Title: Experimental Evaluation of the Tools of the Mind Preschool Curriculum

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Abstract Body

Limit 4 pages single-spaced.

Background / Context:

This paper will focus on the results of our ongoing experimental evaluation of the Tools of the Mind Prekindergarten Curriculum (Bedrova & Leong, 2007), which is being conducted in Tennessee and North Carolina. The Tools of the Mind curriculum approach follows from socio-cultural perspectives on child development that emphasize how children acquire skills and “cultural tools” (e.g., spoken and written language, pretend play, the use of numbers, diagrams and maps) in collaboration with knowledgeable others. In the Tools approach, the tactics, mediators, forms of talk, and activities the teacher uses to foster learning are themselves designed to be part of what the student learns. Tools teaches teachers to use dynamic assessment and scaffolding techniques that will help children internalize the learning tools, that is, to use the mediators introduced by the teacher and then create their own, to apply self-talk and writing, and to use shared activities and dramatic play in ways that help them attend, self-monitor, solve problems, plan, and remember.

Purpose / Objective / Research Question / Focus of Study:

The aim of the Tools of the Mind prekindergarten curriculum is to enhance children’s executive function skills within an instructional context that promotes the basic academic and social skills that prepare them for kindergarten and beyond. To investigate the effectiveness of Tools in achieving this aim, we are conducting a longitudinal randomized experiment to answer the following questions:

1. Do children in Tools of the Mind classrooms improve more in literacy, math, social skills, and behavior problems during the preschool year than children in “business as usual” control classrooms? Are those gains sustained through kindergarten and first grade?
2. Do children in Tools of the Mind classrooms show greater gains in executive function than children in the control classrooms? Do those gains mediate the curriculum effects on literacy, math, and social skills outcomes?
3. Are there differential effects of Tools of the Mind associated with characteristics of the children or the classrooms?

Setting:

Four school districts in Tennessee and two in North Carolina are participating in the study. The four Tennessee districts and one of the North Carolina districts experienced their test year during the 2010-2011 school year; the presentation will focus on these school districts. The second North Carolina district is experiencing its test year in 2011-2012. All the prekindergarten programs in these schools are funded through grants from their states and/or Title I, thus all families must meet the income guidelines for free or reduced-price lunch in order to enroll their children. The 2010-2011 school districts are:
1. **Lebanon Special School District**, an independent district for the city of Lebanon that is embedded within the Wilson county district, is located east of Nashville, TN. It serves more than 3,000 prekindergarten to 8th grade students in five schools with 25% minority and a poverty rate of 51%. It has 5 prekindergarten classrooms in 5 schools.

2. **Wilson County School District** is east of Nashville, TN, in a predominantly rural county that is experiencing a dramatic increase in the number of Hispanic children. It serves more than 13,000 students in prekindergarten to 12th grade with a poverty rate of 23% and 11% minorities. It has 10 prekindergarten classrooms in 9 schools.

3. **Franklin Special School District** serves the city of Franklin and embedded within, but independent from, the Williamson County school district. This K-8 school system is south of Nashville, TN, and serves 3,900 students in 7 schools. It serves 32% minority students with 30% economically disadvantaged and has 7 prekindergarten classrooms in 4 schools.

4. **Cannon County Schools** is southeast of Nashville, TN, in a predominantly rural, poor county. It serves 2,177 children, prekindergarten to 12th grade, the majority of which qualify for free or reduced-price lunch (52%) but a low percentage (3.2%) is minority. It has 4 prekindergarten classes in 4 schools.

5. **Guilford County School System** is an urban system serving 70,000 children in the piedmont region of North Carolina. This school system serves a majority of minority students (58%), nearly half the students qualify for free or reduced-price lunch (49%). It has 77 prekindergarten classes in 45 schools, and 30 of those classrooms in 22 schools participated in the research.

**Population / Participants / Subjects:**

In all, 847 children from 60 classrooms in 44 schools were seen at the beginning of prekindergarten and 801 children at the end of prekindergarten. Demographics for the participating children are shown in Table 1 (please insert Table 1 here). Overall, the sample of students was diverse in terms of ethnicity and language background, with multiple minority groups represented. Close to 30% of the students were English language learners.

Sixty teachers participated in the study, with 32 in the Tools condition and 28 in the comparison condition. Overall, teachers averaged 12 years of teaching experience, with seven years in preschool classrooms. All teachers had at least a Bachelor’s degree, and over half had completed coursework toward or obtained a Master’s degree. In addition, each classroom had at least one assistant.

**Intervention / Program / Practice:**

*Tools of the Mind* is based on an interactive sequence of change (shown in Figure 1) whereby teachers use assessment and scaffolding to tailor their use and modeling of specific tactics. These are internalized by their students as cognitive tools, which are then used independently and manifested in observable behaviors in the classroom. That set of
behaviors we call learning-related self-regulation or executive function. As we describe in
the data collection section below, our set of outcome measures includes indicators of both
executive function and other key literacy, language, math, and social & emotional skills
outcomes. Operationally, Tools of the Mind is both a curriculum and a professional
development program for teachers. As a curriculum, the focus is on 61 Vygotskian activities
designed to promote children’s meta-cognitive development. As a part of this evaluation, a
detailed fidelity of implementation system was devised that tallied the 61 activities
teachers enacted, the steps they completed, mediators used and the inclusion of incorrect
actions ("should not's") as identified by the curriculum developers.

