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Educational effects of the Tools of the Mind curriculum: A randomized trial

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ABSTRACT

The effectiveness of the *Tools of the Mind* (*Tools*) curriculum in improving the education of 3- and 4-year-old children was evaluated by means of a randomized trial. The *Tools* curriculum, based on the work of Vygotsky, focuses on the development of self-regulation at the same time as teaching literacy and mathematics skills in a way that is socially mediated by peers and teachers and with a focus on play. The control group experienced an established district-created model described as a "balanced literacy curriculum with themes." Teachers and students were randomly assigned to either treatment or control classrooms. Children (88 *Tools* and 122 control) were compared on social behavior, language, and literacy growth. The *Tools* curriculum was found to improve classroom quality and children's executive function as indicated by lower scores on a problem behavior scale. There were indications that Tools also improved children's language development, but these effects were smaller and did not reach conventional levels of statistical significance in multi-level models or after adjustments for multiple comparisons. Our findings indicate that a developmentally appropriate curriculum with a strong emphasis on play can enhance learning and development so as to improve both the social and academic success of young children. Moreover, it is suggested that to the extent child care commonly increases behavior problems this outcome may be reversed through the use of more appropriate curricula that actually enhance self-regulation.

1. Introduction

Most children in the United States now attend public or private preschool programs for 1 or 2 years prior to kindergarten (Barnett & Yarosz, 2004). Public investments in preschool education have largely focused on improving the school success of low-income and other children at high risk of school failure. The federal and state governments now invest considerable sums in such preschool programs, motivated by research demonstrating that preschool programs can contribute to impressive short- and long-term gains in cognitive, language, and social-emotional development (Bowman, Donovan, & Burns, 2001). However, many questions remain about the most effective approaches to educating young children, including curricular questions about the appropriate balance of teaching methods and children's experiences, and the knowledge and skills that young children should be expected to learn (Zigler & Bishop-Josef, 2006).

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This study investigates the effects on learning and development of the Tools of the Mind (*Tools*) curriculum, with particular emphasis on self-regulation and emergent literacy. *Tools* is based on a socio-cultural perspective pioneered by Vygotsky (1978) that construes child development to be interactive and constructivist in its orientation (Bodrova & Leong, 2001, 2007). Its design is consistent with the principle that success in preschool is best promoted when children experience environments in which they have an opportunity to be active participants in learning and they are challenged and supported in that learning (Krafft & Berk, 1998). While child-centered, *Tools* also emphasizes the teacher's role in guiding and supporting the child's learning. As we explain below, it does not fit neatly into frameworks that classify curricula as teacher-directed or child initiated, child-centered or content-centered, and academic-focused or socialization-focused.

Our research design employs random assignment of both teachers and students to either treatment (*Tools*) or control (a "generic" district-developed curriculum) conditions. Previous quasi-experimental studies of *Tools* led us to expect that this curriculum would change children's classroom experiences in ways that would improve children's learning and development particularly with respect to emergent literacy and self-regulation (Bodrova & Leong, 2001). Self-regulation has been defined in a variety of ways, but self-regulatory capacity encompasses the ability to control one's physical, emotional, and cognitive functioning (Bronson, 2000). Progress in the development of self-regulation is regarded as "one of the really central and significant cognitive developmental hallmarks of the early childhood period" (Flavell, 1977, p. 64). This experiment was conducted in a low-income urban school district with a high proportion of children from low-income and non-English-speaking families. Such children are especially vulnerable to reading failure and other adverse outcomes if they do not receive high quality education in preschool and later in primary school (Bowman et al., 2001; Snow, Burns, & Griffin, 1998).

We have three primary research hypotheses. First, the *Tools* curriculum will lead to higher quality educational experiences for children, and these should be related to specific *Tools*' curricular emphases including the teacher's use of scaffolding. Second, *Tools* will produce larger gains in children's self-regulation and these gains should be evident in teacher reports of behavior problems (Blair, 2002a,b). Third, *Tools* will produce increases in children's cognitive and language development, especially emergent literacy skills, primarily because of elements of the curriculum directly related to literacy and only secondarily because of its emphasis on self-regulation (Diamond, 2007; Duncan et al., 2006). The comparative advantage for *Tools* over the control curriculum is expected to be greater for self-regulation as the control curriculum also emphasizes literacy development.

2. Literature review

The history of research on preschool curriculum is at once rich and limited. Debates about the appropriate extent of play, teacher directedness, individualization and other differences in curricular approaches span the entire history of early childhood education in the United States (Nourot, 2004). Among the most hotly debated questions are how much classroom time should be devoted to play, and how and to what extent play should be guided (Singer, Golinkoff, & Hirsh-Pasek, 2006). The nature and content of education to support to development of young children's literacy as a means to better prepare them for learning to read is similarly contentious. In a recent debate, the only point of agreement between Whitehurst (2001) and Elkind (2001) was that there is a lack of rigorous research on the relative effectiveness of preschool curricula that would help to resolve these issues. Few studies of curricula have employed random assignment, and non-experimental studies commonly confound curriculum differences with other preschool program characteristics and characteristics of the children attending the programs (Bowman et al., 2001). The U.S. Department of Education funded seven randomized trials to study preschool curriculum in 2002 and another six in 2003. However, few studies using randomized trials to evaluate the effects of curricula have actually been published in recent years (e.g., Assel, Landry, Swank, & Gunnewig, 2007; Domitrovich, Cortes, & Greenberg, 2007).

Among the more noteworthy studies on curriculum are randomized, small-scaled trials, some dating to the 1960s and 1970s, comparing the effects of well-specified alternative models on children's learning and development with long-term follow-up. These studies compared: Direct Instruction, High/Scope's open framework model, and a traditional unit-based approach (Schweinhart & Weikart, 1997); Montessori, Direct Instruction, DARCEE, and traditional nursery school (Miller & Bizzell, 1983; Miller & Dyer, 1975); Montessori, Direct Instruction, traditional nursery school, and the Community Integrated Program (Karnes, Shwedel, & Williams, 1983); and, Direct Instruction and Mediated Learning (Mills, Cole, Jenkins, & Dale, 2002).

Taken together these studies yielded several conclusions. First, differences in curricular emphases tend to be reflected in immediate differences in children's learning. The Direct Instruction models produced larger gains on achievement tests of subject matter specific content, for example. Second, the differences in cognitive outcomes did not persist more than a few years after leaving the program. Third, there was some evidence that curriculum effects varied with child characteristics, specifically gender and level of ability at program entry. However, these last findings emerge from post hoc analyses rather than tests of hypotheses specified prior to analysis. As these findings did not appear to replicate across studies, these apparent interactions may simply be due to random variation. Finally, differences in curricula also produce differences in social and emotional development. These differences in social and emotional outcomes may be more persistent than differences in cognitive outcomes.

Long-term follow-up of High/Scope's curriculum comparison study has received much attention because it found that the Direct Instruction curriculum produced far worse outcomes for social and emotional development over a long period of time (Schweinhart, Weikart, & Larner, 1986). The children in the Direct Instruction model had less pro-social behavior and