

# **A Cognitive Neuroscientific Approach: Teaching Mental Calculation Strategies to Grade 4 Learners to Improve Number Sense**

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## **Abstract**

Mathematics teachers in South African primary schools teach mental calculation with little impact on the learners' conceptual knowledge development of number sense. A number of approaches have been used to assist learners to developing number sense, and most of these approaches seem unsatisfactory. This study sought to prepare mathematics teachers to use a cognitive neuroscience approach to teaching mental calculation strategies in order to improve Grade 4 learners' number sense by involving emotion and motivation to impact on the learning and teaching of numbers. Making use of a qualitative research approach, this participatory action research design involved two purposively selected Grade 4 mathematics teachers. The two teachers interacted closely with the learners in two urban schools, and taught bridging through 10 as a mental calculation strategy based on insights and contributions from cognitive neuroscience. Data were from the Ballard One-Minute Addition Test, a forum with the learners, as well as a forum with the teachers and were thematically analysed for each instrument. The themes from each instrument were triangulated to find common, different, and specific themes. The findings revealed that teaching using a cognitive neuroscience approach improved the number sense of the Grade 4 learners. The recommendation is that teachers need a cognitive neuroscience approach to teach number sense through the mental calculation strategies by involving emotion and motivation.

**Keywords:** Cognitive neuroscience, emotion, mental calculation strategies, motivation, number sense