

## **Understanding Effects of Early Childhood Education**

High quality early childhood education (ECE) programs can have a profound effect on children's development while simultaneously yielding substantial social returns (Blau & Currie, 2006; Brownell et al., 2015; Heckman, 2006; Shonkoff & Phillips, 2000; Weiland & Yoshikawa, 2013; Wong, Cook, Barnett, & Jung, 2008). At the same time, studies suggest that the academic benefits students experience of preschool and kindergarten may not persist (Bailey, Duncan, Odgers, & Yu, 2017; Jenkins, et al., 2018). Questions regarding which features of ECE programs are associated with larger and lasting effects remain. Few rigorous studies have explored key programmatic features such as session duration (full-day vs half-day), intervention duration (one year vs two years), or content (i.e., quality of instruction or how time is spent). With many preschool and kindergarten children attending full-day programs (Kena, et al., 2016), federal, state, and locally-funded ECE programs need evidence of effects regarding dosage and quality to best support children's academic and social-emotional outcomes.

This session brings together three papers addressing pressing questions about ECE. Two examine the impact of full-day, school-based preschool on children's school readiness skills – one using a quasi-experimental design (QED) and the other a randomized controlled trial (RCT). Leveraging natural variation using a QED of a public preschool program, the first paper explores the relationship between session duration and intervention duration on children's school readiness skills across a range of direct assessments and teacher reported outcomes. Finding limited effects of full-day preschool, the authors explore evidence of differential enrollment patterns and heterogeneity of effects by child and family characteristics. The second paper reports results from an RCT of full-day preschool, finding large, positive effects on academic assessments and teacher-reported outcomes. The authors explore potential explanations for the large positive effects of a longer preschool day. The third paper provides data from a rich and novel approach to understanding how time is spent in ECE classrooms. Using observations conducted across two years, the authors provide an in-depth exploration of how kindergarteners in a large urban district spend their school days. They find that instructional time focuses almost entirely on reading and mathematics, with little time for other subjects, recess, or play. Further, they observe extensive downtime (on average, nearly half of the school day) in most classrooms.

Together these papers provide new evidence relevant for federal, state, and local ECE programs as they develop plans for scaling up preschool, revise existing preschool and kindergarten programs, and engage in quality improvement efforts for young children's learning. Preschool and kindergarten programs should consider further study of how the school day is spent before implementing plans for particular dosage and duration of programs.

## Symposium Justification

### References

Bailey, D., Duncan, G. J., Odgers, C. L., & Yu, W. (2017). Persistence and fadeout in the impacts of child and adolescent interventions. *Journal of Research on Educational Effectiveness*, *10*(1), 7-39.

Brownell, M. D., Nickel, N. C., Chateau, D., Martens, P. J., Taylor, C., Crockett, L., ... & Goh, C. Y. (2015). Long-term benefits of full-day kindergarten: a longitudinal population-based study. *Early child development and care*, *185*(2), 291-316.

Jenkins, J. M., Watts, T. W., Magnuson, K., Gershoff, E. T., Clements, D. H., Sarama, J., & Duncan, G. J. (2018). Do High-Quality Kindergarten and First-Grade Classrooms Mitigate Preschool Fadeout?. *Journal of Research on Educational Effectiveness*, 1-36.

## Natural Variation in Dosage and Intensity of a Public Preschool Program and Associations with School Readiness Skills

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**Background.** Research on early childhood education (ECE) programs has focused on access and quality, particularly in promoting school readiness outcomes for children from low-income families (Pianta et al, 2009). There is little consensus in the field about the relationship between hours spent in ECE settings and the benefits in terms of child development outcomes (Melhuish, et al., 2015). Some studies suggest that three and four-year olds benefit from full-day compared to part-day but primarily for academic outcomes, with mixed impacts on behavior and social skills (Loeb et al., 2007; Robin et al., 2006). Reynolds and colleagues analyzed a large sample of children participating in the Child-Parent Center (CPC) program in Chicago Public Schools and found full-day CPC was associated with increased school readiness skills in 4 of 6 formative assessment domains (social-emotional, language, math, and physical health but not literacy or cognitive development) and better attendance compared with children in the part-day CPC program (Reynolds et al, 2014). Researchers have also explored the impact of one-year vs two-years of preschool with studies finding positive impacts in Head Start populations in the short-term (Wen, et al., 2012) and in public preschool participants in the long-term (Shah, et al., 2017). This inconsistent body of research has led some policy advocates and researchers to call for more research into how children spend their time and less on the number of hours, especially if studies lack data on the quality of the program (Wasik & Snell, 2015). However, the 2015 federal preschool expansion opportunity – the Preschool Expansion Grant (PEG) – required programs receiving funding to provide full-day services (defined as 5 plus hours of preschool programming). With nearly half of young children attending full-day programs (Kena, et al., 2016), federal, state, and locally-funded preschool programs need clarity on dosage, intensity, and quality to best support children’s academic and social-emotional outcomes.

