



## Supporting 5 Year Olds to Represent their Mathematical Reasoning

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Mathematical representations are a powerful way to demonstrate reasoning and understanding. For young learners entering school at five, learning how to accurately represent their mathematical thinking requires teacher support. Our investigation examined how young students in New Zealand at the beginning of school could be supported to develop mathematical representations. We focused on a group of ten five-year-old learners during their first seven formal school mathematics lessons. Lessons were video and audio recorded and wholly transcribed to allow for thematic analysis (Clarke & Braun, 2017). The students worked on an algebra patterning unit requiring them to develop more sophisticated understanding of patterns through the sequence of lessons.

Each lesson followed a similar structure, firstly, the teacher launched a patterning task followed by paired work, a large group discussion, and in the conclusion of the lesson student reasoning was connected to mathematical ideas. Students were given multiple opportunities to ask and answer questions about their own and others' thinking. The teacher used a range of pedagogical actions. This included explicitly voicing high expectations for students to work together on the mathematical task. While they worked, she observed closely, paying attention to the students' reasoning and drawing on their reasoning to build and extend everyone's understanding. The teacher provided consistent exposure to multiple mathematical representations and opportunities for the students to explore these. The teacher carefully scaffolded new learning by explicitly modelling how to transfer the concrete representations the students had shared to visual drawn representations. After modelling, the teacher expected all students to represent through materials and drawing in the following lesson. The teacher reinforced students' ideas with constant positive praise and public naming of representations such as "wow, I love how you have represented your pattern". During each lesson, the teacher demonstrated another way to represent their patterns, using drawings, letters and equations. Subsequently in the seventh lesson, when students were asked to predict further points in their pattern, the teacher used an open prompt "represent your thinking". At this point, some pairs choose to use numbers and blocks to represent and others represented using letters (see article for images). The responsive teacher actions had supported five-year-olds to build and extend their algebraic reasoning to use sophisticated representations.

### References

Clarke, V., & Braun, V. (2017). Thematic analysis. *The Journal of Positive Psychology*, 12(3), 297–298.  
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For more information, please refer to the following paper presented at the 47<sup>th</sup> Annual Conference of MERGA in July 2025.  
 Pearce, E., Leach, G., & Hunter, J. (2025). Supporting 5 year olds to represent their mathematical reasoning. In S. M. Patahuddin, L. Gaunt, D. Harris & K. Tripet (Eds.), *Unlocking minds in mathematics education. Proceedings of the 47th annual conference of the Mathematics Education Research Group of Australasia* (pp. 357-364). Canberra: MERGA.