

Change in Primary Students Algebraic Functional Thinking

Bridget Wadham

Massey University

b.wadham@massey.ac.nz

Emily Pearce

Massey University

e.pearce1@massey.ac.nz

Within Level Two of the New Zealand Curriculum (MOE, 2007) students aged 7-9 years are expected to ‘Find the rule for the next member in a sequential pattern’. Despite this requirement, many teachers continue to place importance on developing number knowledge at the expense of developing deep understandings across the content strands of algebra. This results in algebra being an area of weakness for New Zealand students and a declining number of students selecting algebra pathways in high school. Researchers are now at an increasing rate, recognizing the importance of providing young students with the opportunity to explore and develop functional thinking from the start of their formal schooling journey (Chimoni et al., 2018), with the view that this will aid the struggles and lack of success many students face when they encounter algebra for the first time in high school (Blanton et al., 2017).

We will present the initial findings of a study focused on how students’ functional reasoning changes over a five-week algebraic patterning teaching unit. The student participants (n=85) aged 8-9 years old completed a pre and post open-response task (based on the linear function $4x+1=y$). Drawing on Stephens et al., (2017) framework for Levels of Sophistication and the New Zealand Curriculum (Ministry of Education, 2007) students’ responses were coded and analysed to identify common themes. A key finding shows a shift from mainly pre-structural and variational thinking (pre-unit) to differing levels of correspondence thinking (post-unit). Other key themes evident include the remediation of the assumption of proportionality, changes in representations to structured diagrams to show variables, and the use of natural language to explain and apply emerging functional rules.

References

- Blanton, M., Brizuela, B. M., Gardiner, A. M., Sawrey, K., & Newman-Owens, A. (2017). A progression in first-grade children’s thinking about variable and variable notation in functional relationships. *Educational Studies in Mathematics*, 95, 181-202.
- Chimoni, M., Pitta-Pantazi, D., & Christou, C. (2018). Examining early algebraic thinking: Insights from empirical data. *Educational Studies in Mathematics*, 98, 57-76.
- Ministry of Education (2017). *New Zealand curriculum*. Wellington: Learning Media. <https://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum>
- Stephens, A. C., Fonger, N., Strachota, S., Isler, I., Blanton, M., Knuth, E., & Murphy Gardiner, A. (2017). A learning progression for elementary students’ functional thinking. *Mathematical Thinking and Learning*, 19(3), 143-166.

(2023). In B. Reid-O’Connor, E. Prieto-Rodriguez, K. Holmes, & A. Hughes (Eds.), *Weaving mathematics education research from all perspectives. Proceedings of the 45th annual conference of the Mathematics Education Research Group of Australasia* (p. 603). Newcastle: MERGA.