**Purpose.** We conducted a quasi-experimental study of the CPC program and examined the natural variation in dosage that occurred to understand whether more time spent in the program (full-day vs. part-day or two years vs. one) led to better school readiness skills at kindergarten entry.

**Setting.** CPC preschool classrooms were operated by Chicago Public Schools as part of the Investing in Innovation (i3)-funded CPC expansion project. The comparison group consisted of non-CPC, “business as usual” (BAU), preschool classrooms in the same district.

**Participants.** Approximately 1,079 children participated in the evaluation and outcome assessments ( $n = 776$  CPC and  $n = 319$  non-CPC). Approximately 30% of the sample were Dual Language Learners (DLLs) by parent report of home language. Nearly all families met income eligibility requirements of the district preschool program. More than half (56%) of participants were African-American and approximately one-third (31%) were Latino/a. See Table 1.

**Intervention.** CPC is an evidence-based PreK to 3<sup>rd</sup> grade school reform model which enrolls children at age three or age four for one or two years of part-day or full-day preschool. The CPC program promotes young children's school readiness skills using evidence-based curricula, language enriching activities and intensive, mandatory parent involvement with a system of comprehensive support services for children and their families.

**Research Design.** Analyses presented here are part of a larger independent impact evaluation of CPC using a QED, where schools implementing CPC were matched to BAU schools in the district using several school-level demographic and achievement variables. This study focuses on outcomes at kindergarten entry.

**Data collection and Analysis.** Approximately half (69%) of the CPC schools offered full-day preschool whereas only 13% of the comparison schools did. At the beginning of preschool and either one or two years later when children entered kindergarten, the research team collected data on literacy, math, and school readiness skills using a battery of direct assessment (Woodcock-Johnson III Applied Problems (AP) and Letter-Word Identification (LWI) – Woodcock, et al., 2001) and teacher ratings (Minnesota Work Sampling System – Meisels, et al., 2001). We also collected data on student's social skills and behavior control using the Teacher-Child Rating Scale (T-CRS 2.1) (Hightower & Perkins, 2010) and an executive function task – the Dimensional Change Card Sort task (Zelazo, 2006). Two-level hierarchical linear modeling (HLM) was used to estimate the impact of the intervention to account for the clustering and adjusting for important covariates (Raudenbush & Bryk, 2002). The first level was children and second level was schools. HLM controlled for child demographic characteristics and baseline scores.

**Findings.** We found no significant main effect favoring the CPC preschool program compared to the district BAU preschool program (see Table 2) although there was a trend for CPC participants to have higher LWI scores at kindergarten entry. We then explored the impact of full-day preschool finding no difference in outcomes when comparing full-day CPC preschool to full-day BAU. Unfortunately, there were too few children in the comparison group attending full-day to know if there was no effect or we were underpowered to detect an effect.<sup>1</sup> When we examined within treatment impacts, we again find no difference between full-day CPC and part-day CPC participants on any school readiness or social-emotional outcomes at kindergarten entry.

Approximately 34% of children in the intervention group ( $n = 670$ ) and 32% of children in the comparison group ( $n = 220$ ) began preschool as three-year-olds and comprise the two-year preschool cohort. For this cohort, we found a significant positive impact on literacy (as measured by the WJ LWI subtest) at kindergarten entry for children who began CPC preschool at three compared with children who began the district's BAU preschool at three ( $p < .05$ ). We found a similar positive impact for the two-year CPC preschool cohort on the T-CRS assertiveness subscale ( $p < .10$ ).

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<sup>1</sup> Approximately 18% of intervention children were enrolled in full-day CPC preschool classrooms but only 6% of children in the comparison group were enrolled in full-day.

**Conclusions.** Discussion will focus on what we know about the experiences of the children during in the different categories - part- or full-day preschool and one-year or two-years - related to curriculum, CLASS observation scores, and the demographic characteristics of participating children.

