



The Effects of the Tennessee Voluntary Pre- Kindergarten Program: Initial Results

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Background

- Tennessee invests over \$85 million a year in its statewide Pre-K program
- 934 state-funded Pre-K classrooms serve 18,000+ economically disadvantaged children across all 95 Tennessee counties
- Support for Pre-K is based on the belief that high quality Pre-K:
 - Improves at-risk children's readiness for kindergarten
 - Improves achievement test scores and decreases retention rates, special education placements, and drop outs
 - In adulthood, increases employment rates and earnings, and reduces welfare needs and criminal behavior

But, hard evidence is needed

- To show how effective large scale, statewide pre-K programs are in improving school readiness and student achievement
- To determine which factors influence effectiveness
- To examine whether statewide pre-K programs produce the sustained long-term effects expected of them by legislators, education administrators, and taxpayers

Political Controversy and Limited Research Support

- Many Tennessee legislators question the value of Pre-K, some calling it “expensive babysitting,” and whether it warrants funding given the current budget constraints
- The evidence for long-term Pre-K effects is from small intensive programs that are not typical of state programs
- The national Head Start study provides little support for the view that large scale preschool programs are especially effective for boosting academic performance
- No research using a randomized control trial design has studied the benefits of typical public Pre-K programs and their effects beyond the beginning of kindergarten

Phase 1 RCT Intensive Substudy

- Phase 1 in 2009-10 school year (Phase 2 underway for 2010-11 school year)
- Randomized admissions in 23 schools in 14 TN school districts
- 907 children in full randomization (will be tracked in state EIS database)
- 303 consented children with assessment data, 73 no pre-k controls and 230 pre-k

Intensive Substudy Sample

- Mean age, 4.4 yrs; 56% girls, 44% boys
- 57% white, 23% African-American, 20% Hispanic
- 31% language other than English in home
- Median parent education: High school/GED
- No Pre-K control childcare alternatives:
 - 11% Head Start
 - 22% Private childcare center
 - 51% Home with parent or other
 - 16% Unknown

Achievement Assessments

- Children *individually* assessed as early in the pre-k year as possible and then again in late spring/early summer at the end of pre-k
 - In pre-k settings if receiving pre-k
 - In homes, libraries, MacDonald's or other child care setting if not in TN-VPK

Achievement Measures

Woodcock Johnson III Scales

- *Literacy*: Letter-Word Identification, Spelling
- *Language*: Picture Vocabulary, Oral Comprehension
- *Math*: Applied Problems, Quantitative Concepts

Letter-Word Identification

Point to the "W"

Point to the "S"

H C A S B W

Letter-Word Identification

*What is the name of
this letter?*

R

N

k

Spelling (Writing)

Test Items

Starting With Item 1

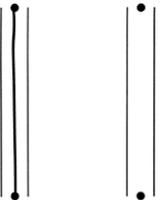
 Open Subject Response Booklet to Spelling test items and place directly in front of subject.

1. 

Say: **Watch me.** Make single vertical pencil mark 1 to 2 inches long in left side of box for Item 1 (see sample at left). Hand pencil to subject and say: **Now you do it right here** (point to right side of box for Item 1). Collect pencil when subject has finished.

▲ **Correct:** any mark at least $\frac{1}{2}$ inch long and at least partially in box
2. 

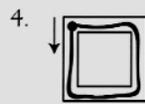
Say: **Watch me.** Make scribble down left side of box for Item 2 (see example at left). Hand pencil to subject and say: **Now you scribble like I did—right here** (point to right side of box for Item 2). Collect pencil when subject has finished.

▲ **Correct:** any scribble that changes direction three or more times and is at least partially in the box
3. 

Say: **Watch me.** Draw straight line from top dot to bottom dot in left drawing for Item 3 (see sample at left). Hand pencil to subject, point to right drawing, and say: **Now you draw a line just like I did. Stay on the road.** Collect pencil when subject has finished.

