



Classroom Activities and Organization: Predicting Gains in Achievement and Self-Regulation

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Public Pre-kindergarten Classrooms

- Serve children likely to have lower academic and self regulation skills
- Required to have a curriculum and a licensed teacher
- Full day curricular approaches adopted by school systems
 - Involving significant shifts for teachers in practices and behaviors
- One question is – can curricula produce the changes claimed for them?
- Recent interest in curriculum to facilitate growth in executive function and academic skills (e.g., Diamond & Lee, 2011).

Tools of the Mind Curriculum

- Development began in the 1990s
- Focused on helping children develop learning dispositions while they are learning academic skills
 - Self Regulation
 - Attentiveness
 - Behavioral Control
- Dispositions will help children master new material across the school years
- Widely in use (e.g., Washington D.C. school system, the country of Chili)
- Data presented here are from first large scale randomized control trial of the curriculum

Participating School Systems

- Tennessee
 - 4 small rural or suburban school districts
 - 30 classrooms (2010-2011 school year)
 - 17 *Tools* classrooms
 - 13 Comparison classrooms
- North Carolina
 - 1 urban school district
 - 30 classrooms (2010-2011 school year)
 - 15 *Tools* classrooms; 15 Comparison classrooms
 - 2nd system in North Carolina (data collection lagged a year)
 - 10 *Tools* classrooms; 10 Comparison classrooms
 - All adopting a new curriculum for first time
 - *Tools* developers had results from cohort 1 to guide them
- School-level randomization; blocked by district.

Characteristics of Children by Condition, Cohort 1

	Tools Condition	Comparison Condition	Overall
Number of children	459	347	806
Age in Months at T1	54.2	54.7	54.4
Age in Months at T3	72.9	73.4	73.1
Gender (% female)	47%	43%	45.8%
Ethnicity			
Black (%)	30%	23%	26.2%
Hispanic (%)	23%	25%	24.3%
White (%)	38%	42%	39.4%
Other (%)	9%	10%	9.6%
IEP (%)	14%	15%	14.2%
ELL (%)	28%	31%	28.7%

Characteristics of Children, Cohort 2

	Tools Condition	Comparison Condition	Overall
Number of children	147	120	267
Age in Months at T1	54.6	55.4	55
Gender (% female)	46.3%	46.7%	46.4%
Ethnicity			
Black (%)	30.6%	20.8%	26.2%
Hispanic (%)	26.5%	20.8%	24%
White (%)	38.1%	51.7%	44.2%
Other (%)	4.8%	6.7%	5.6%
IEP (%)	9.5%	5.8%	7.9%
ELL (%)	40.8%	51.7%	45.7%

Cohort 1 Teacher Characteristics by Condition

	Tools Condition (n=32)		Comparison Condition (n=28)		Overall (n=60)	
	Mean/n	Range/%	Mean/n	Range/%	Mean/n	Range/%
<i>Years of Experience</i>						
Years Teaching	12.0	2-30	12.1	1-34	12.0	1-34
Years Teaching Pre-K	7.7	2-22	6.6	1-17	7.1	1-22
<i>Education Level</i>						
Bachelor's Degree	12	38%	17	61%	29	48%
Some Graduate Coursework	11	34%	5	18%	16	27%
Master's Degree	9	28%	6	21%	15	25%
<i>Licensure Area</i>						
Early Childhood (0-Pre-K)	19	60%	18	64%	37	62%
Pre-K-3 rd	2	6%	1	3%	3	5%
Elementary Ed.	8	25%	8	29%	16	26%
Early Childhood & Special Ed	3	9%	1	4%	4	7%

Cohort 2 Teacher Characteristics by Condition

	Tools Condition (n=32)		Comparison Condition (n=28)		Overall (n=60)	
	Mean/n	Range/%	Mean/n	Range/%	Mean/ n	Range/%
<i>Years of Experience</i>						
Years Teaching	11.9	1-34	17	7-31	14.5	1-34
Years Teaching Pre-K	7	1-16	10.7	2-20	8.8	1-20
<i>Education Level</i>						
Bachelor's Degree	8	80%	6	60%	14	70%
Some Graduate Coursework	1	10%	4	40%	5	25%
Master's Degree	1	10%	-	-	1	5%
<i>Licensure Area</i>						
Early Childhood (o-Pre-K)	7	70%	7	70%	14	70%
Pre-K-3rd	1	10%	1	10%	2	10%
Elementary Ed.	1	10%	1	10%	2	10%
Early Childhood & Special Ed	1	10%	1	10%	2	10%

Instrumentation

- Woodcock-Johnson Tests of Achievement
 - Literacy
 - Letter-Word ID
 - Spelling
 - Language
 - Academic Knowledge
 - Oral Comprehension
 - Picture Vocabulary
 - Mathematics
 - Applied Problems
 - Quantitative Concepts
- Self-Regulation (EF)
 - Attention
 - DCCS
 - Copy Design
 - Inhibitory Control
 - Peg Tapping
 - Head-Toes-Knees-Shoulders
 - Working Memory
 - Corsi Blocks (forward and backward digit span)
- Teacher ratings
 - Interpersonal Skills
 - Work-related Skills
 - Adaptive Language Inventory

Summary of Child Outcome Effects

- **No effects** for *Tools of the Mind* on literacy, language, or mathematics gains when compared to comparison classrooms at the end of pre-k.
- **No effects** for second cohort that received intense coaching, changes led by developers following cohort 1 results.
- At the **end of kindergarten** cohort 1 children from *comparison* classrooms scored higher on two WJ subtests, with a marginally significant trend for them to score higher on all achievement outcomes.
- **No effects** for *Tools* on self-regulation gains at both outcome points, for either cohort.
- **No effects** on teacher ratings for either time or cohort.
- *Tools of the Mind* was not found to be consistently more or less effective for subgroups (gender, ethnicity, ELL) or low scorers.