## References

- Hightower, A. D., & Perkins, P. E. (2010). *Teacher-child rating scale 2.1. Examiner's manual*. Rochester, NY: Children's Institute.
- Shah, H. K., Domitrovich, C. E., Morgan, N. R., Moore, J. E., Cooper, B. R., Jacobson, L., & Greenberg, M. T. (2017). One or two years of participation: Is dosage of an enhanced publicly funded preschool program associated with the academic and executive function skills of low-income children in early elementary school? *Early Childhood Research Quarterly, 40*, 123-137.
- Kena, G., Hussar, W., McFarland, J., de Brey, C., Musu-Gillette, L., Wang, X., . . . Diliberti, M. (2016). The Condition of Education 2016. NCEES 2016-144. *National Center for Education Statistics*.
- Loeb, S., Bridges, M., Bassok, D., Fuller, B., & Rumberger, R. W. (2007). How much is too much? The influence of preschool centers on children's social and cognitive development. *Economics of Education Review, 26*, 52-66.
- Melhuish, E., Ereky-Stevens, Petrogiannis, K., Ariescu, A., Penderi, E., Rentzou, K., Tawell, A., Leseman, P. & Broekhuisen, P. (2015). A review of research on the effects of early childhood education and care (ECEC) on child development, CARE publication.
- Pianta, R. C., Barnett, W. S., Burchinal, M., & Thornburg, K. R. (2009). The effects of preschool education: What we know, how public policy is or is not aligned with the evidence base, and what we need to know. *Psychological Science in the Public Interest, 10*(2), 49-88.
- Reynolds, A. J., Richardson, B. A., Hayakawa, M., Lease, E. M., Warner-Richter, M., Englund, M. M., Ou, S.-R., & Sullivan, M. (2014). Association of a full-day vs part-day preschool intervention with school readiness, attendance, and parent involvement. *Journal of the American Medical Association, 312*(20), 2126-2134. doi:10.1001/jama.2014.15376
- Robin, K. B., Frede, E. C., & Barnett, W. S. (2006). Is more better? The effects of full-day vs half-day preschool on early school achievement. Rutgers, National Institute for Early Education Research.
- Wasik, B. A. & Snell, E.K. (2015). Synthesis of preschool dosage: Unpacking how quantity, quality and content impacts child outcomes. Presentation at the Human Capital Research Collaborative National Invitational Conference Agenda in Minneapolis, MN.

Wen, X., Leow, C., Hahs-Vaughn, D. L., Korfmacher, J., & Marcus, S. M. (2012). Are two years better than one year? A propensity score analysis of the impact of Head Start program duration on children's school performance in kindergarten. *Early Childhood Research Quarterly, 27*(4), 684–694.

Zelazo, P. D. (2006). The Dimensional Change Card Sort (DCCS): A method of assessing executive function in children. *Nature Protocols, 1*(1), 297-301.

Table 1. Descriptive statistics of children in treatment and comparison condition in Chicago Public Schools

Variable	Intervention		Comparison		$\beta$	<i>SE</i>	<i>p</i>
	<i>M</i> ( <i>SD</i> )	<i>N</i>	<i>M</i> ( <i>SD</i> )	<i>N</i>			
Demographic characteristics							
Male	0.46	756	0.49	303	-0.08	0.14	0.5434
Age (months) as of Sep 2012	49.51 (6.38)	756	49.02 (6.48)	303	0.92	1.02	0.3716
Low income	0.96 (0.19)	747	0.92 (0.28)	239	0.82	0.62	0.1951
Latino/a	0.33 (0.47)	749	0.44 (0.5)	238	-0.73	1.12	0.5206
White (not Latino/a)	0.01 (0.11)	749	0.05 (0.22)	238	-0.57	0.90	0.5293
Black (not Latino/a)	0.65 (0.48)	749	0.50 (0.50)	238	0.68	1.15	0.5605
Other race/ethnicity	0.01 (0.10)	749	0.01 (0.11)	238	0.17	0.68	0.8073
Speak only English at home	0.71 (0.46)	756	0.60 (0.49)	303	1.02	1.05	0.3416
Mother's education	2.19 (0.96)	589	2.17 (1.14)	240	-0.03	0.18	0.8625
IEP status	0.05 (0.22)	712	0.03 (0.18)	242	0.50	0.93	0.3617
Single parent	0.43 (0.5)	607	0.41 (0.49)	240	0.09	0.38	0.8215
Employment status	2.19 (0.91)	603	2.3 (0.84)	238	-0.15	0.14	0.3035
Public assistance	2.95 (1.77)	605	2.97 (1.63)	236	0.01	0.31	0.9692
Full day, %	0.79 (0.4)	756	0.96 (0.19)	303	-3.38	1.84	0.0768
3 year old, %	0.66 (0.48)	756	0.61 (0.49)	303	0.54	0.54	0.3229



