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TRANSLATING EQUATIONS AND INEQUALITIES: FROM VISUALLY SUPPORTED PROBLEMS TO ALGEBRAIC SYMBOLISM

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Within the context of a design research teaching experiment focused on students' development of algebraic thinking, we attend to the structures that 3rd and 4th grade students show when translating equation and inequation problems stated with visual support into algebraic symbolism. Referring to and generalising structure are our focuses as components of algebraic thinking (Kieran, 2022) which have proven to have an impact in promoting students' success in mathematics as well as into their preparation for the later study of formal algebra (Blanton et al., 2018).

We qualitatively analysed the written responses and oral discussions carried out by 51 students when solving an equation problem and an inequality problem. Subsequently, we conducted semi-structured interviews to 12 of these students when solving other similar problems. From the answers obtained, we analysed the structures perceived by the group. The results inform of the elements that students included in their expressions: relationship of equality and inequality, indeterminate quantities, the use of operations, as well as the composition, decomposition, and re-composition of numbers. They perceived and expressed multiple structures and equivalences between them, both for equations and inequalities, and reasoned about the equivalence of structures. Differences between the case of equations and inequations reveal difficulties to be addressed in teaching. The role of visual aids is highlighted as a way to contribute to facilitate structural reasoning even without specific instruction. It was a key element in recognising the equivalence of different symbolic representations of a problem.

Additional information

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