Follow Up Research Questions

1. How different were the comparison classrooms from the *Tools* classrooms on teacher and child behaviors and time allocation?
2. Across all classrooms, were teacher or child behaviors or time allocation related to gains for children?
3. Are those processes similar in classrooms serving different populations of children

Classroom Observations

Collected in both Treatment and Comparison Classrooms with Tablet Computers

- 3 full day observations
 1. *Narrative Record*-- captures how time is spent in the classroom (activities and content) (Farran & Bilbrey, 2004)
 2. Implementation Fidelity System (number and timing of *Tools* activities) (Vorhaus, Meador, Leong, Bodrova, & Farran, 2010)
 3. *Teacher Observation in Preschool* (TOP) – teacher behaviors (Vorhaus, Bilbrey & Farran, 2007)
 4. *Child Observation in Preschool* (COP) – child behaviors (Farran et al., 2006, 2008)

Research Question 1

HOW DIFFERENT WERE THE CONTROL CLASSROOMS? COHORT 1

Curricula in Comparison Classrooms

Curricula Reported by Comparison Teachers	
Creative Curriculum	15
Literacy First	4
Houghton Mifflin	2
Scott Foresman	5
CSEFEL (Social-Emotional)	6
Opening Worlds of Learning (OWL) (<i>Cohort 2</i>)	10
Other	10

Note: Teachers often listed more than one

Fidelity of Implementation Summary

- Most *Tools* teachers implemented the activities prescribed in the manual at the appropriate times during the year.
- Teachers in the control classrooms did not implement *Tools* activities.
- Number of activities, steps, and weighted fidelity scores varied across teachers.
- **Levels of implementation were not linked to academic or self regulation outcomes at either pre-k or kindergarten.**

General Effects of Curriculum Change

- Different curricula should lead to general positive differences in treatment and comparison classrooms
- Developers should specify what will be different
 - Could be general quality will be higher
 - Could be specifiable behaviors will be different e.g.,
 - Less time allocated to whole group instruction
 - More time in small groups
 - Better ratio of child/teacher talk
 - Higher levels of instruction
 - Higher rates of child involvement in Literacy, math, etc.

Tools Developers Predictions

1. How time would be spent

- More time in *Tools* classrooms will be spent in Centers)- **No**
- Less time in *Tools* classrooms will be spent in large group instruction - **No**
 - During large group instruction, children will be more involved in *Tools* classrooms - **No**
- Less time in *Tools* classrooms will be spent in transitions – **Yes**
- Less intentional teaching in *Tools* classrooms compared to comparison classrooms (i.e., teacher led instruction) **No**

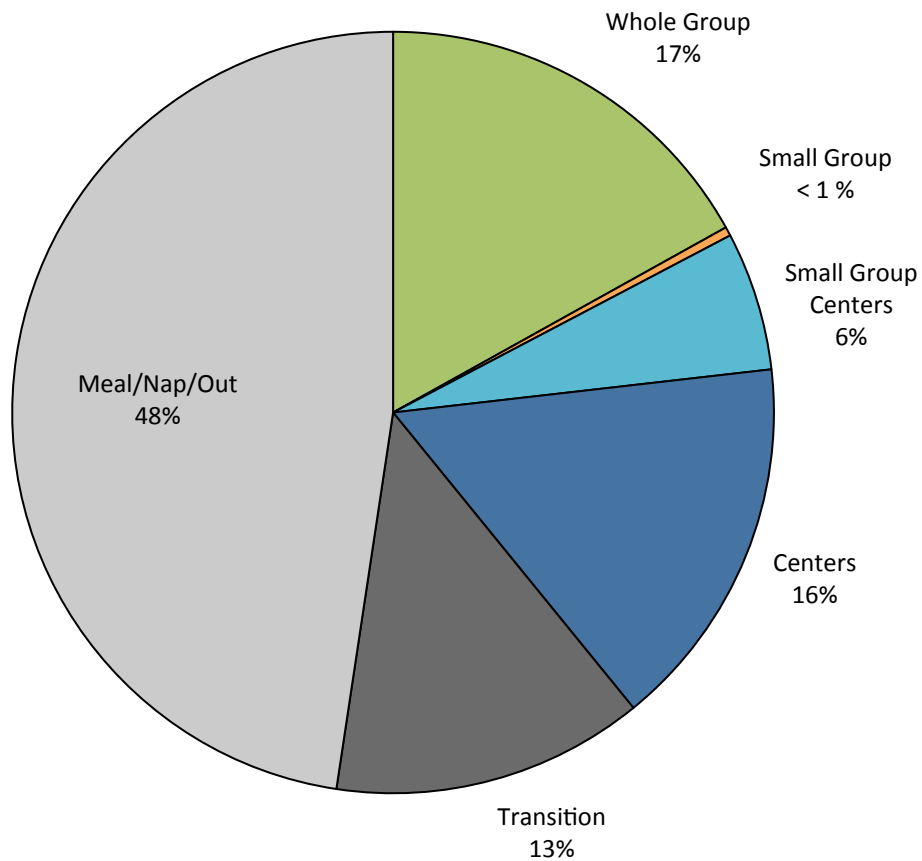
Narrative Record

- Flexible summary of the way time is spent in classrooms.
Can be adapted for specific questions.

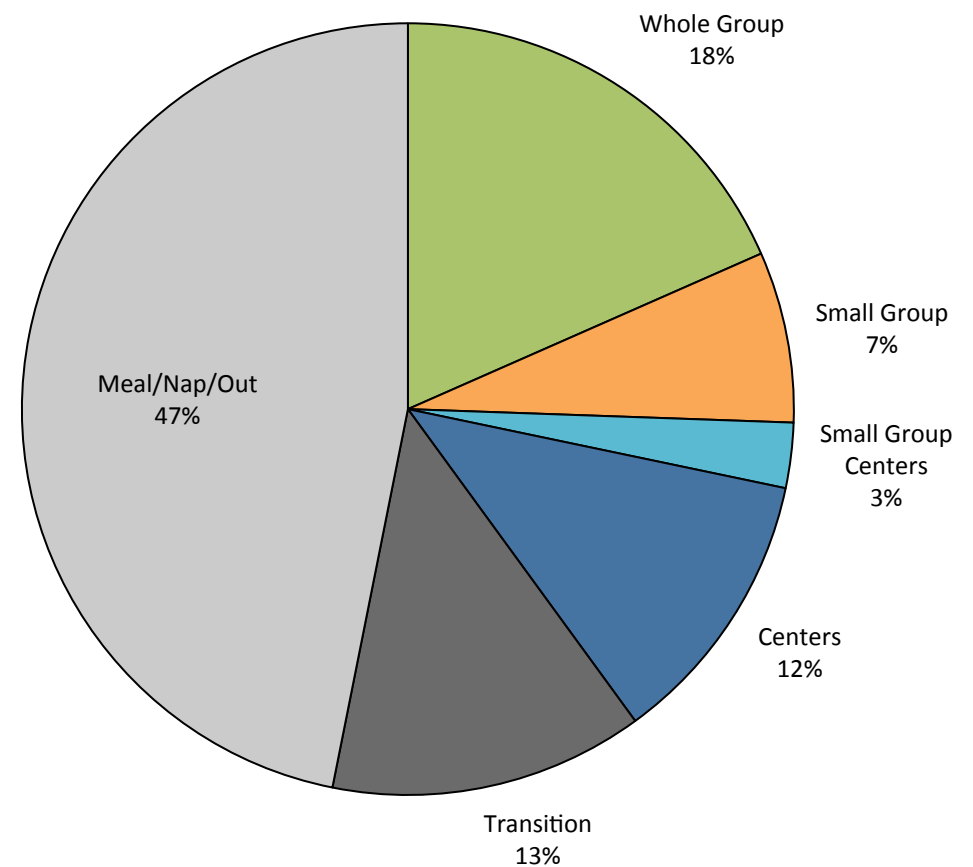
The screenshot shows the Narrative Record software interface. At the top, there is a toolbar with icons for navigation (back, forward, home), a page indicator (2 / 10), a status indicator (9 / 10 Found (Unsorted)), and buttons for 'Show All', 'New Record', 'Delete Record', 'Find', and 'Sort'. Below the toolbar, there is a 'Layout' dropdown set to 'Narrative Record' and a 'View As' section with icons for list, table, and preview views, along with a 'Preview' button. The main interface area contains several input fields: 'Observer Initials', 'Teacher ID', and 'Date'. There are also several action buttons: 'Next Line of Narrative', 'Go to Fidelity', 'Go to Envir. Scan', 'Go to POST', and a large red 'Easy' button. A 'Sort Narrative Lines' button is also present. The central part of the interface is a table with the following columns: 'Tools of The Mind', 'Break Start Time', 'Break Out Time', 'Brief Description', 'Activ. Type', 'Content', 'Engage', 'Reinf', 'Behav Rem', 'Choral Respon', 'T. Pr. Act', 'Indiv. Scaff', 'Priv. Speech', 'Intent. Mistakes', and a final column with a checkbox. The table has three rows of data, each with a 'Time' label in the first column. The first row is highlighted in light blue, the second in light orange, and the third in light blue. The first row contains the value '420503' in the final column, and the third row contains 'ad' in the final column.

