

MATHEMATICS TEACHERS' KNOWLEDGE OF STUDENTS' UNDERSTANDING OF ALGEBRAIC EXPRESSIONS AND EQUATIONS

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Middle school is a transition from concrete arithmetic operations to more abstract algebraic reasoning procedures. At this level of schooling, it is crucial to unpack teachers' thoughts about students' conceptions, difficulties, and errors to determine the gaps in teaching algebra, as well as to determine professional development needs. This study aims to contribute to the existing literature by focusing on teachers' knowledge of students' conceptions, difficulties, and errors in algebra (Asquith et al., 2007).

The purpose of this case study was to explore five middle school mathematics teachers' knowledge of students' understanding of algebraic expressions and equations. For this purpose, first, the researchers prepared an Algebra Diagnostic Test (ADT), then semi-structured interviews were done with mathematics teachers, where they were asked to predict and elaborate on their students' possible difficulties in ADT. Finally, ADT was administered to 267 eighth-grade students who were the students of those teachers interviewed. Students' responses in ADT were analyzed by coding their difficulties, conceptions, and strategies. Then, the findings of actual student responses were compared with teachers' predictions stated in the interviews.

Results indicated that teachers' predictions of students' understanding corresponded with students' actual responses in simple arithmetic and algebraic operations and doing simple transformations from arithmetic to algebra. However, teachers' predictions were not compatible with students' actual responses in more abstract and complex procedures, such as comparing two algebraic expressions and writing an algebraic expression of a word problem. Although teachers rarely identified some of the difficulties and errors about variables, they generally focused on using x to manipulate symbols rather than considering the abstract and complex meaning of x . The results will be provided with specific examples of students' responses and teachers' quotes.

References

Asquith, P., Stephens, A. C., Knuth, E. J., & Alibali, M. W. (2007). Middle school mathematics teachers' knowledge of students' understanding of core algebraic concepts: Equal sign and variable. *Mathematical Thinking and Learning*, 9(3), 249-272. <https://doi.org/10.1080/10986060701360910>