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Developing procedure and structure sense of arithmetic expressions.

Chick, H. L. (ed.) et al., Proceedings of the 29th annual conference of the International Group for the Psychology of Mathematics Education, PME 29, Melbourne, Australia, July 10–15, 2005. Vol 1-4. Melbourne: University of Melbourne, Dep. of Science and Mathematics Education. Part II, 121-128 (2005).

Summary: This paper describes sixth grade students' performance in tasks related to arithmetic expressions in the context of a design experiment aimed at developing a principled approach to beginning symbolic algebra. This approach, which is centered on the concept of 'term', is described elsewhere. In the paper, students' performance in two kinds of tasks over items that test procedural knowledge and items that test structural understanding is examined. We address questions of consistency in the use of procedures in different task items, and the transfer of procedural knowledge to the more structure-oriented items. The data shows that the relation between procedural knowledge and structural understanding is complex. Developing a structural understanding of expressions requires the consistent use of the procedures and rules in various situations/ contexts and making sense of the relationships between the components of the expression. We cite some preliminary evidence in favour of the effectiveness of the structure-oriented approach both in strengthening procedural knowledge and structural understanding.

Classification: F33 H23 C33 A63

Keywords: arithmetic expressions; beginning symbolic algebra; procedural knowledge; structural understanding; grade 6; lower secondary; student observation

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