Time Allocation

Control Classrooms: Proportion of Time Spent in Preschool Activities

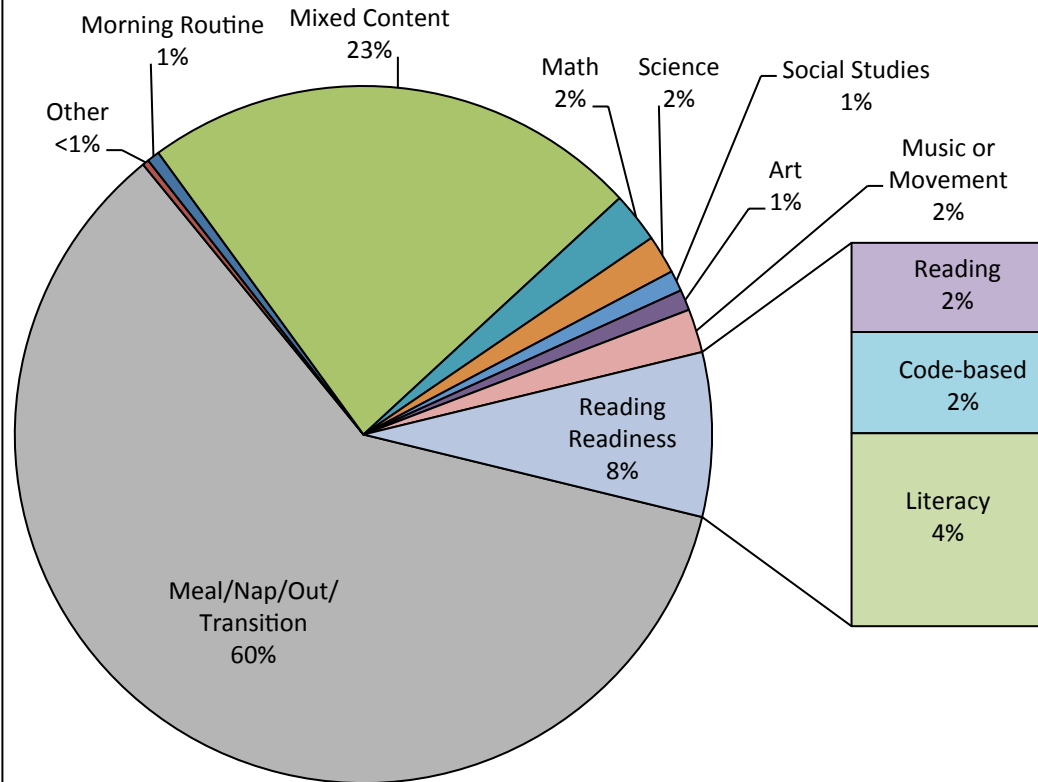


Tools Classrooms: Proportion of Time Spent in Preschool Activities

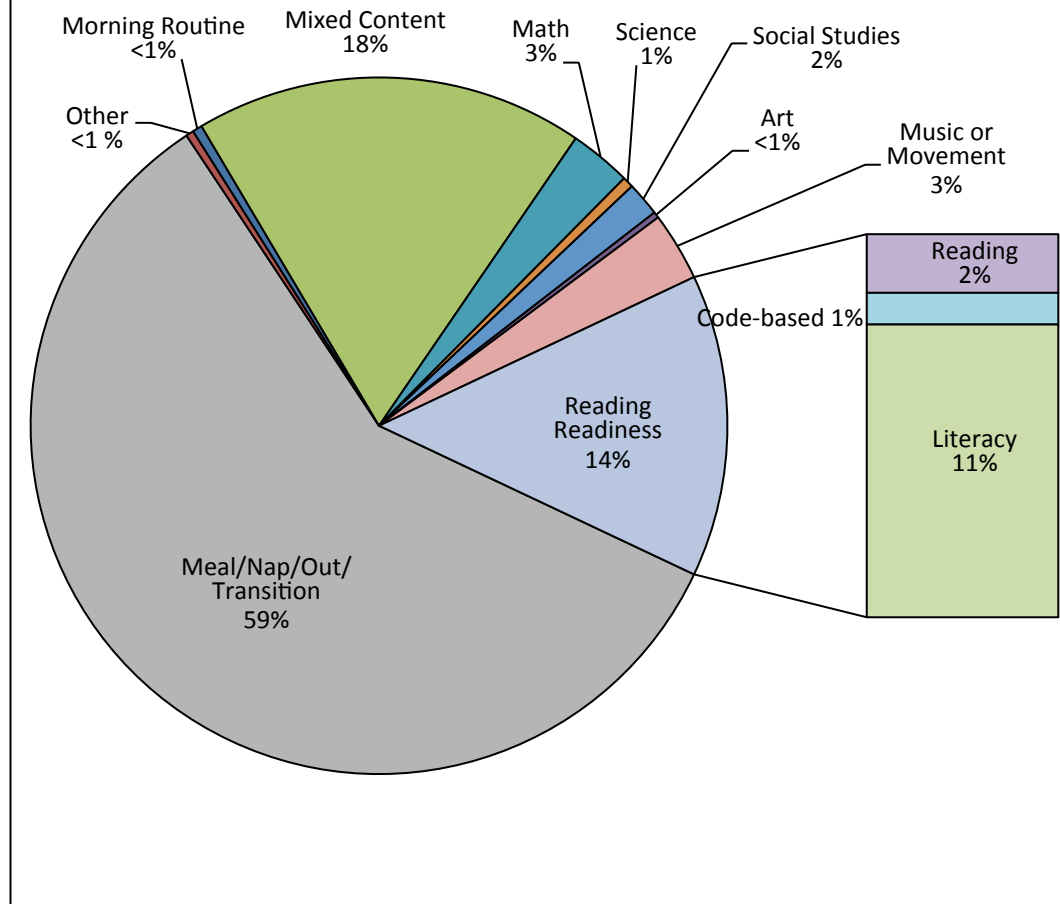


Intentional Teaching

Control Classrooms: Proportion of Time Spent in Preschool Content Areas



Tools Classrooms: Proportion of Time Spent in Preschool Content Areas



Tools Developers Predictions

2. Teacher Behavior

- Teachers in *Tools* classrooms will engage in more Behavior Approving - **No**
- Teachers in *Tools* classrooms will engage in less Behavior Disapproving - **No**
- Teachers in *Tools* classrooms will engage in more instruction - **Yes**
- Teachers in *Tools* classrooms will have a higher level of instruction- **No**
- Teachers in *Tools* classrooms will have a higher emotional tone (i.e., be warmer)- **No**

Tools Developers Predictions

3. Teacher Talk

- Teachers will talk less in *Tools* classrooms - **No**
- There will be a better balance between teacher and child talk in *Tools* classrooms - **No**
- Teachers will engage in less Management activities (**Yes**) and a lower proportion of their talk will be during Management in *Tools* classrooms (*percent of all talking sweeps*)- **No**
- Teachers will talk more with children during Center time in *Tools* classrooms - **No**

TOP Coding: Sample Category

File Edit View Insert Format Records Scripts Tools Window Help

4 19 / 297 Found (Sorted)

