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Students' use of variables and multiple representations in generalizing functional relationships prior to secondary school.

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Summary: Algebra has been explicit in many school curriculum programs from the early years but there are competing views on what content and approaches are appropriate for different levels of schooling. This study investigated 12–13-year-old Australian students' algebraic thinking in a hybrid environment of functional and equation-based approaches to learning algebra. This article reports on a survey of 102 students examining their generalization ability and knowledge of multiple representations and variables prior to formal study of algebraic expressions and equations at secondary school. Nearly half of the students demonstrated the ability to generalize explicitly with one fifth able to construct a symbolic functional rule. Nearly half were able to represent a real-life scenario of a linear relationship algebraically. There was little evidence yet of connecting a growing pattern or real-life scenario to an appropriate graphical representation. Level of pattern generalization ability was found to be associated with flexible thinking for exploring functional relationships in reverse and with explaining the inappropriateness of proportional reasoning for linear functions with a constant. Implications for the teaching and learning of algebra are presented.

Classification: H23 H33 C33

Keywords: algebra teaching and learning; functional thinking; multiple representations; variables; middle years of schooling

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