▲ **Correct:** line that stays within boundaries connects or extends beyond two dots

Spelling (Writing)



Say: **Watch me.** Start at dot in left square and draw line counterclockwise around square, ending at dot. Hand pencil to subject, point to right square, and say: **Now you draw a line just like I did. Stay on the road.** Collect pencil when subject has finished.

▲ **Correct:** line going completely around square, drawn either clockwise or counterclockwise, and inside boundaries at least half of time



Say: **Watch me.** Trace "B" on left. Hand pencil to subject, point to "B" on right, and say: **Now you make one just like I did. Stay on the line.** Collect pencil when subject has finished.

▲ **Correct:** "B" that is recognizable if standing alone, has been drawn on broken line at least 75% of time, and has corners that are sharp, not curved



Say: **Watch me.** Trace "P" on left. Hand pencil to subject, point to "P" on right, and say: **Now you do it just like I did. Stay on the line.** Collect pencil when subject has finished.

▲ **Correct:** "P" that is recognizable if standing alone and has been drawn on broken line at least 75% of time

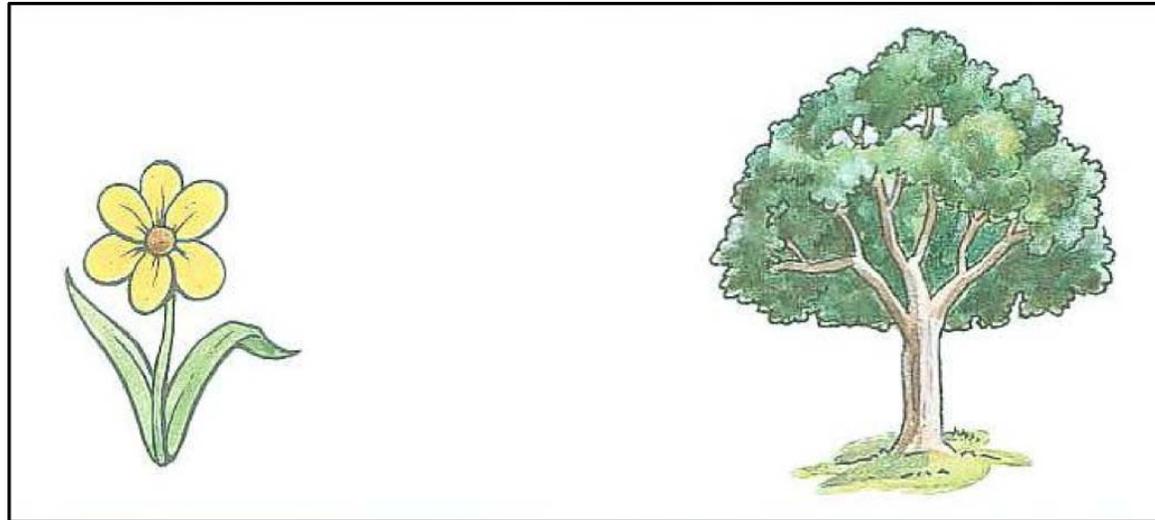


Hand pencil to subject, point to "S," and say: **Now you make one just like this. Make it here** (point to space to right of "S").

▲ **Correct:** "S" that is recognizable if standing alone

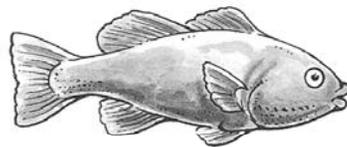
Picture Vocabulary

Put your finger
on the flower



Picture Vocabulary (nouns)

What is this?



Oral Comprehension

Listen carefully and finish what I say.

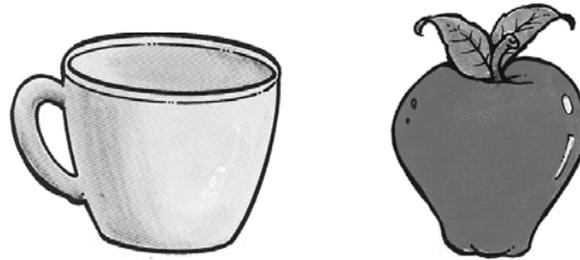
“A bird flies, a fish _____.”

“We ride in _____.”