Records Show All New Record Delete Record Find Sort Import Manage

Layout: TOP Form View As: Preview

Pract 1 back to list status report Help Screen

Math Literacy Sci SocStud Toy Literacy LangArts

No Talk Child WG Instruction AssessT

Sm Grp SG Teacher MANage Behav App

SGT Centers Child Behav Dis

Wh Grp MBPlay SG Pers/Care

WGT SGC SGT MONitor

Self Transition WG

No Parent Trans Instr WGT

Yes Teacher MealTime Self

Listen ExtAdult Other CT

Math Literacy Sci SocStud Toy Literacy LangArts

Music/Move Reading

Drama Math

Computer Sci Vibrant

Worksheet SocStud Pleasant

TV/vid Drama Flat

Can't Code Other Negative

None None ExtremeNeg

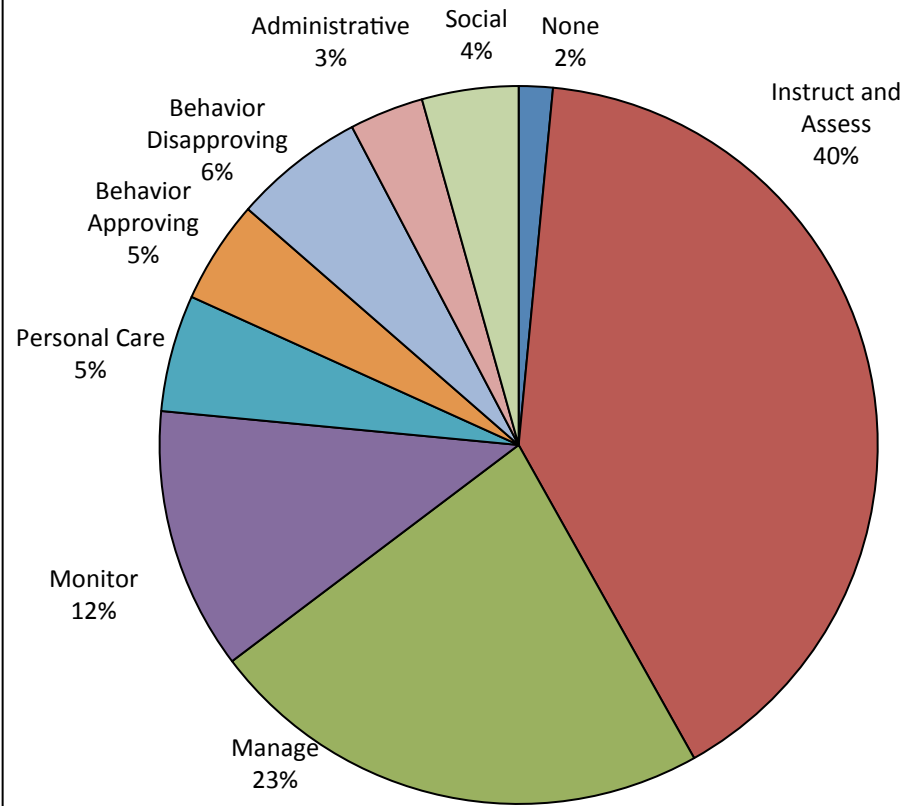
0 none 1 low 2 skills 3 inf 4 hi inf

None None

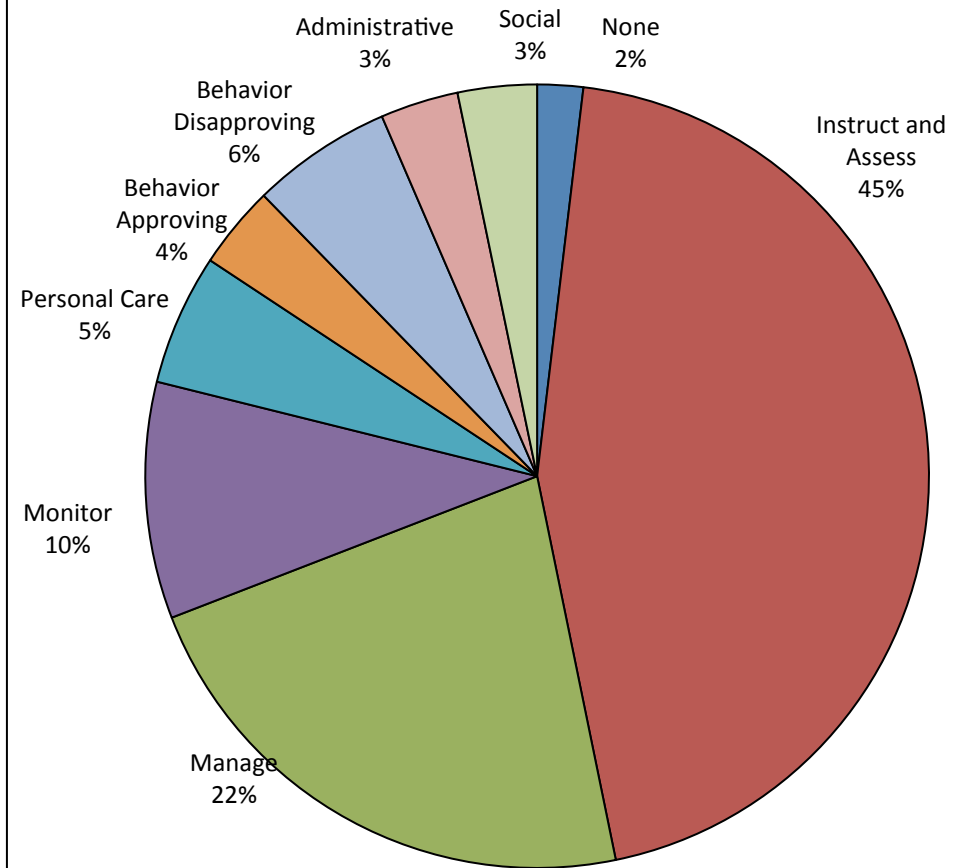
Time	SW	Verbal	To Whom	Sched	Prox.	Task	Lev	Inst	Material	Focus	Tone	Notes
1												next
2						I						next
3						AT						next
4						MA						next
5						BA						next
6						BD						next
7						PC						next
