledge of how to implement the standard written algorithm with little conceptual place value knowledge (Fasteen, et al., 2015). Place value helps learners understand the position and value of the number (Kortenkamp & Ladel, 2014). Considering the difficulties of PV for learners, visual representations should assist in developing their understanding of PV (Ainsworth, 2006).

VRs assist learners in understanding and interpreting concepts, and they transmit information in an aesthetically pleasing way (Arcavi, 2003). When selecting textbooks, it is important to pay attention to the quality of the learning opportunities in the text and whether the teaching and learning activities are based on the prescribed curriculum. Much research has been done on the content of texts, however, there is little research that focuses on analysing the appropriateness of the visual representations in texts (Mathews et al., 2014). This research aims to assist pre-service teachers in choosing suitable visual representations when teaching place value using a visual representation framework. The above has led to the following research question: *How might (or not) a Visual Representation Framework assist pre-service teachers in analysing and selecting visual representations from texts for teaching place value?*

This research explores how a visual representation framework can assist pre-service teachers in analysing textbook visuals. The data collection includes document analysis, observations, task analysis, reflections, and interviews. The research consists of three phases: Phase 1 focuses on developing a Visual Representation Framework for analysing PV visual representations. Phases 2 and 3 focus on the use of the VRF to assist pre-service teachers' in analysing and selecting visual representations for teaching PV. The Artifact-Centric Activity Theory (ACAT) will be used to analyse the data (Larkin et al., 2019).

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