Variable	Intervention		Comparison		$\beta$	<i>SE</i>	<i>p</i>
Pretest Scores							
School readiness (MWSS) total score	43.53 (17.66)	632	46.64 (15.43)	242	-3.22	3.03	0.2959
WJ AP W score	390.36 (25.17)	756	389.79 (41.85)	302	0.70	0.22	0.8302
WJ LWI W score	327.59 (27.19)	756	322.5 (25.66)	302	4.64	2.55	0.0794
DCCS	1.17 (0.63)	756	1.11 (0.63)	303	0.06	0.04	0.1416
T-CRS assertiveness	56.59 (24.37)	619	59.99 (23.49)	234	-1.39	3.39	0.6844
T-CRS peer social skills	54.03 (22.06)	631	58.21 (22.87)	242	-2.73	4.26	0.5267
T-CRS behavior control	48.43 (24.56)	624	56.29 (24.35)	235	-6.19	4.36	0.1656
T-CRS task orientation	55.42 (23.41)	631	59.04 (21.74)	242	-3.40	3.11	0.2135

Table 2. Outcome Scores and HLM Impact Estimates for Intervention and Comparison Children

Variable	Intervention		Comparison		Estimated impact	Effect Size
Outcomes	<i>M</i> ( <i>SD</i> )	<i>N</i>	<i>M</i> ( <i>SD</i> )	<i>N</i>	( <i>SE</i> )	
School readiness (MWSS) total score	51.19 (19.11)	610	52.61 (15.96)	220	2.87 (3.14)	0.16
WJ AP W score	418.85 (17.27)	756	417.06 (16.98)	302	-0.28 (1.62)	-0.02
WJ LWI W score	376.50 (35.54)	756	369.72 (25.74)	302	7.76† (3.83)	0.23
DCCS	1.72 (0.56)	756	1.68 (0.56)	303	-0.01 (0.06)	-0.02
T-CRS assertiveness	58.06 (25.14)	574	55.20 (25.95)	207	4.51 (3.05)	0.18
T-CRS peer social skills	56.67 (23.16)	598	57.42 (23.71)	217	0.06 (2.58)	0.004
T-CRS behavior control	48.03 (21.49)	593	49.53 (27.05)	210	0.29 (2.65)	0.01
T-CRS task orientation	56.07 (26.03)	605	57.32 (25.44)	220	1.09 (2.20)	0.04

†  $p < .10$

Table 3. Outcome Scores for Full-Day vs Part-Day CPC Participants

Variable	Full day Intervention		Part day Intervention		Part day- Full day Estimated impact	<i>Effect Size</i>
Outcomes	<i>M</i> ( <i>SD</i> )	<i>N</i>	<i>M</i> ( <i>SD</i> )	<i>N</i>	( <i>SE</i> )	
School readiness (MWSS) total score	54.33 (18.23)	136	50.39 (19.28)	474	3.04 (2.70)	0.16
WJ AP W score	419.89 (15.67)	155	418.28 (17.80)	601	0.02 (1.85)	0.01
WJ LWI W score	384.04 (32.74)	155	376.07 (35.52)	601	-0.49 (4.18)	-0.01
DCCS	1.80 (0.53)	155	1.70 (0.57)	601	-0.08 (0.07)	-0.14
T-CRS assertiveness	63.80 (22.8)	115	56.63 (25.52)	459	-1.42 (3.84)	-0.02
T-CRS peer social skills	59.49 (26.31)	133	55.87 (22.14)	465	-0.54 (3.24)	-0.02
T-CRS behavior control	46.51 (28.17)	128	48.45 (23.05)	465	2.87 (3.53)	0.11
T-CRS task orientation	55.81 (28.17)	135	56.14 (24.89)	470	2.40 (2.88)	0.09

Table 4. Outcome Scores for 3-year Old Students Who Received Two years of Intervention and 3-year Old Comparison Children