8						MO						next
9						AD						next
10						SOC						next
11						N						next
12												next
13												next
14												next
15												next
16												next
17												next
18												next
19												next
20												next

Teacher Behavior: Tasks

Comparison Teachers: Teacher Type Task

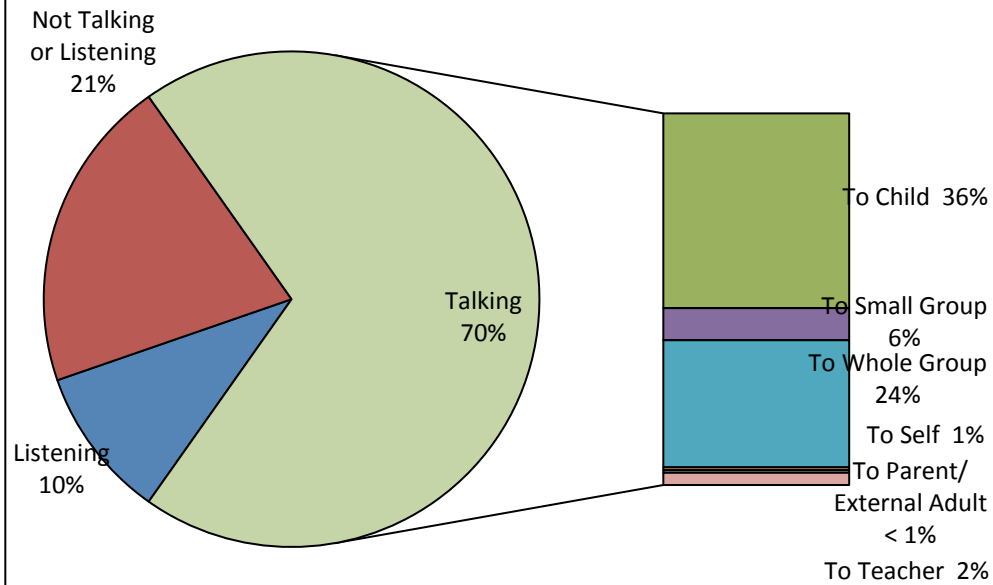


Tools Teachers: Teacher Type Task

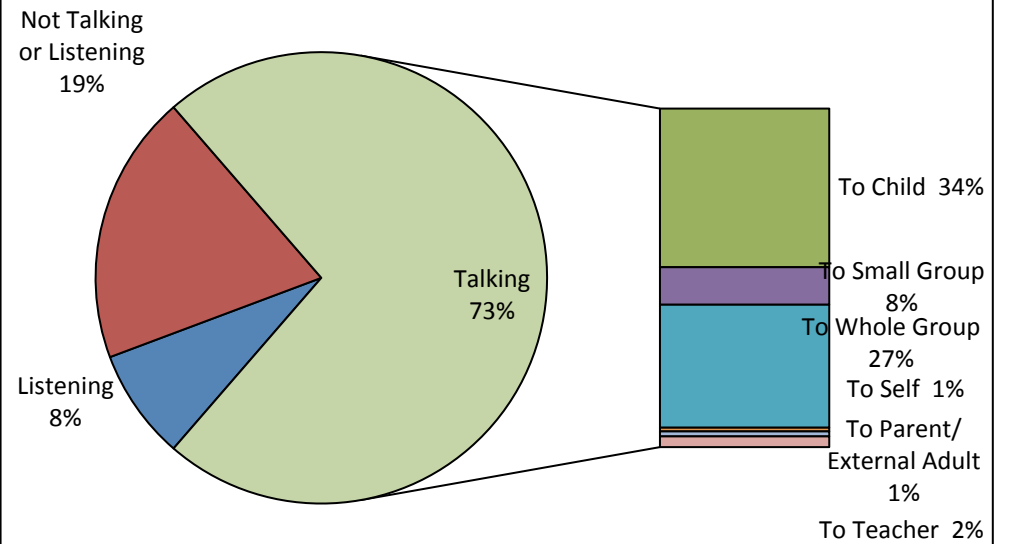


Teacher Talk

Comparison Teachers: Teacher Talking and To Whom



Tools Teachers: Teacher Talking To Whom



Tools Developers Predictions

4. Child Talk

- There will be more instances of Child to Child talk in *Tools* classrooms- **No**
- Children who are talking to each other will be more likely to have a learning focus (all content areas) in *Tools* classrooms - **Yes**
- Children in *Tools* classrooms will more often talk to themselves- **No**
- Children will more often be observed listening to other children in *Tools* classrooms- **No**

