Experimental Evaluation of the Tools of the Mind Pre-K Curriculum



2/13/2012

Report of Fall Assessments and Observations: Alamance County





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The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305A090533 awarded to Drs. Dale C. Farran, Mark Lipsey, and Sandra Wilson



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INTRODUCTION

This report is intended to provide a brief summary of the baseline group equivalence of the Tools and comparison groups in Alamance County, NC on the key outcome variables and report highlights from the first round of classroom observations in the Fall of 2011.

We will first describe the characteristics of the students in the study classrooms. Then, we present baseline information for the Tools and comparison groups on the outcome variables. Third, we summarize the fidelity observations. Finally, we use the Child Observation in Preschool to illustrate the amount of talking and listening observed in the study classrooms.

CHARACTERISTICS OF THE CHILDREN: ALAMANCE COUNTY, NC

TABLE 1: CHILD DESCRIPTIVES FOR ALAMANCE COUNTY, NC

Variable	Tools Condition	Comparison Condition	Overall
Alamance County			
Total N	147	120	267
N with Pretest Data	144	120	264
Gender (% female)	46.3	46.7	46.4
Ethnicity			
Black (%)			
Hispanic (%)			
White (%)			
Other (%)			
IEP Status (%)			
ELL Status (%)	38.8	51.7	44.6
Number of classrooms	10	10	20



DESCRIPTION OF MEASURES

The goal of the Experimental Evaluation of the Tools of the Mind Curriculum is to determine if the Tools curriculum is more effective in enhancing children's learning-related self-regulation and academic preparedness for kindergarten when compared to other "business as usual" preschool curricula.

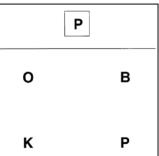
Woodcock-Johnson III Tests of Achievement (WJ-III)

- WJ-III standard scores are reported, which are normed to a representative sample of American youth. Standard scores have a mean of 100 and a standard deviation of 15. A score of 100 therefore is considered average. Higher scores on the measures reflect better academic performance. An increase in standard scores from fall to spring indicates learning at a faster rate than previously.
- These same measures will be used in follow up assessments.



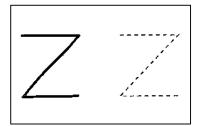
Letter Word Identification

- Letter Word Identification assesses children's letter and word identification ability. Items include identifying and pronouncing presented letters and pronouncing presented words.
- Sample Script: This is the letter "P." Find the "P" down here.



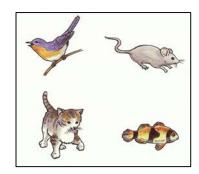
Spelling

- Spelling measures the ability to write orally presented letters and words correctly beginning with tracing simple shapes.
- Sample Script: Watch Me. [Trace "Z" on left. Hand pencil to child, point to "Z" on right] Now you make one just like I did. Stay on the line.



Academic Knowledge

- Academic Knowledge is given in three subtests measuring factual knowledge of science, social studies, and humanities.
- Sample Script: Look at the pictures, put your finger on the one that flies.

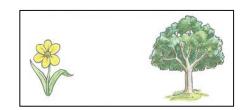


Oral Comprehension

- Oral Comprehension assesses children's ability to understand a short passage by providing a missing word based on the syntactic and semantic cues of the sentence.
- Sample Script: Water looks blue and grass looks ______. (pause expectantly).

Picture Vocabulary

- Picture Vocabulary assesses children's receptive and expressive language and word knowledge at the single word level. After the initial items, children must say the name of the picture.
- Sample Script of initial item: Put your finger on the flower.



Applied Problems

- Applied Problems assesses children's ability to solve mathematics problems. The items in the scale measure children's ability identify information necessary to solve problems and to determine an appropriate strategy to solve the problem.
- Sample Script: How many dogs are there in this picture?



Quantitative Concepts

- Quantitative Concepts is a measure given in two parts. The first part assesses children's knowledge of mathematical concepts, including vocabulary, numbers, shapes, and symbols. The second part measures sequencing of numbers with difficulty increasing with each problem.
- Sample Script A: Point to the largest star. Now point to the smallest star.
- Sample Script B: Look at these numbers and tell me the number that belongs in the blank space.



