Relatively few studies have examined preschool children’s concepts and learning in science domains that are generally assumed to require deliberate instruction. This presentation examines preschoolers’ understanding of and learning about light and shadows—a topic that has been demonstrated to involve conceptual change among older students. Well into the elementary school years, children typically view a shadow as a semi-material property or extension of the object that casts it, rather than understanding a shadow as a phenomenon that results when an opaque object blocks light from reaching a surface (e.g., Brickhouse, 1994; Feher & Rice, 1988; Fetherstonhaugh & Treagust, 1992; Guesne, 1985). School-age children strongly expect shadows to resemble the associated object and may view light as incidental or peripheral to the shadow’s “existence.”

We present a study comparing children in a preschool classroom (n = 11, mean age 4;7) who completed an extended series of investigations of light and shadows to a control classroom (n = 7, mean age 5;1) in the same school. This study asks, first, whether preschoolers show the same conceptual misunderstandings of shadows as have been documented in older children, and, second, whether structured learning experiences are effective in helping preschoolers understand light-blocking as the mechanism that produces shadows. In other words, is conceptual change in some areas of science a plausible goal for a preschool science program?

Children from both classrooms were tested individually in a procedure in which they were shown models (two-dimensional cardboard figures of familiar shapes) in a shadow-making set-up and were asked to judge whether various designs of light and dark could be created with each model. Models included solid forms, open stencils (in which the shape was cut out leaving an opening surrounded by a solid frame), and a solid item with a prominent feature printed on the surface.

Across the entire set of items, children who consistently make judgments on the basis of shape and feature resemblance, children who have either a strong “yes” or “no” bias, children who believe all “shadows” should have a dark central shape, and children who are making random guesses would show response patterns that yield about 4 or 5 correct answers out of 10 possible. In contrast, scores in the higher range indicate attention to how different models interact with light.

Instructed children scored significantly higher than control children, with respective mean scores of 6.2 versus 4.0 out of 10 (t (16) = -2.378, p = 0.030). As the graph below illustrates, no child in the control group scored more than 5 points, and six out of eleven children in the intervention group scored 6 or more points, with two children (ages 4;11 and 5;0) achieving perfect scores. A number of children in the instructed group produced explanations based on
light-blocking as the causal mechanism accounting for shadows. In contrast, children in the control group never did so, instead basing their choices on general resemblance or the expectation that all of the shapes on the screen should be dark.

![Number of Test vs. Control Children at Each Score Level on a 10-Pt. Test](image)

**References**


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