COP Coding: Sample Category

File Edit View Insert Format Records Scripts Tools Window Help

Records: 6 | 18 / 296 Found (Sorted)

Show All | New Record | Delete Record | Find | Sort | Import | Manage

Layout: COP form | View As: | Preview

child | 3 | back to list | status report | Help Screen

Teacher Child Sm Grp SGT Wh Grp WGT SelfWords SelfNoise No Listen FssCry

WG Centers MBplay SGC Transition Trans Instr MealTime Other

Non Acad Parallel ASsoc Coop ALone Onlooker SOCial Unocc TimeOut

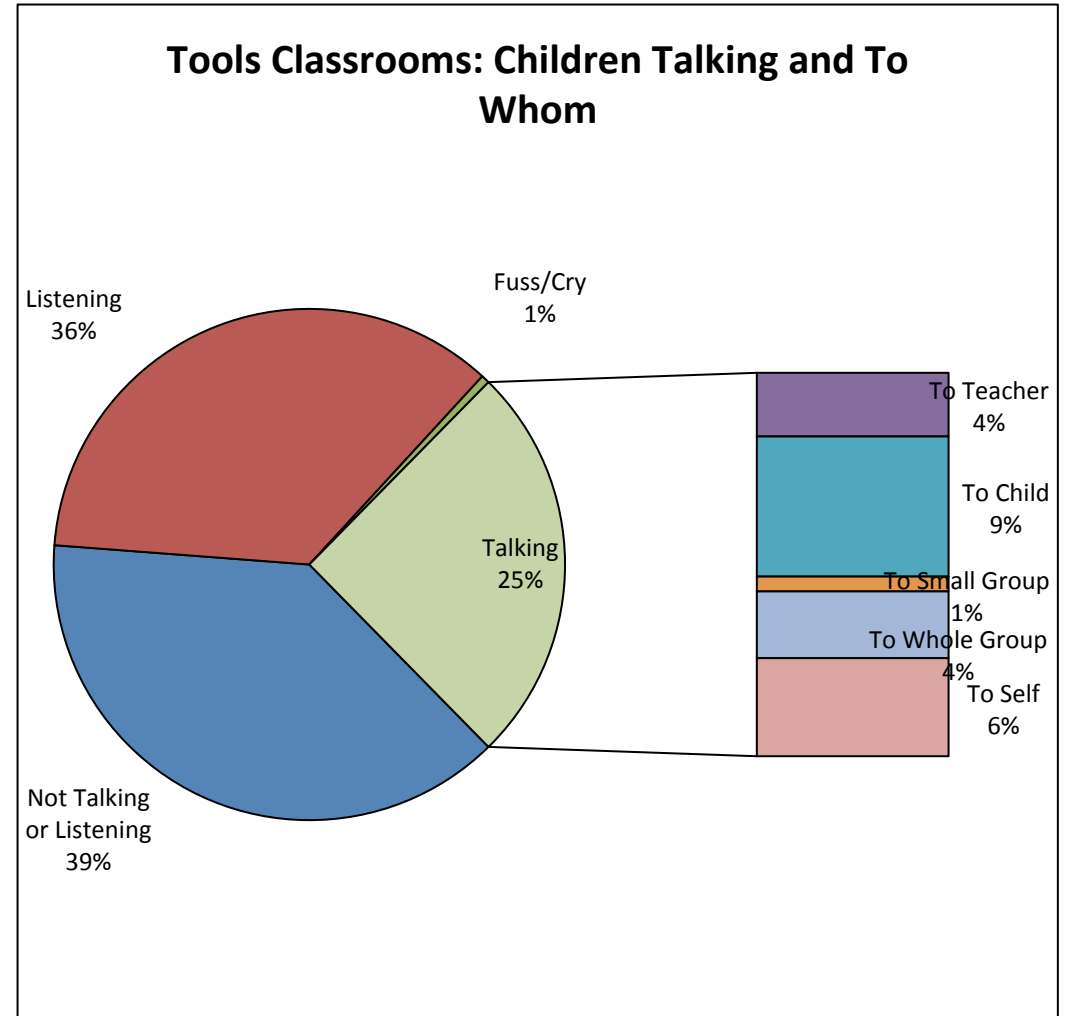
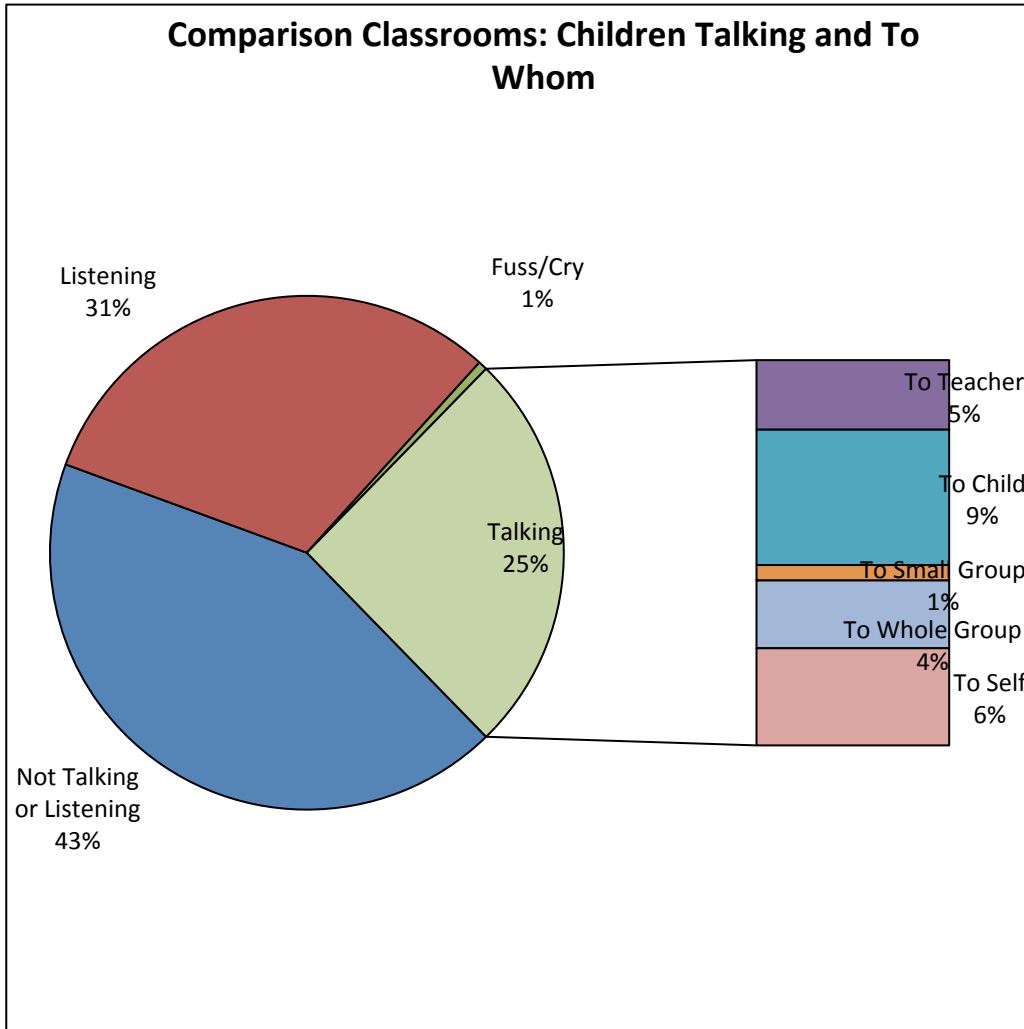
Pass Inst Non Seq SeQ Fantasy Dr None Other Med H Disrupt X TimeOut