1 2 3 __



Learning-Related Cognitive Self-Regulation

Children were assessed individually in two sessions in the fall and spring of the 2010-2011 school year. The following assessments were used:

Peg Tapping

- Children are instructed to tap once with a wooden dowel when the examiner taps twice and to tap twice when the examiner taps once.
- The Peg Tapping Task is a measure of inhibitory control. A child must inhibit the most powerful immediate response of imitating the examiner.
- Each item is scored 0 if the child gives the incorrect number of taps and 1 if the child gives the correct number of taps. Scores on the items are summed and converted to a portion correct out of a possible score of 16. Larger scores on the task reflect greater inhibitory control.
- For more information see: Diamond, A., & Taylor, C. (1996). Development of an aspect of executive control: Development of the ability to remember what I said and to "do as I say, not as I do." Developmental Psychobiology, 29, 315-334.

Head Toes Knees Shoulders (HTKS)

- Children are asked to play a game in which they must do the opposite of what the examiner says. The examiner instructs children to touch their head (or their toes), but instead of following the command, the children are supposed to do the opposite and touch their toes. If children pass the head/toes part of the task, they complete an advanced trial where the knees and shoulders commands are added.
- The HTKS task is a measure of inhibitory control; a child must inhibit the dominant response of imitating the examiner.
- Each response is scored with the following system: 0 = incorrect response, 1 = any motion to an incorrect response, but self-corrected to the correct response, and 2 = correct response. Scores on the first six practice items and the 20 test items are summed and converted to a proportion correct out of a possible score of 52. Larger scores on the task reflect greater inhibitory control.
- For more information see: Ponitz, C. C., McClelland, M. M., Matthews, J. S., & Morrison, F. J. (2009). A structured observation of behavioral regulation and its contributions to kindergarten outcomes. Developmental Psychology, 45, 605-619.



Dimensional Change Card Sort (DCCS)

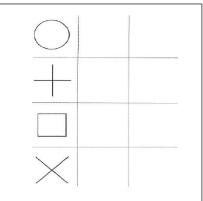
Children are required to sort picture cards first according to one dimension (e.g., color) and then according to another dimension (e.g., shape). If they can make this switch, children are then asked to complete an advanced version of the DCCS that adds a third sorting rule, sorting by the borders on the cards (e.g., the presence of a border means one rule, no border means another rule).



- The DCCS is a measure of attention shifting. To complete the task children must shift their attention to a different dimension of the card from the color of the object to the shape of the object (e. g. focus on the shape on a card and not the color of the shape). To complete the advanced phase, children must children shift their focus from one dimension to another from card to card.
- The task is scored as follows, using a system developed by Zelazo. Scores were converted to a proportion correct out of 3. Larger scores on the task reflect greater ability to shift attention with task demands and less perseveration.
 - 0 =Sorted by color on fewer than 5/6 cards
 - 1 =Sorted by color on at least 5/6 cards, but sorted by shape on fewer than 5/6 cards
 - 2 =Sorted by color and shape on at least 5/6 cards; but sorted fewer than 9/12 cards correctly on advanced version
 - 3 =Sorted by color and shape on at least 5/6 card and sorted at least 9/12 cards correctly on advanced version.
- For more information see: Zelazo, P. D. (2006). The dimensional change card sort (DCCS): A method of assessing executive function in children. *Nature Protocols*, 1, 297-301.

Copy Design

- Children are asked to copy 8 simple geometric designs. Children are given two attempts to draw each of the 8 designs. The attempts are scored to indicate if the child was able to properly replicate the design.
- The Copy Design task is a measure of persistence and sustained attention during a difficult task.
- Each design is given a score of 1 if at least one attempt is correct, 2 points if both attempts are correct, and 0 if both attempts are incorrect or are not attempted. Scores on the items are summed and converted to a portion correct out of a possible score of 16. Larger scores the task indicate greater attention and sustained focus.
- For more information see: Osborn, A. F., Butler, N. R., & Morris, A. C. (1984). The social life of Britain's five-year-olds: A report of the child health and education study. London: Routledge & Kegan Paul.





