

Sidney, Pooja (2016). Does New Learning Provide New Perspectives on Familiar Concepts? Exploring the Role of Analogical Instruction in Conceptual Change in Arithmetic.

Abstract

Do analogies made between familiar concepts and novel concepts cause conceptual change in children's prior knowledge, in addition to supporting new learning? The development of children's mathematics knowledge is often characterized as building new knowledge using children's prior knowledge as a foundation for learning. The work explores an alternative hypothesis, that children's prior arithmetic knowledge becomes reorganized as they gain more arithmetic experience. Furthermore, this work explores whether analogical instruction, either with an explicitly guided or implicitly primed analogy, can catalyze such a conceptual reorganization. In Study 1, 5th, 6th, and 8th grade children and undergraduate students completed a series of tasks designed to measure the mental organization of their arithmetic knowledge. Younger students were more likely to demonstrate knowledge organized by number type, believing that fraction arithmetic problems belonged in a different category than whole number arithmetic problems. In contrast, older students were more likely to demonstrate knowledge organized by operational structure. Thus, the findings suggested that students' arithmetic knowledge does undergo a conceptual reorganization across development. In Study 2, 6th grade students viewed a lesson about a novel fraction division concept that either included analogical instruction or additional fraction division instruction. Two types of analogy were tested: an explicitly guided analogy or an implicitly primed analogy. Neither analogy condition affected students' knowledge organization. Children who received the implicit analogy had the greatest learning. Study 2 suggests that a brief instructional analogy does not result in dramatic conceptual change for most children. Furthermore, activating children's knowledge of structurally-similar, familiar problems before instruction is more beneficial than either drawing an explicit teacher-led analogy or providing greater instruction on the target concept.