Variable	Intervention		Comparison		Estimated impact	Effect Size
Outcomes	<i>M</i> ( <i>SD</i> )	<i>N</i>	<i>M</i> ( <i>SD</i> )	<i>N</i>	( <i>SE</i> )	
School readiness (MWSS) total score	58.08 (28.29)	209	53.92 (16.16)	96	4.37 (3.76)	0.17
WJ AP W score	424.55 (17.40)	260	420.50 (17.49)	116	1.02 (2.31)	0.06
WJ LWI W score	395.55 (38.11)	260	371.78 (23.20)	116	17.63** (6.07)	0.52
DCCS	1.83 (0.55)	260	1.76 (0.54)	117	0.03 (0.09)	0.05
T-CRS assertiveness	63.66 (24.28)	201	56.83 (25.17)	89	6.81† (3.61)	0.28
T-CRS peer social skills	59.29 (24.35)	205	60.98 (23.56)	94	-0.91 (4.31)	-0.04
T-CRS behavior control	49.97 (25.04)	207	52.26 (27.41)	88	0.84 (4.48)	0.03
T-CRS task orientation	59.82 (26.17)	208	61.58 (23.66)	96	-1.03 (3.56)	-0.04

†  $p < .10$ , \*\*  $p < .01$

*Note.* Descriptive analysis uses the sample of children with posttest on each outcome. MWSS = Minnesota Work Sampling System; WJ LWI = Woodcock-Johnson III Letter Word Identification subtest; WJ AP = Woodcock-Johnson III Applied Problems subtest; DCCS = Dimensional Change Card Sort task; T-CRS = Teacher-Child Rating Scale 2.1

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### **Background.**

In this presentation, we will present initial results from a randomized control trial—the first of its kind—in which we estimate the causal impacts of full-day versus half-day preschool on a variety of short- and medium-term student and parent outcomes. High quality early childhood education (ECE) programs can have a profound effect on children’s development while simultaneously yielding substantial social returns (Blau & Currie, 2006; Heckman, 2006; Shonkoff & Phillips, 2000; Weiland & Yoshikawa, 2013; Wong, Cook, Barnett, & Jung, 2008). At the same time, studies have also suggested that the benefits students experience from preschool participation may not persist. What features of ECE programs are associated with larger and lasting effects?

One candidate feature is the duration/intensity of the school day. Recent studies suggest that intensive programs, defined broadly to include both the number of years and the number of hours children attend a program, could have persistent effects on children’s development; however, these studies rely on non-experimental or quasi-experimental approaches (Walters, 2015; Leow & Wen, 2017; Shah et al., 2017; Wen, Leow, Hahs-Vaughn, Korfmacher, & Marcus, 2012). The lack of rigorous causal evidence in the ECE literature creates a need to understand what features are critical for the enhancement of effective early childhood interventions.

### **Research Questions.**

We estimate the causal effect of (an offer of) full day preschool, relative to an offer of half-day preschool on:

- Student academic outcomes (PPVT, DIBELS, TS GOLD scores) in pre-K through 1<sup>st</sup> grade;
- Student socioemotional and behavioral outcomes, including an executive function assessment (HTKS), a special needs screener (ESI-R), and attendance in pre-K through 1<sup>st</sup> grade;
- Parent and family outcomes including childcare expenses, ability to work, perceptions of barriers to work, and home-based daily care routines?

### **Setting and Population.**

Westminster Public School District (WPS) is located northwest of Denver and serves approximately 10,000 students annually. WPS students are non-White (83 percent), low-income (76 percent), and non-native English speaking (34 percent). The population of interest is four-year old children, and we are particularly interested in focusing on students from historically underserved groups and their responses to full-day preschool, because we hypothesize that the

provision of full-day preschool may affect these students and their families differently than families with greater access to social capital resources.

### **Intervention.**

Prior to the 2016-2017 school year, WPS provided half-day preschool for three hours per day, four days per week. Starting in 2016-17, WPS created seven new full-day classrooms to supplement their existing half-day offerings. Because about twice as many families wanted to attend full-day than could be accommodated in those classrooms, WPS sought to select students based on a lottery system. Families who did not receive slots in the full-day program were offered enrollment in the business-as-usual half-day program. We conducted a lottery preceding the start of pre-k in academic years 2016-17, 2017-18, and 2018-19.