“Houses are for people, garages are for _____.”

Applied Problems (early math)

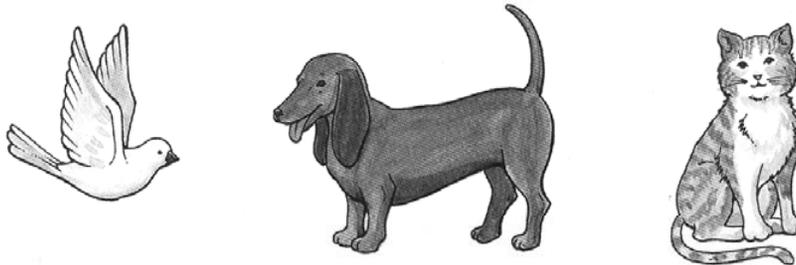
How many apples are there in this picture?



How many boats are there?



How many birds are there?



Quantitative Concepts



10



12

Pre-Post Gains and Effect Sizes for Achievement

Outcome Measure	Control Gain in SD Units	Pre-K Gain in SD Units	Difference (Effect Size)	% Improvement for Pre-K
<i>Literacy</i>				
Letter-Word ID	.51	1.00	.49*	96%
Spelling	.70	1.01	.31*	45%
<i>Language</i>				
Picture Vocabulary	.18	.43	.25*	141%
Oral Comprehension	.28	.58	.31*	110%
<i>Math</i>				
Applied Problems	.69	.91	.22*	32%
Quantitative Concepts	.64	1.05	.41*	63%

All the differences between the Control and Pre-K children are statistically significant, $p < .05$.

Kindergarten Behavior Ratings

Teacher Ratings: Kindergarten teachers rated all children as early in the school year as children could be found.

- Cooper-Farran Work-Related Skills & Social scales
- Academic Child Behavior Record: School Readiness, Likes School, & Behavior Problems

CFBRS Work Related Skills

13 INDEPENDENT WORK

1	2	3	4	5	6	7
Works independently without supervision		Works alone with minimal supervision		Disorganized; tries to work but requires much assistance or prompting		Lacking in self-motivation; teacher prompting has only slight impact on work habits

14 MEMORY FOR INSTRUCTIONS

1	2	3	4	5	6	7
Seems to quickly forget instructions relating to work; needs frequent reminders		Retains instructions for up to an hour, then needs them repeated		Can recall detailed series of instructions for several hours		Remembers all instructions, regardless of time interval

15 ORGANIZATION OF WORK PRODUCTS

1	2	3	4	5	6	7
Totally disorganized; work is sloppy, often misplaced		Slightly disorganized; occasionally produces messy work		Usually organized; work is generally neat		Meticulous, produces neat work consistently, rarely loses material

16 FUNCTIONING WITHIN DESIGNATED TIME PERIODS

1	2	3	4	5	6	7
Never concludes at designated time; late starting next activity		Often slightly out of synch with groups as they end and begin activity periods		Concludes most activities on time; usually ready to start next activity		Is synchronous with beginnings and endings of all activities

CFBRS Social Skills

20. STATEMENTS TO PEERS

1	2	3	4	5	6	7
REFRAINS FROM INSULTING OTHERS EVEN WHEN PROVOKED		WILL RETURN ANOTHER'S INSULT WHEN CLEARLY AND REPEATEDLY PROVOKED		RESPONDS WITH VERBAL ABUSE TO REJECTION, FRUSTRATION, CRITICISM, ETC.		REPEATEDLY INSULTS OTHERS FOR NO APPARENT REASON

21. CONFLICT RESOLUTION

1	2	3	4	5	6	7
DEPENDS ON TEACHER TO INTERVENE IN DISPUTES OR TRIES TO USE PHYSICAL FORCE		TRIES TO DISCUSS DIFFERENCES BUT INEVITABLY ESCALATES TO AN ARGUMENT		CONTROLS ANGRY FEELINGS WHEN TRYING TO RESOLVE DIFFERENCES; SOMETIMES SUCCESSFUL		WORKS OUT COMPROMISES THAT ARE REASONABLE AND FAIR

