

IN THE TRANSITION FROM ARITHMETIC TO ALGEBRA: MISCONCEPTIONS OF THE EQUAL SIGN

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Students in elementary grades encounter the equal sign but many misunderstand its meaning (Behr, Erlwanger, & Nichols, 1980; Falkner, Levi, & Carpenter, 1999). Following early algebra researchers' recommendations of smoothing the transition from arithmetic to algebra, we focus on the understanding of the equal sign as one of the keys in the development of mathematical and particularly algebraic thinking. This understanding enables to employ relational thinking where students look across the equal sign at relationships between numbers to solve equations, as in $8 + 4 = _ + 5$.

In our study, we analyzed the understanding of the equal sign in two groups of 3rd graders (n=15) and 5th/6th graders (n=26), paying attention to any evidence of the use of relational thinking. Open number sentences, such as $14 + _ = 13 + 4$ and $_ = 25 - 12$, were proposed to the students. In the 3rd grade group, different reactions depending on the structure of the sentence were encountered. The necessity of equivalence between both sides of the equal sign was not recognized and the equal sign was mainly considered as an order to perform an operation. A wide variety of responses was encountered in the sentences where this conception was more difficult to apply, (e.g. $12 + 7 = 7 + _$ and $14 + _ = 13 + 4$). The kind of wrong responses given, students' comments and the multiple answers to the sentence $12 + 7 = 7 + _$ suggested that students were not using relational thinking.

In the 5th/6th grade group, most responses were correct and some use of relational thinking may be inferred from the wrong answers. Notable difficulties were observed in the subtraction sentence which could result from the greater complexity of applying relational thinking in subtraction contexts. The better performance of this group, not observed in other studies, may be a consequence of some (Socratic) instruction these students received from a university mathematics teaching group during the month previous to the study.

References:

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