None Math Literacy SCi Soc Stud Toy Art Music/Move Drama Computer Worksheet TV/vid Can't Code

Literacy LangArts Reading Math SCi Soc Stud Drama Other None

Time	SW	Verbal	To Whom	Sched	Prox.	Interact	Type	Involv	Material	Focus	Notes
1											next
2							PI				next
3							NS				next
4							SQ				next
5							FD				next
6							N				next
7							O				next
8							SOC				next
9							D				next
10							DX				next
11							TO				next
12											next
13											next
14											next
15											next

Child Talk



Tools Developers Predictions

5. Child Involvement

- Children will be rated as more highly involved in Tools classrooms compared to Control classrooms- **No**
 - Higher involvement will be observed in particular in Tools classrooms when the learning focus is Drama- **No**
 - Children in Tools classrooms will be more involved in Center time than in Control classrooms- **No**
- Children will be less often seen as Disruptive in Tools classrooms than in Control classrooms- **No**
- Children in Tools classrooms will be less often observed to be Unoccupied than in Control classrooms- **No**
- Children will be more highly involved in transitions in Tools classrooms than in Control classrooms- **Yes**

Research Question 2

TIME ALLOCATION, TEACHER, AND CHILD BEHAVIORS RELATED TO GAIN

Classroom-Level Predictors of Self-Regulation Gains

Variable	Standardized Estimate	t-ratio	<i>p</i>
Emotional Climate			
Positive Behavior Reinforcers	0.05	1.64	0.11
Behavior Reminders	-0.08	-2.73	0.01
Quantity of Instruction			
Proportion of Day Spent in Mathematics	0.07	2.32	0.02
Proportion of Day Spent in Literacy	-0.004	-0.09	0.93
Proportion of Day Spent in Language Arts	0.05	1.58	0.12
Proportion of Day Spent in Reading	0.01	0.30	0.73
Opportunity to Learn	0.03	0.84	0.41
Proportion of Day Spent in Transitions	-0.01	-0.32	0.75
Level of Instruction and Engagement			
Global Level of Instruction	0.06	1.91	0.06
Global Level of Engagement	0.08	2.55	0.01
Mathematics Level of Instruction	0.02	0.61	0.55
Mathematics Level of Engagement	0.02	0.62	0.54
Literacy Level of Instruction	0.02	0.54	0.59
Literacy Level of Engagement	0.06	1.93	0.06
Language Arts Level of Instruction	-0.02	-0.62	0.54
Language Arts Level of Engagement	-0.03	-0.98	0.33
Reading Level of Instruction	0.04	1.05	0.30
Reading Level of Engagement	0.13	3.6	0.001

Classroom-Level Predictors of Achievement Gains

Variable	Standardized Estimate	t-ratio	p
Emotional Climate			
Positive Behavior Reinforcers	0.01	0.54	0.59
Behavior Reminders	-0.05	-2.12	0.04
Quantity of Instruction			
Proportion of Day Spent in Mathematics	-0.01	-0.20	0.85
Proportion of Day Spent in Literacy	-0.05	-1.30	0.19
Proportion of Day Spent in Code Based Instruction	0.05	2.07	0.04
Proportion of Day Spent in Reading	-0.02	-0.76	0.45
Opportunity to Learn	0.05	2.24	0.03
Proportion of Day Spent in Transitions	0.01	0.51	0.61
Level of Instruction and Engagement			
Global Level of Instruction	0.04	1.58	0.12
Global Level of Engagement	0.06	2.64	0.01
Mathematics Level of Instruction	0.004	0.19	0.85
Mathematics Level of Engagement	0.02	0.99	0.33
Literacy Level of Instruction	-0.01	-0.35	0.73
Literacy Level of Engagement	0.08	3.56	0.001
Language Arts Level of Instruction	0.001	0.01	0.99
Language Arts Level of Engagement	0.0001	0.02	0.99
Reading Level of Instruction	0.06	1.86	0.07
Reading Level of Engagement	0.08	2.67	0.01

COP/TOP Predictors of Self-Regulation Gains

Variable	Standardized Estimate	t-ratio	p
Emotional Climate (TOP)			
Behavior Approving	0.06	2.05	0.05
Behavior Disapproving	-0.05	-1.70	0.09
Emotional Tone	0.06	1.88	0.07
Quantity of Instruction			
<i>Instruction as Delivered (from TOP)</i>			
Math Focus	0.05	1.65	0.11
Literacy Focus	0.10	2.88	0.01
Language Arts Focus	0.03	0.75	0.46
Reading Focus	0.03	0.95	0.35
Instruction and Assessment	0.07	2.25	0.03
Transition	-0.04	-1.19	0.24
<i>Instruction as Received (from COP)</i>			
Math Focus	0.08	2.79	0.01
Literacy Focus	0.11	2.83	0.01
Language Arts Focus	0.07	2.09	0.04
Reading Focus	0.05	1.57	0.12
Level of Instruction (TOP)			
Overall Level of Instruction	0.06	2.00	0.05
Teacher and Child Talk/Listen (COP and TOP)			
Teacher Talk to Child	-.02	-.72	.48
Teacher Listening to Children	-0.03	-1.03	0.31
Children Listening to Teacher	.11	3.39	0.001
Children Talking to Self	-.06	-1.99	.05

