Exploring Using the Empty Number Line for Enhancing Pre-Service Teachers' Mental Computations

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This short communication shares the preliminary stages of a study exploring pre-service mathematics teachers' (PSTs) use of the empty number line (ENL) as a strategy for performing and teaching mental computations. As part of a broader South African project—Mental Mathematics Work Integrated Learning (MM-WiL) (Graven & Venkat, 2023)—the intention of this study will be to answer the research question:

- In what ways can the empty number line enhance mathematics PSTs' confidence and competence in performing and teaching mental computation strategies?

Evidence from international and local studies shows that the mathematics knowledge and number sense of many PSTs globally is limited (e.g., Aktaş & Özdemir, 2017; Bowie et al., 2019). Such limitation consequently results in negatively affecting learners. The study is, therefore, framed by Ball et al.'s (2008) Mathematical Knowledge for Teaching. One useful tool to support number sense development and mental calculation strategies is the empty number line. The ENL is a visual representation, with no numbers or unit markers, used for supporting mental computations of addition and subtraction. Bobis (2007) and van den Heuvel-Panhuizen (2008) caution against using the ENL rigidly as a procedural tool, but rather encourage its use as a flexible strategy. The MM-WiL programme's use of the ENL is thus appropriate for supporting participating PSTs' mathematical knowledge.

In my presentation I will share some guiding literature on the ENL from leading authors working from Australian, Dutch and South African perspectives. I will outline aspects of my intended mixed methods research design for the study. I will include in the design collecting pre- and post-test data from my participating PSTs, plus their responses to in-depth interviews and their written reflections on the various micro-teaching opportunities they will have been exposed to as part of the MM-WiL project. As this study is in its initial stages, I welcome engagement with fellow researchers on the research design.

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