28. SOCIAL INTERACTION

1	2	3	4	5	6	7
APPEARS WITHDRAWN, TOTALLY CLOSED TO THE SOCIAL ENVIRONMENT		CAN BE COAXED TO INTERACT AT A MINIMAL LEVEL WITH CERTAIN CHILDREN; SLOW TO WARM UP		SOCIALIZES ADEQUATELY WITH A VARIETY OF CHILDREN		INITIATES FRIENDLY SOCIAL INTERACTIONS

30. RESPECT FOR OTHER CHILDREN'S FEELINGS

1	2	3	4	5	6	7
COMPLETELY EGOCENTRIC; SELFISHLY DISREGARDS PEERS' FEELINGS AND RIGHTS		FORGETS TO CONSIDER OTHERS; NEEDS TO BE REMINDED TO EMPATHIZE		RESPONDS APPROPRIATELY WHEN PEERS EXPRESS SPECIFIC FEELINGS OR NEEDS		EMPATHETIC; CONSIDERS CONSEQUENCES TO OTHERS OF HIS/HER BEHAVIOR

ABR: Prepared for Kindergarten

1. How well prepared for kindergarten work is this child *in math*?

1	2	3	4	5	6	7
Extremely well prepared; understands numbers, shapes, and patterns		Above average preparation for this grade level		Slightly below average preparation for this grade level		Very unprepared for this grade level; cannot count to ten or identify shapes.

2. How well prepared for kindergarten work is this child *in language/literacy*?

1	2	3	4	5	6	7
Extremely well prepared; knows letters/sounds and is learning to read		Above average preparation for this grade level		Slightly below average preparation for this grade level		Very unprepared for this grade level; does not know many letters; unfamiliar with books

3. How well prepared for kindergarten work is this child *socially*?

1	2	3	4	5	6	7
Extremely well prepared; gets along well with others and handles classroom expectations maturely		Above average social skills for this grade level		Slightly below average social skills for this grade level		Very unprepared for this grade level; immature and behaves inappropriately with peers

ABR Feelings about School

9. How do you think this child feels about school? Circle Response to Each.

a. Likes to come to school	Always	Sometimes	Never
b. Dislikes school	Always	Sometimes	Never
c. Has fun at school	Always	Sometimes	Never
d. Seems unhappy at school	Always	Sometimes	Never
e. Enjoys most classroom activities	Always	Sometimes	Never
f. Difficult to get engaged in activities	Always	Sometimes	Never

Effect Sizes for Teacher Ratings

Outcome Measure	Effect Size	<i>p</i> -value
Cooper-Farran Work Related Skills	.29*	.027
Cooper-Farran Social Skills	-.04	.791
ABR Readiness for Kindergarten	.36*	.006
ABR Likes School	-.09	.653
ABR Behavior Problems No/Yes	.06	.468
ABR Number of Behavior Problems	.00	.939

Note: Based on ratings by 19 teachers at 19 of the 23 schools and 203 children rated (133 T and 70 C).

Regression-Discontinuity Substudy: Middle Tennessee Region

- 36 schools in 17 middle Tennessee school districts
- 682 children who attended Pre-K during the 2009-10 school year
- 676 children who were below the age cutoff and attended Pre-K during the 2010-11 school year
- All children assessed early in the fall of 2010

