directly applies research on making computer software for young children motivating and educationally effective {Clements, 1993; Clements & Swaminathan, 1995). Previous publications provide detailed descriptions of how we applied these research corpora in our design process model (Clements, 2002a, 2002b; Sarama, in press; Sarama & Clements, 2002, in press).

Summative Research Evaluation

Summative research was conducted at two sites, involving the two principal types of public preschool programs serving low-income families, Head Start and state-funded pre-kindergarten programs. At each site, one classroom was assigned as experimental, one control. Mathematics knowledge of all children was assessed at the beginning and end of the school year with two tests, number (counting, number sense, and arithmetic) and geometry (shapes, composing shapes, spatial sense, measurement, and patterning). The *Building Blocks* preschool curriculum was implemented in the experimental classes following the pretesting. This curriculum, a component of the *DLM Early Childhood Express* (Schiller, Clements, Sarama, & Lara-Alecio, 2003), consists of daily activities in four teacher's editions, and a *DLM Express Math Resource Package* (Clements & Sarama, 2003) including computer software, correlated games, activities, and centers, and ideas for integrating mathematics throughout the school day. The software includes 11 activities, each with up to 6 sublevels, and a management system that guides children through research-based learning trajectories.

Results

The results are illustrated in two graphs. We computed effect sizes using the accepted benchmarks of .25 as indicating practical significance (i.e., educationally meaningful), .5 as indicating moderate strength,

Conclusions and Implications

Results indicate strong positive effects of the *Building Blocks* materials, with achievement gains near or exceeding those recorded for individual tutoring. We believe this is the result of implementing a curriculum built on *comprehensive research-based principles*. The materials include research-based computer tools, providing software analogs to critical mathematical ideas and processes. These are used, or implemented, with activities and a management system that guides children through research-based learning trajectories. These activities-through-trajectories connect children's informal knowledge to more formal school mathematics. In addition, such synthesis of curriculum/technology development as a scientific enterprise and mathematics education research reduces the separation of research and practice in mathematics and technology education. Funding from agencies such as the NSF is necessary to carry our such comprehensive research and development projects. We are presently evaluating a large-scale implementation of *Building Blocks*.

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