### **Research Design.**

We employ a randomized block design (within first choice of school site) RCT in which eligible families who completed an application were randomly assigned to offers of full- and half-day classrooms. We estimate the intent-to-treat (ITT) and complier-average-treatment-effects (CATE) as causal estimates of interest since a small number of families did not take-up their lottery assignments into full- or half-day classrooms.

### **Data Collection and Analysis.**

At both the start and end of the preschool year, the study team administers three assessments—the PPVT, HTKS, and ESI-R—to all randomized students, regardless of whether or not they ultimately enrolled in WPS pre-k. Additionally, the school district administers its own assessments during the pre-k year (e.g., TS GOLD); however, since these measures are available only for the subset of children enrolled in WPS, we treat these study results as exploratory. We also administer parent surveys in the spring of the preschool year to assess how preschool offerings affect the lives of children and their families at home.

### **Preliminary Results.**

In exploring academic outcomes, we find that an offer of full-day pre-k produced large, positive effects on children's receptive vocabulary (0.267 standard deviations) by the end of pre-k, while actually attending full-day pre-k improved children's receptive vocabulary score by a greater amount (0.398 standard deviations). See Table 1. Children offered a full-day pre-k assignment also outperform their peers on teacher-reported measures of cognition, literacy, math, and physical development; furthermore, this group of children outperformed their peers on a widely used measure of basic literacy at the start of their kindergarten year.

### **Next Steps.**

We will supplement the findings above with evidence on additional outcomes including socio-emotional, behavioral, and parental outcomes. As the current year of the study continues, we will supplement existing analyses with new data from the fall of 2018 in order to follow three cohorts of students as they move through school. Where relevant, we will utilize supplemental data to contextualize findings. Additional data collected includes classroom time-use information, quality of teacher-child interactions (CLASS scores), parent surveys, and teacher surveys.

**Table 1. Primary and Exploratory Outcomes: Causal Effects of Full-Day Pre-K, when Missing Outcomes Imputed (ITT vs. CATE).**

<i>Intent-to-Treat Analysis</i>											
	Primary Outcomes		End of Pre-K TS GOLD						Fall Kindergarten DIBELS		
	<i>PPVT</i> (M3)	<i>ESI-R</i> (M3)	<i>Cognition</i> (M3)	<i>Language</i> (M3)	<i>Literacy</i> (M3)	<i>Math</i> (M3)	<i>Physical</i> (M3)	<i>Socio-Emotional</i> (M3)	<i>Overall Composite</i> (M3)	<i>1st Sound Fluency</i> (M3)	<i>Ltr Naming Fluency</i> (M3)
<b>Assigned to Full</b>	0.218 *	0.048	0.171 *	0.069	0.262 **	0.156 *	0.161 *	0.108	0.122	0.136	0.096
	(0.100)	(0.140)	(0.078)	(0.083)	(0.084)	(0.078)	(0.079)	(0.070)	(0.139)	(0.151)	(0.143)
<b>Constant</b>	0.104	0.176	0.082	0.055	0.071	0.045	-0.014	-0.002	0.112	0.067	0.133
	(0.080)	(0.111)	(0.062)	(0.065)	(0.067)	(0.062)	(0.063)	(0.055)	(0.110)	(0.120)	(0.113)
<b>R<sup>2</sup></b>	0.669	0.407	0.758	0.731	0.770	0.783	0.743	0.803	0.446	0.408	0.392
<b>Adj. R<sup>2</sup></b>	0.588	0.263	0.699	0.666	0.714	0.730	0.680	0.755	0.311	0.265	0.244
<b>N</b>	226	226	226	226	226	226	226	226	226	226	226

<i>Complier Average Treatment Effects (Two-Stage Least Squares)</i>											
	Primary Outcomes		End of Pre-K TS GOLD						Fall Kindergarten DIBELS		
	<i>PPVT</i> (M3)	<i>ESI-R</i> (M3)	<i>Cognition</i> (M3)	<i>Language</i> (M3)	<i>Literacy</i> (M3)	<i>Math</i> (M3)	<i>Physical</i> (M3)	<i>Socio-Emotional</i> (M3)	<i>Overall Composite</i> (M3)	<i>1st Sound Fluency</i> (M3)	<i>Ltr Naming Fluency</i> (M3)
<b>Attended Full-Day</b>	0.338 *	0.074	0.265 *	0.107	0.406 **	0.242 *	0.250 *	0.167	0.189	0.210	0.149
	(0.156)	(0.217)	(0.119)	(0.127)	(0.124)	(0.118)	(0.123)	(0.107)	(0.214)	(0.233)	(0.222)
<b>Constant</b>	0.021	0.158	0.016	0.029	-0.029	-0.015	-0.075	-0.043	0.066	0.015	0.096
	(0.111)	(0.154)	(0.084)	(0.090)	(0.088)	(0.083)	(0.087)	(0.076)	(0.152)	(0.166)	(0.157)
<b>N</b>	226	226	226	226	226	226	226	226	226	226	226