Corsi Blocks

- Children are asked to point to a series of blocks as indicated by the examiner. Children are first asked to repeat the pattern exactly as the examiner did (i.e., forwards) then they are asked to reverse the pattern given by the examiner (i.e., backwards). Task difficultly increases by asking children to repeat increasingly longer block patterns. The child gets two attempts at each pattern and continues until the recalled pattern is no longer correct.
- Corsi Blocks is a measure of working memory.
- The task is scored as the largest pattern span that the child is able to reproduce. The maximum forward span possible was 9 and 7 for backward span. Larger scores indicate a greater working memory.
- backward span. Larger scores indicate a greater working memory.
 For more information see: Berch, D. B., Krikorian, R., & Huha, E. M. (1998). The corsi block-tapping task: Methodological and theoretical considerations. Brain and Cognition, 38, 317-338.



Assessor Ratings

- At the end of each assessment session, the assessor completed a rating of children's self-regulatory behavior during the testing. The 17 items provide a global picture of attention and impulsivity throughout the assessment interaction. Each child therefore was rated twice during pretesting and twice during post testing by independent raters.
- Sample item:

A3. Sustains concentration; willing to try repetitive tasks

- 3. Child able to concentrate and persist with task, even toward end of tasks and with distractions
- 2. Child occasionally distracted but generally persistent, but does not require prompt from assessor
- 1. Child frequently distracted, requires multiple prompts from assessor
- 0. Child not able to concentrate or persist on much of the assessment
- For more information, see: Smith-Donald, R., Raver, C. C., Hayes, T., & Richardson, B. (2007). Preliminary construct and concurrent validity of the Preschool Self-regulation Assessment (PSRA) for field-based research. Early Childhood Research Quarterly, 22(2), 173-187. doi: DOI: 10.1016/j.ecresq.2007.01.002



Behavior Rating Scales (collected from teachers)

Teachers rated the children in their classes 6 weeks after school began and again at the end of the year.

Cooper-Farran Behavior Rating Scales

The Cooper-Farran is composed of 37 items in two subscales. The Interpersonal Skills subscale (IPS) includes 21 items and the Work-Related Skills (WRS) subscale includes 16 items. The IPS subscale measures how well children get along with peers and the teacher. The WRS subscale includes items about independent work, compliance with instructions, and memory for instructions. Items are rated on a 1-7 scale with descriptive phrases to "anchor" points 1, 3, 5, and 7.

■ Example item for Interpersonal Skills (IPS):



2 3 5 Repeatedly irritates Does not Teases others but Occasionally tries to get purposefully stops short of attention by playful but others by hostile touching, annoy anyone actual annoyance annoying behavior poking, verbal insulting, etc.

Example item for Work-Related Skills (WRS):

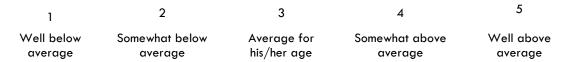
RELEVANT PARTICIPATION IN GROUP DISCUSSIONS

2 3 5 Often contributes original Makes irrelevant Makes an Inattentive to ideas; relevant and responsive occasional relevant others; quite but remarks; interrupts to others' comments and uninvolved the flow comment; attentive interests

For more information see: Cooper, D., & Farran, D. C. (1988). Behavioral risk in kindergarten. Early Childhood Research Quarterly, 3, 1-20.

Adaptive Language Inventory (ALI)

The ALI focuses on Children's comprehension and use of language in classroom settings in comparison to their peers and has been used both at the preschool and elementary levels. The measure consists of 18 items that focus on comprehension, production, rephrasing, spontaneity, listening, and fluency. Children are rated on 1-5 scale.



 Sample items: Responds to questions asked of him/her in a thoughtful logical way. Listens carefully when the teacher is giving instructions to the class.



For more information see: Feagans, L., Fendt, K. & Farran, D.C. (1995). The effects of day care intervention on teachers' ratings of the elementary school discourse skills in disadvantaged children. International Journal of Behavioral Development, 243-261.

RANDOMIZATION CHECK

Did the randomization produce comparable groups? Are children in the *Tools* condition comparable at the outset to those in comparison classrooms?