COP/TOP Predictors of Achievement Gains

Variable	Standardized Estimate	t-ratio	p
Emotional Climate (TOP)			
Behavior Approving	0.01	0.52	0.60
Behavior Disapproving	-0.07	-3.16	< .001
Emotional Tone	0.05	2.10	0.04
Quantity of Instruction			
<i>Instruction as Delivered (from TOP)</i>			
Math Focus	-0.01	-0.66	0.51
Literacy Focus	0.04	1.52	0.14
Language Arts Focus	0.05	1.97	0.05
Reading Focus	0.02	1.05	0.30
Instruction and Assessment Transition	0.01	0.45	0.65
	-0.01	-0.22	0.83
<i>Instruction as Received (from COP)</i>			
Math Focus	0.00	-0.09	0.93
Literacy Focus	0.05	1.50	0.14
Language Arts Focus	0.05	2.21	0.03
Reading Focus	0.00	0.03	0.98
Level of Instruction (TOP)			
Overall Level of Instruction	0.04	1.93	0.06
Teacher and Child Talk/Listen (COP and TOP)			
Teacher Talk to Child	-.02	-.83	.41
Teacher Listening to Children	1.00	0.54	0.59
Children Listening to Teacher	.03	.95	.35
Children Talking to Self	-.03	-1.42	.16

Why these behaviors matter (*based on Cohort 1 classes*)

Achievement Gains

1. More opportunity to learn
2. More engaged children
3. More time in math
4. More time in code-based instruction
5. Less behavior disapproving
6. More positive teacher affect

Self Regulation Gains

1. More time in math instruction
2. More engaged children
3. More teacher instruction
4. Involved listening to the teacher by children
5. Children listening more
6. More behavior approving
Less behavior disapproving

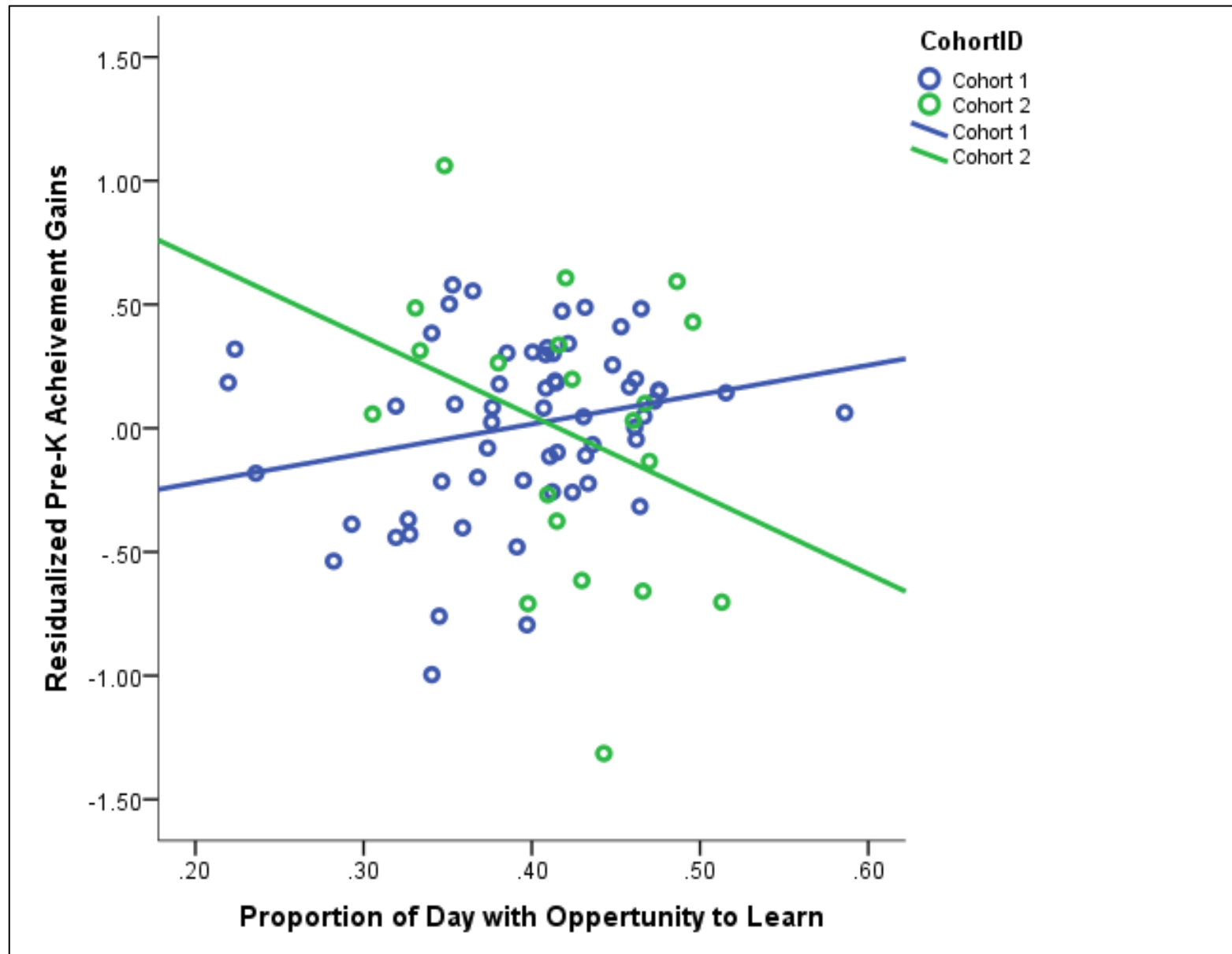
Research Question 3

REPLICATION OF FINDINGS ON NEW COHORT

Cohort 2: Less replication, more enigma

- 20 additional classrooms
- Different composition:
 - More ELL children
 - Single school district
 - More uniformity in practice
- Classroom processes predictive for Cohort 1 (60 classrooms, 5 school districts) not replicated for Cohort 2, some significantly predictive in the opposite direction
- Example:

Opportunity to Learn and Achievement Gains



Last Thoughts

- *Tools of the Mind* joins a line of new approaches (e.g. ERF) where teachers have changed their behaviors without accompanying changes in child outcomes.
- New curricula are supposed to lead to more general changes and higher quality classrooms.
- Few of the differences in teacher or child behaviors that *Tools* developers predicted were actually obtained.
- Many of the expected differences were predictive of gains in self regulation and achievement for Cohort 1.
- General practices may supersede curricula in importance.
- *However*, Cohort 2 demonstrates the importance of situating practice recommendations in context before making conclusions.



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