Regression-Discontinuity Sample

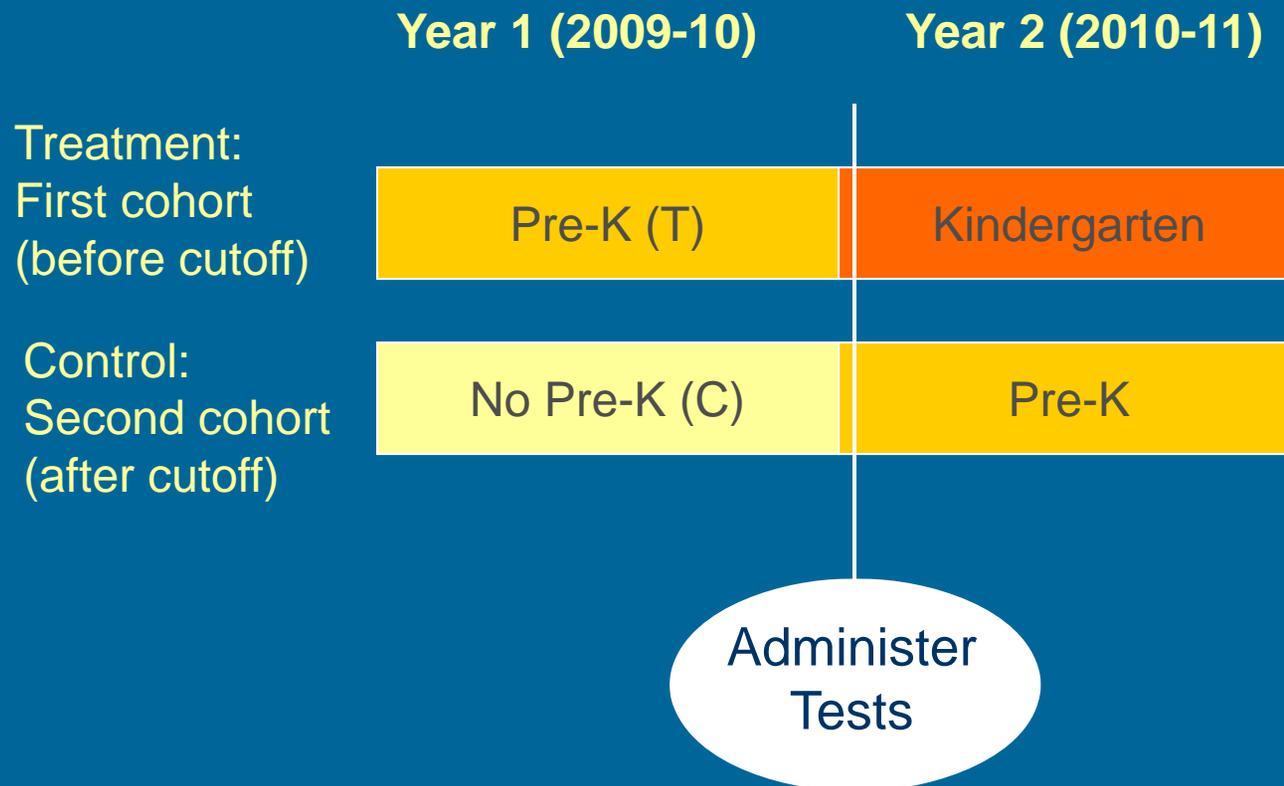
- Mean age at time of assessment
 - Beginning of Pre-K control sample: 4.4 yrs
 - Beginning of K treatment sample: 5.4 yrs
- 50% boys; 50% girls
- 52% white, 35% African-American, 13% Hispanic
- 12% native language other than English
- Urban and rural schools