The Tools and comparison conditions were statistically equivalent on all outcome variables except for the Woodcock-Johnson Spelling test, where the Tools students exhibited significantly higher scores on the pretest than the comparison children.

In general, Tools children had higher achievement scores on most of the measures, though differences between Tools and comparison groups were small and non-significant (except for on the Spelling test).

We conclude that the randomization was successful and that our groups are statistically and practically similar on important outcomes prior to receiving treatment. All analyses of posttest and follow-up scores, however, will include pretest scores and demographic covariates to insure that any differences between groups do not unduly influence estimates of treatment effects.

Means are shown in Table 2 below.



TABLE 2: PRETEST MEANS AND SIGNIFICANCE TEST RESULTS ON ACHIEVEMENT, SELF-REGULATION, TEACHER RATINGS, AND ASSESSOR RATINGS BY EXPERIMENTAL CONDITION

	Tools Cond	ition	Comparison C	ondition	Pre-tx Diffs ¹
	mean	sd	mean	sd	ns=non-significant
Literacy					
Letter-Word ID	88.23	13.51	85.73	11.96	ns
Spelling	79.58	10.59	75.09	11.67	sig
Language					
Oral Comprehension	88.02	13.75	83.77	11.21	ns
Picture Vocabulary	87.46	22.70	84.19	21.89	ns
Academic Knowledge	80.86	21.39	75.05	18.53	ns
Mathematics					
Applied Problems	90.51	13.97	88.54	13.27	ns
Quantitative Concepts	84.76	12.09	81.49	10.70	ns
Attention					
DCCS	1.24	0.61	1.22	.54	ns
Copy Design	.87	1.43	.72	1.23	ns
Working Memory					
Forward Digit Span	2.58	1.05	2.49	1.20	ns
Backward Digit Span	1.03	1.10	1.09	1.10	ns
Inhibitory Control					
Peg Tapping	4.08	6.16	3.32	5.33	ns
Head-Toes-Knees-Shoulders	9.03	12.98	7.47	11.27	ns
Teacher Ratings					
Interpersonal Skills	5.18	0.84	5.17	0.85	ns
Work-related Skills	4.40	0.87	4.32	0.92	ns
Adaptive Language Inventory	50.11	10.10	48.28	11.70	ns



Experimental Evaluation of the Tools of the Mind Pre-K Curriculum

	Tools Cond	dition	Comparison (Pre-tx Diffs ¹	
Assessor Ratings					
Attentiveness	2.31	0.65	2.34	0.69	ns

¹ Pretreatment group equivalence tested via multi-level regression models with students nested within classrooms and schools. Covariates included age, gender, and ELL status.

IMPLEMENTATION FIDELITY

Do teachers trained in the Tools of the Mind curriculum carry out Tools Activities, enact the required steps in each activity, conduct the Activities at the appropriate times and carry out a range of easy to difficult activities?

Tools Fidelity

The Tools Fidelity captures the specific *Tools* curriculum activities that occur within a classroom observation period along with information about the specific implementation steps that occur, and mediators that are used. In addition, the curriculum developers furnished a list of behaviors that "should not" happen during each activity that are also captured by observers. The *Tools* Fidelity Measure provides an in-depth look at the degree of curriculum implementation across the year within experimental classrooms. Although this instrument was used in both *Tools* and comparison classrooms, relatively few *Tools* activities were ever coded in comparison rooms.

For more information see: Vorhaus, E. & Meador, D. (2010). Tools of the Mind curriculum implementation fidelity checklist. Nashville, TN: Peabody Research Institute, Vanderbilt University.

TABLE 3: NUMBER OF TEACHERS OBSERVED PERFORMING TOOLS ACTIVITIES

	Large Group	Make Believe Play	Math/ Science	Literacy	Across the Day	Story Lab
Tools of the Mind (n=10)						
# teachers w/any	10	10	9	10	10	10
# activities (avg.)	4.9	3.2	1.6	1.2	2.1	2.0
# possible	18	4	12	4	14	8
Comparison (n=10)						
# teachers w/any	0	0	0	0	0	0
# activities (avg.)	0.0	0.0	0.0	0.0	0.0	0.0

^{*}Since no TOOLS activities were observed in Comparison classrooms, the remaining tables show only observations from TOOLS classrooms only.