Research Design:

This large-scale experimental study was designed to test the effectiveness of the Tools of
the Mind curriculum when compared to the usual curriculum and practice occurring in the
participating school systems. Because it is advantageous for the Tools professional
development if all the prekindergarten teachers within a school are trained together and
encouraged to support each other during implementation, schools were the unit of
randomization. This scheme was also intended to minimize interaction between
experimental and control teachers that might have compromised the comparison. The
schools were blocked by district, with the large Guilford, NC district divided into two
blocks. Within each block, half the schools were assigned to the Tools condition and half to
the practice as usual control condition (with slight variations due to the uneven number of
schools in some districts). All the prekindergarten classrooms within each school then
participated in the condition to which the school was assigned.

The teachers in the classrooms assigned to the control condition continued to practice as
usual with whatever curriculum they were using, which varied from district to district. The
teachers in the Tools condition began the professional development sequence for Tools and
began implementing the Tools curriculum the first year of the study (the 2009-2010 school
year). However, that first year was a training and practice year for the teachers and no
measures were taken on the children to assess curriculum effects. The second year (2010-
2011) was the test year for the classrooms we report on here.

Data Collection and Analysis:

We used a battery of child achievement measures as well as a number of direct
assessments of self-regulation and teacher and assessor behavior rating measures to assess
the effects of the curriculum. Achievement measures included 7 subtests from the
Woodcock-Johnson that examine literacy, language, and math skills. The direct assessments
of self-regulation were selected to capture one or more components of executive function
including attentiveness, attention shifting, inhibitory control, persistence, and working
memory. Teachers reported on children’s classroom behavior and language ability. In
addition, assessors rated children’s self-regulatory behaviors during the assessment
sessions.
Children were consented in both the intervention and comparison classrooms and tested on executive function and their academic preparation for kindergarten at the beginning and end of preschool. Children were individually assessed by trained and certified assessors in two 20-minute sessions. Teachers rated the children’s social skills and classroom behavioral competencies in the fall (after 6 weeks of school) and in May.

Findings / Results:

The students in the treatment and comparison groups were similar on all demographic variables. Furthermore, randomization checks have shown that the treatment and comparison groups were similar on all pretest assessments and ratings, with no significant differences between the Tools and comparison groups on any measure.

The effectiveness of the Tools curriculum was tested using multi-level regression models with students nested within classrooms, schools, and district blocks. The models for each outcome included pretest scores, age, interval between assessments, gender, ELL status, and ethnicity as covariates.

Our results show that there were no significant treatment effects on any of our outcome variables. Students in Tools classrooms performed about equally well on all outcome variables, including the executive function measures, after receiving a year of the curriculum as students who received the usual preschool curriculum. Similarly there were no differences between the two sets of classrooms in teacher ratings of social and behavioral competence. In addition, the Tools curriculum did not appear to result in significantly better outcomes for any student subgroups (i.e., ELL, ethnic groups, gender) when compared to the control condition. Gains on all outcomes were observed across the preschool year in both Tools and comparison classrooms.

The presentation will summarize and report on the statistical models tested, examine the effects of the curriculum for demographic and regional subgroups of students. Descriptives for the main outcomes are shown in Table 2 (please insert Table 2 here).

Conclusions:

Given the widespread interest and growing adoption of the Tools of the Mind curriculum, the curriculum developers and research team at the Peabody Research Institute agreed that a rigorous experimental evaluation of the curriculum was necessary. While analyses thus far have not shown significant treatment effects, results from the Kindergarten and future 1st grade assessments might evidence results that appear late as the cognitive demands of schooling increase. Furthermore, our results have not shown the curriculum to be any less effective than the curricula used in the comparison classrooms. Further analyses are being conducted to examine classroom processes in Tools and comparison classrooms more closely to investigate the theoretical model of the Tools approach.
Appendices
Not included in page count.

Appendix A. References
References are to be in APA version 6 format.

## Appendix B. Tables and Figures

*Not included in page count.*

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<th>Table 1. Demographics</th>
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<td>Male</td>
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### Table 2. Pretest and Posttest Descriptives on Academic Outcomes (W scores) and Self-Regulation Direct Assessments

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Developmental Functioning for “Target Skill X”
Content: Literacy, Math/Science, Social Competence

Teacher Tactics
- External mediators
- Language
- Shared activities

Tools of the Mind
- Mediators
- Language
  - Self-talk
  - Writing, drawing
  - Decontextualized speech
- Shared activities
  - Dramatic play
  - Buddy activities

Dynamic Assessment Scaffolding

Tools of the Mind Curriculum Theory of Change

Target Skills

Language and Literacy
- Oral language
- Decontextualized speech
- Phonemic awareness
- Phonics
- Vocabulary
- Listening comprehension
- Print awareness

Math and Science
- Numbers and operations
- Geometry
- Measurement
- Data analysis
- Algebra
- Science

Social/Emotional Competence
- Social skills
- Emotion regulation
- Perspective taking
- Self-control
- Social problem solving skills

Learning-related Self-regulation
- Attending
- Planning
- Thinking
- Remembering
- Practicing
- Problem solving