Note: In this table, we impute possible assessment scores for study participants who are missing these outcomes. For study participants without scores in the treatment group, we assume they would have scored at the mean of the control group (within the same school site). For study participants without scores in the control group, we assume they would have scored at the mean of the treatment group. Results are reported for M3 only, which includes first-choice school (i.e., block) fixed effects, student-level control variables, and start of schoolyear pre-scores on all assessments (and, where relevant, the language and format in which these assessments were taken). The vector of student-level pre-treatment covariates includes gender, race/ethnicity, free/reduced price lunch eligibility, and age at the start of pre-k. To control for any possible family context differences we also include parental education, whether or not child had a teen parent, whether the home language is English, as well as indicators for (pre-treatment reports of) history of family drug/alcohol abuse, family special needs, frequent moving, physical abuse, interactions with social services, difficulties obtaining secure housing, and perceived child underdeveloped language or social skills prior to pre-k. We include missingness dummies in cases where respondents have missing pre-treatment covariates.

References

- Blau, D., & Currie, J. (2006). Pre-school, day care, and after-school care: who's minding the kids? *Handbook of the Economics of Education*, 2, 1163-1278.
- Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science*, 312(5782), 1900-1902.
- Leow, C., & Wen, X. (2017). Is full day better than half day? A propensity score analysis of the association between Head Start Program intensity and children's school performance in kindergarten. *Early Education and Development*, 28(2), 224-239.
- Shah, H. K., Domitrovich, C. E., Morgan, N. R., Moore, J. E., Cooper, B. R., Jacobson, L., & Greenberg, M. T. (2017). One or two years of participation: Is dosage of an enhanced publicly funded preschool program associated with the academic and executive function skills of low-income children in early elementary school? *Early Childhood Research Quarterly*, 40, 123-137.
- Shonkoff, J. P., & Phillips, D. A. (2000). *From neurons to neighborhoods: The science of early childhood development*: National Academies Press.
- Walters, C. R. (2015). Inputs in the production of early childhood human capital: Evidence from Head Start. *American Economic Journal: Applied Economics*, 7(4), 76-102.
- Weiland, C., & Yoshikawa, H. (2013). Impacts of a prekindergarten program on children's mathematics, language, literacy, executive function, and emotional skills. *Child Development*, 84(6), 2112-2130.
- Wen, X., Leow, C., Hahs-Vaughn, D. L., Korfmacher, J., & Marcus, S. M. (2012). Are two years better than one year? A propensity score analysis of the impact of Head Start program duration on children's school performance in kindergarten. *Early Childhood Research Quarterly*, 27(4), 684-694.
- Wong, V. C., Cook, T. D., Barnett, W. S., & Jung, K. (2008). An effectiveness-based evaluation of five state pre-kindergarten programs. *Journal of Policy Analysis and Management*, 27(1), 122-154.



## Sitting and Listening or Standing and Waiting: Kindergarten in a Large Urban District

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**Background:** Prior research using large, nationally representative, datasets indicates that the focus of kindergarten has narrowed over time, with an increased emphasis on reading and mathematics and less time on other academic subjects, unstructured time, and play (Bassok, Rorem, & Latham, 2016; Engel, Claessens, Watts, & Farkas, 2016). However, there is little systematic evidence documenting how kindergarteners spend their days beyond single point-in-time teacher surveys. The current study was designed to provide an in-depth window into the amount of time spent on various activities and what academic subjects are taught in kindergarten classrooms. Using observations conducted across two years, we expand on previous research, which relied on teacher recall and provided limited information about instructional grouping or how non-instructional time is spent in classrooms, with an in-depth exploration of how kindergarteners in a large urban district spend their school days.