TABLE 4: MEAN NUMBER OF STEPS AND SHOULD NOTS OBSERVED FOR LARGE GROUP ACTIVITIES

	N	Steps Possible	Mean Steps Observed	Range	Should Nots Possible	Mean Should Nots Observed	Range
Mystery Question	5	5	3.6	3 - 4	6	1.0	1 - 1
Mystery Shape	5	6	3.0	3 - 3	6	1.3	1 - 2
Mystery Word	0	7			6		
Mystery Numeral	0	6			6		
Mystery Rhyme	0	4			6		
Mystery Pattern	0	6			6		
Mystery Letter	0	4			6		
Timeline Calendar	10	8	4.3	2 - 7	6	1.0	1 - 1
Weather Graphing	10	3	2.9	2 - 3	2		
Message of the Day	10	8	6.5	5 - 8	8		
Write Along	0	7			8		
Share News	8	8	4.1	3 - 5	3	1.0	1 - 1
Tallying	0	4			0		
Share and Tell	0	5			3		
Write a Familiar Fingerplay	0	5			5		
Make a Rhyme	0	5			2		
Take Away Sounds	0	7			2		
Class Schedule	1	3	3.0	3 - 3	0		

TABLE 5: MEAN NUMBER OF STEPS AND SHOULD NOTS OBSERVED FOR MAKE BELIEVE PLAY ACTIVITIES

	N	Steps Possible	Mean Steps Observed	Range	Should Nots Possible	Mean Should Nots Observed	Range
Make Believe Play Planning	10	11	8.2	6 – 9	7	1.0	1 - 1
Make Believe Play Center	9	11	5.6	3 – 8	2	0.0	0 - 0
Make Believe Play Clean- Up	9	3	2.4	1 – 3	3	1.5	1 - 2
Make Believe Play Practice	4	8	1.5	1 – 2	2	1.0	1 - 1

TABLE 6: MEAN NUMBER OF STEPS AND SHOULD NOTS OBSERVED FOR MATH/SCIENCE ACTIVITIES

	N	Steps Possible	Mean Steps Observed	Range	Should Nots Possible	Mean Should Nots Observed	Range
Remember and Replicate	4	10	6.0	4 - 7	1	0.0	0 - 0
Puzzles and Manipulatives		3			1		
Math Memory		13			2		
Science Eyes	3	12	4.7	3 - 7	5	1.0	1 - 1
Numeral Game		8			2		
Venger Drawings		6			0		
Attribute Game		6			0		
Numberline Hopscotch	1	6	3.0	3 - 3	2	0.0	0 - 0
I Have Who Has Numbers	1	8	7.0	7 - 7	3	0.0	0 - 0
I Have Who Has Colors	2	8	5.5	5 - 6	3	0.0	0 - 0
I Have Who Has Shapes	1	8	7.0	7 - 7	3	0.0	0 - 0
Making Collections	2	12	10.5	10 - 11	0		

TABLE 7: MEAN NUMBER OF STEPS AND SHOULD NOTS OBSERVED FOR LITERACY ACTIVITIES

	N	Steps Possible	Mean Steps Observed	Range	Should Nots Possible	Mean Should Nots Observed	Range
Graphics Practice	8	13	6.6	5 - 8	5	1.0	1 - 1
Buddy Reading	4	10	3.5	2 - 4	5	1.0	1 - 1
Elkonin Boxes I and II	0	9			5		
I Have Who Has Letters	0	8			4		

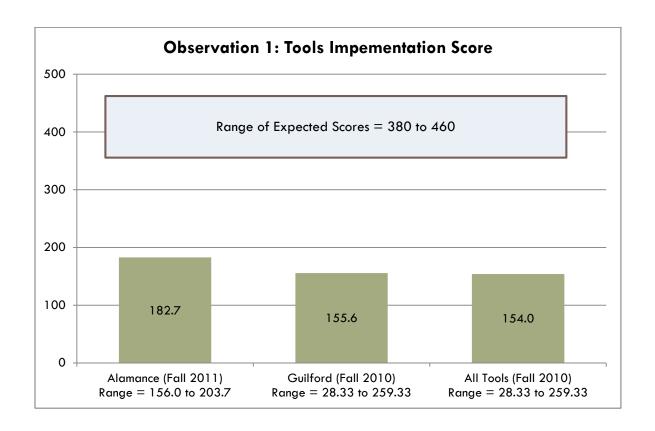
TABLE 8: MEAN NUMBER OF STEPS AND SHOULD NOTS OBSERVED FOR ACROSS THE DAY ACTIVITIES

