# Mathematical Thinking in Primary School Students: The Relative Contribution of Student and Teacher Characteristics

Erin Mackenzie
*Western Sydney University*
e.mackenzie@westernsydney.edu.au

Nathan Berger
*Western Sydney University*
n.berger@westernsydney.edu.au

Matt Thompson
*Western Sydney University*
matt.thompson@westernsydney.edu.au

Kathryn Holmes
*Western Sydney University*
k.holmes@westernsydney.edu.au

The development of a strong foundation in primary mathematics is viewed as a critical outcome of schooling (Goos & Kaya, 2020), contributing to students' future achievement in mathematics (Siegler et al., 2012). While there are many factors that may influence children's achievement in mathematics, their enjoyment of mathematics and their teacher's pedagogical decisions when teaching mathematics are of particular interest, due to their malleability (and opportunity for intervention). Whether the relative importance of these factors in predicting children's mathematical thinking changes over the primary years is relatively underexplored, however.

In this study, we examined three waves of data from the Kindergarten cohort of the Longitudinal Study of Australian Children. The data were collected in 2006, 2008, and 2010, when the children were in Stage 1, 2, and 3 respectively. In each wave, children ($n$ = 4464) were asked about their enjoyment of learning mathematics, and each child's teacher completed a measure of the child's level of mathematical thinking. Teachers also reported their approach to teaching mathematics, use of ability groupings to teach mathematics, and teaching self-efficacy.

Regression models predicting mathematical thinking were conducted for each Stage. Findings suggest that student gender was not a significant predictor of mathematical thinking in any Stage. In all Stages, there was a positive relationship between children's enjoyment of mathematics and their mathematical thinking. Similarly, teacher self-efficacy was positively related to children's mathematical thinking in all Stages. All other teacher variables differed in their relationship with children's mathematical thinking across the Stages. Teachers' frequency of use of ability groupings to teach mathematics was positively related to children's mathematical thinking in Stage 1, but not Stage 2 or 3. Conversely, teachers' emphasis on talking about and solving mathematical problems (rather than on learning rules, facts, and procedures) was positively related to children's mathematical thinking in Stage 3, but not Stage 1 or 2. These findings emphasise the importance of children's enjoyment of mathematics and teacher self-efficacy, while also pointing to differences in how teaching strategies predict mathematical thinking across the primary years, offering opportunities for targeted intervention strategies.

## References

Goos, M., & Kaya, S. (2020). Understanding and promoting students' mathematical thinking: A review of research published in ESM. *Educational Studies in Mathematics, 103*, 7–25. https://doi.org/10.1007/s10649-019-09921-7

Siegler, R. S., Duncan, G. J., Davis-Kean, P. E., Duckworth, K., Claessens, A., Engel, M., Susperreguy, M. I., & Chen, M. (2012). Early predictors of high school mathematics achievement. *Psychological Science, 23*(7), 691–697. https://doi.org/10.1177/0956797612440101

(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. 588). Newcastle: MERGA.