RDD Outcome Measures

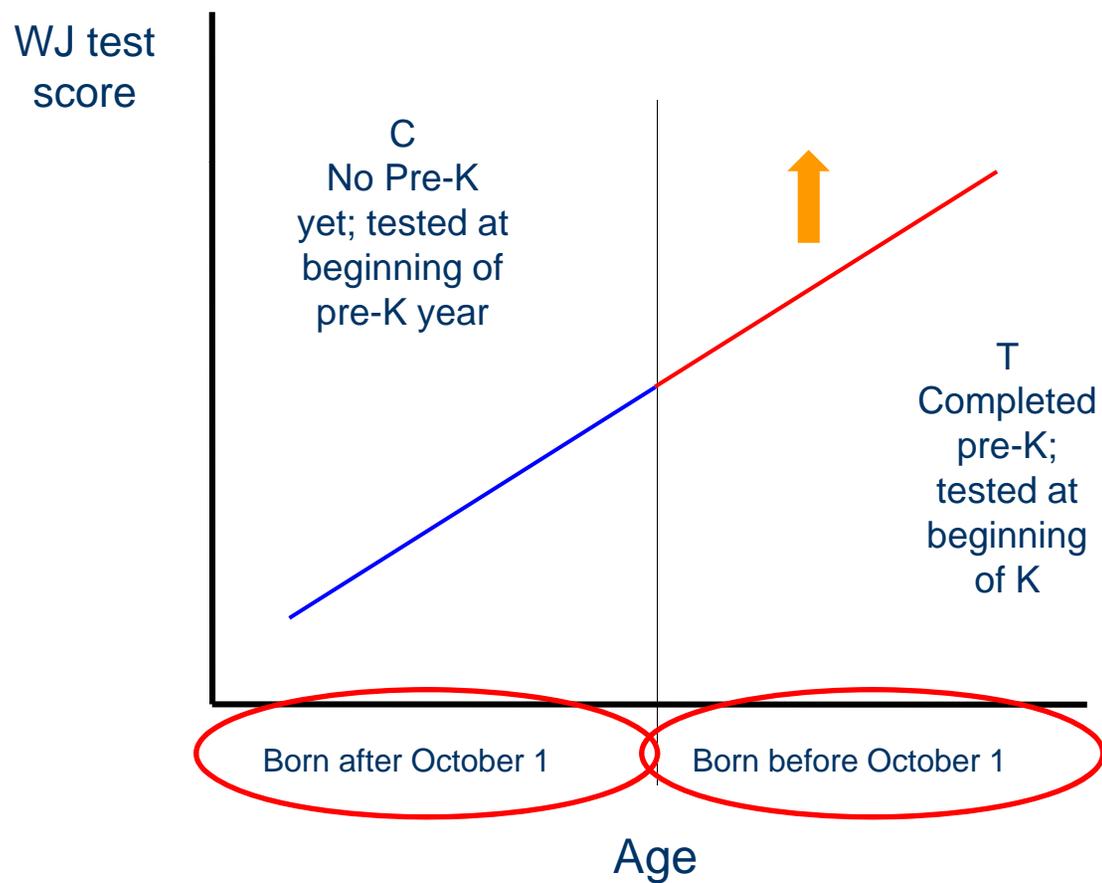
Woodcock Johnson III Scales

- *Literacy*
 - Letter-Word Identification
 - Spelling
- *Language*
 - Picture Vocabulary
 - Oral Comprehension
- *Math*
 - Applied Problems
 - Quantitative Concepts

Pre-K Age Cutoff RDD: Timing of Outcome Measures



Entry into Pre-K Selected by Birthday



RDD Effect Sizes for WJIII Scales (\pm 3-months around birth date cutoff)

Outcome Measure	Est. 1-yr Gain w/o Pre-K in SD Units	1-year Gain with Pre-K in SD Units	Pre-K Effect Size Estimate	% Improvement for Pre-K
<i>Literacy</i>				
Letter-Word ID	.35	1.01	.66**	190%
Spelling	.44	1.13	.69**	159%
<i>Language</i>				
Picture Vocabulary	.16	.46	.30	193%
Oral Comprehension	.08	.45	.37*	456% (!)
<i>Math</i>				
Applied Problems	.42	.76	.34*	81%
Quantitative Concepts	.40	.78	.39*	97%

* $p < .10$, ** $p < .05$.

Final Thoughts

- Important findings so far
 - Strong effects demonstrated for state-funded Pre-K compared to what is otherwise available in the community
 - Same pattern of effects found in both the RCT and the RDD samples lends credibility to the conclusion
 - Teacher ratings corroborate the effect and expand it to include important learning dispositions
- Future work
 - Examine the second RCT sample for similar effects
 - Follow the full RCT sample into 3rd grade
 - Continue the RDD sweep across the state, eventually including 140 classrooms

Final, Final Thoughts

- Policy level research is remarkably difficult to do with rigor
 - Schools prize their independence and are reluctant to change procedures for the sake of research
 - It is unlikely there will be another study like this – too difficult, too expensive
- Close collaboration with the TN DOE was essential for obtaining the RCT and RDD samples
- More to come!