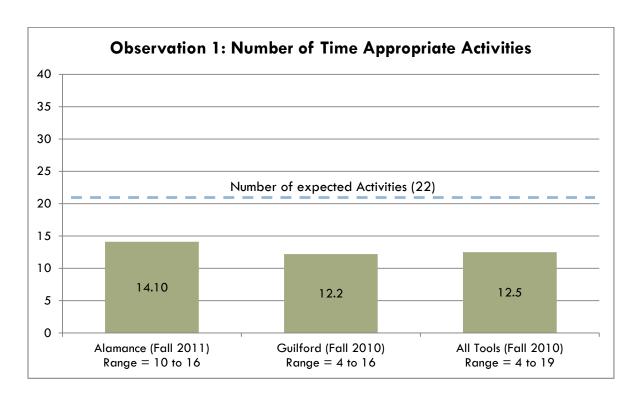
	N	Steps Possible	Mean Steps Observed	Range	Should Nots Possible	Mean Should Nots Observed	Range
Attention Focusing	7	6	2.4	2 - 3	2	0	0-0
Freeze Game	8	5	4.3	4 - 5	4	1.0	1 – 1
Partner Freeze	0	7			4		
Freeze On The Number	0	5			4		
Two Step Freeze	0	4			4		
Pattern Movement Game	1	9	3.0	3 - 3	3	1.0	1 – 1
Complete and Continue	0	7			3		
Other Movement Game	0	10					
Number Follow The Leader	0	5			2		
Pretend Transition	5	3	2.0	1 - 3	3		
Community Building Activities	0	3					
I Have Who Has Name Game	1	6	5.0	5 - 5	1		
Mousetrap	0	5			2		
What are you doing Mr. Wolf?	0	5			2		



TABLE 9: MEAN NUMBER OF STEPS AND SHOULD NOTS OBSERVED FOR STORY LAB ACTIVITIES

	N	Steps Possible	Mean Steps Observed	Range	Should Nots Possible	Mean Should Nots Observed	Range
Active Listening	8	6	3.5	3 - 5	4	1.3	1 - 2
Connections	6	5	3.0	2 - 4	3	1.0	1 - 1
Visualization	0	8			2		
Learning Facts	2	7	2.5	2 - 3	1		
Extensions	0	10			4		
Grammar	0	10			3		
Predictions and Inferences	0	6			1		
Vocabulary	3	6	2.0	1 - 3	4	1.0	1 - 1







CHILD OBSERVATION IN PRESCHOOL (COP)

	Tools Classrooms (n=10; 132 children)	Control Classrooms (n=10; 137 children)
Mean % of time with child talk	.26	.28
Mean % of time with child listen	.37	.37
Mean % of time with child fussing	.01	.01
Mean % of time with no talking, listening or fussing	.37	.35
Average Classroom Involvement	2.25	2.21
SD (range)	.84 (1.9-2.6)	.71 (1.7-3.1)

Proportion (%) of Sweeps	Tools classrooms (n=10)	Control classrooms (n=10)
Talking to teacher	.06	.05
Talking to children	.08	.10
Talking to small group	.02	.01
Talking to whole group	.03	.04
Talking to self (words)	.05	.05
Talking to self (noise)	.02	.04
Overall Talking	.26	.28
Listening to teacher	.28	.28
Listening to children	.08	.08
Listening to small group	.00	.00
Listening to whole group	.01	.01
Listening to self (words)	.00	.00.
Listening to self (noise)	.00	.00.
Overall Listening	.37	.37
-		
Fussing/Crying	.01	.01
Not talking, listening or fussing/crying	.37	.35