Playful Learning: Exploring the Role of Dialogic Inquiry and Exploration in Children's Developing Shape Concepts

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LINK TO PRESENTATION:
Breaking the Mold: Altering Preschoolers' Concepts of Geometric Shapes

Children's early shape concepts represent the building blocks for later mathematical knowledge (Clements & Sarama, 2007). As preschoolers begin labeling shapes in their environment, they must distinguish features and patterns and create abstract categories of each shape. Yet young children find this very difficult! Preschool children start out categorizing shapes by visual similarity and orientation irrespective of geometric properties (Burger & Shaughnessy, 1986). These concepts are global and holistic in nature, in which the most salient shape properties bind together to form an overall feature or a 'gestalt view' of each shape (Ganel & Goodale, 2003; Keil, 1989; Smith, 1989; Tada & Stiles, 1996). For instance, the angle on top of a typical triangle is the most distinguishing feature and thus defines the overall concept for the child (e.g., triangles have a point on top and wide horizontal 'bottoms'). If children see a triangle that is turned on its side or has irregular angles (e.g., obtuse, scalene triangles), they will say it is not a true triangle. Only later do they shift to rule-based classification systems that rely on the *number* of sides or angles for shape identification (Clements, Swaminathan, Hannibal, & Sarama, 1999; Keil, 1989).

In a series of studies we explore how different learning experiences influence children's developing shape concepts. In one such study, we examine how dialogic inquiry (i.e., questions that pose a dilemma/prompt curiosity) and physical exploration influence preschool children's shape learning.

Preschool children were randomly assigned to one of three groups. In guided play, the experimenter helped children 'discover' each shape's features by asking questions and prompting physical exploration of circles, triangles, rectangles, and pentagons (+dialogic inquiry, + physical exploration). In direct instruction, children were taught rule-based classifications for shapes in a passive learning style (- dialogic inquiry, -physical exploration). In the control condition, children participated in a dialogic reading activity for approximately the same amount of time as the shape lessons. To assess shape knowledge, groups were asked to complete a shape sorting task (Satlow & Newcombe, 1998). Children were shown 10 *novel* instances of typical, atypical, and nonvalid forms of each shape (40 total) and asked to place 'real' instances of each shape in a special box and the 'fake' shapes in a trashcan.

To determine the extent children's category decisions were guided by rule-based classification systems versus visual similarities, rates of rejection were calculated across typical, atypical, and nonvalid shapes. As hypothesized, children in the control condition appeared to rely on visual similarity when sorting shapes, signified by small rejection rates of typical shapes and larger rejection rates for atypical and nonvalid shapes (see Figure 1). Conversely, children in both

experimental conditions used rule-based classification systems to sort shapes, indicated by small rejection rates for typical *and* atypical shapes. Also, guided play showed a slight advantage over direct instruction. In Figure 2, guided play and direct instruction appear equal in learning outcomes for simple, familiar shapes (e.g., circles), yet children in the guided play condition showed significantly superior geometric knowledge for a novel, highly complex shape (pentagon).

These results suggest both direct instruction and playful learning approaches promote rule-based shape concepts; however, guided play may be more advantageous for complex concepts. Future research should explore how guided play may facilitate knowledge acquisition and concept formation for complex concepts in other domains. Additional research should explore the differential impact of dialogic inquiry and active exploration on the learning process.

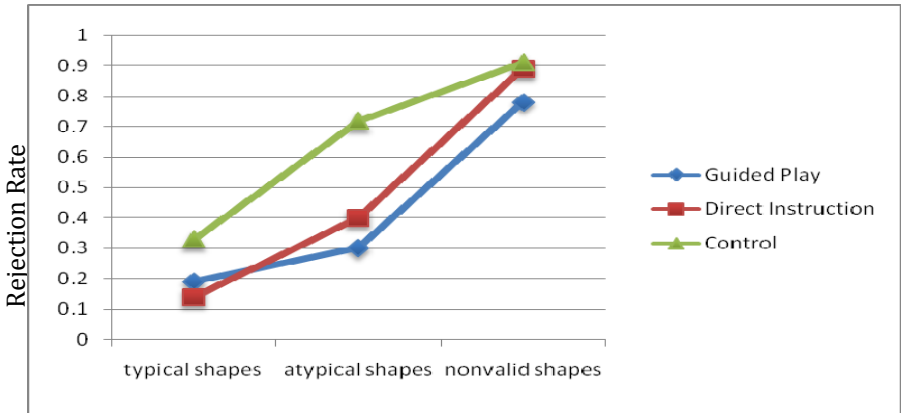

Figure 1. General rejection rates of typical, atypical, and nonvalid shapes across conditions in the shape sorting task.

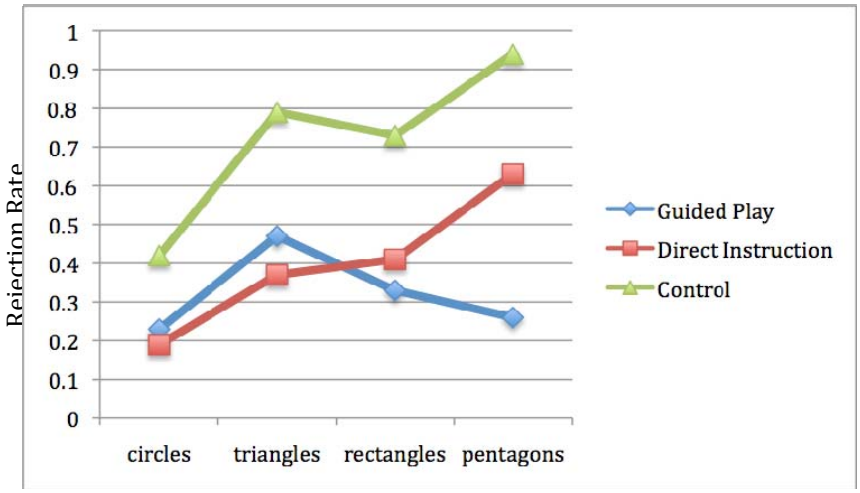

Figure 2. Individual rejection rates for atypical shape types across conditions in the shape sorting task.