**Research Question:** The study was designed to address the following research questions about kindergarten:

1. How much time is devoted, daily, to different types of instructional content (literacy, math, science, social studies, social emotional learning, art/music, and gross motor activities) and what instructional groupings are used during these activities?
2. How much non-instructional time is observed during the day, and what happens during this non-instructional time?
3. Does time on instructional and non-instructional activities vary across classrooms, or between kindergarten and first grade?

**Setting:** The study was conducted in 24 public elementary schools in a large urban school district during the 2015-2016 and 2016-2017 school years. Half of students in these sample schools were Hispanic, 43% were Black, and approximately 5% were White. Fewer than 2% of the sample were Asian and fewer than 2% indicated race as “other”. Fourteen percent of the students across these schools were English Language learners and 98% were eligible for free or reduced-price lunch (FRPL).

**Participants:** Individual classroom teachers in these 24 schools were recruited to participate in the current study. With the exception of classrooms that were designated Special Education inclusion classrooms and classrooms where instruction was conducted entirely in a language other than English, all classrooms in kindergarten (and, during our second year of data collection, 1<sup>st</sup> grade) in sample schools were recruited for participation. The consent rate among

eligible teachers was 84%, with a higher consent rate in 2016-17 (97%) than in 2015-16 (73%). The vast majority of sample teachers were female, mirroring the composition of kindergarten teachers nationally.

**Research Design:** The study used an adapted version of the *Narrative Record Observation for Classrooms* (Farran & Bilbrey, 2004) to record time use. The Narrative Record is an open-ended observational tool for recording activities that occur in classrooms throughout the school day. It provides a “running record”, or log, of what happens in a classroom. Events in the classroom were tracked and trained observers noted the beginning and end of each episode of activity, and, for each episode, observers indicated the content of the instruction provided (e.g. math, social studies, social emotional learning) and the instructional grouping for the activity (e.g., whether instruction was delivered to the whole class, small groups, or individually). Observers included brief descriptions of what was happening in the classroom during each episode.

**Analysis:** We summarize the total amount of time spent on core instructional content including literacy, mathematics, science, and social studies as well as time on social and emotional learning, art and music, and gross motor activities (e.g., gym class, recess). We also recorded when no instructional activities were occurring. The vast majority of non-instructional time fell under one of five categories including (a) beginning or end of school day transitions (e.g., taking off coats, unpacking or packing backpacks, waiting for students to arrive), (b) transitions between lessons (e.g. switching from whole class instruction to seat work during math or shifting from reading to a math lesson), (c) moving to or from special activities (e.g., art or music), meals or recess (d) meals (breakfast and lunch), and (e) behavioral management.

**Findings:** On average, 89 minutes or 24% of the kindergarten day was devoted to literacy and 60 minutes (14% of the school day) were spent on math. Little instructional time was spent on other academic content. A combined total of 17% of the day was spent on science, social studies, social emotional learning, art/music, and gross motor activities, on average (Figure 1, Table 1).

Whole group instruction accounted for 59% of literacy lessons and 69% of time on mathematics. Seatwork, students working individually, typically on worksheets or in workbooks, was the second most frequently observed instructional modality. Whole group instruction and seatwork account for approximately 85% of instructional time in literacy and nearly 95% of instructional time in mathematics in sample classrooms (Table 2, Figure 3).

On average, nearly 3 hours, or 43% of the kindergarten day, included no instructional content. P.E., recess, art, music and most free-play activities were coded as instructional time, and, therefore are not part of this total. There was substantial variation in the amount of non-instructional time across classrooms. While the average class had about 2.5 hours of non-instructional time (157 minutes), the standard deviation for non-instructional time was just over half an hour (33 minutes). We find little difference between kindergarten and first grade classrooms (Table 1, Figures 1 and 2).

**Conclusions:** These findings reinforce prior conventional wisdom and survey evidence suggesting that most instructional time in kindergarten is devoted to reading and math, with little emphasis on other content. Results also indicate that instructional time is spent primarily on whole class instruction or seat work, with few opportunities for small group interactions. A substantial portion of the school day (almost half of the 6-hour day) is spent on non-instructional activities; primarily transitions and meals. Wide variability in downtime documented across classrooms suggests the potential of reducing non-instructional time through small, systematic adjustments to the school day.

**997 words**

## References

Bassok, D., Latham, S., & Rorem, A. (2016). Is kindergarten the new first grade?. *Aera Open*, 2(1), 2332858415616358.

Engel, M., Claessens, A., Watts, T., & Farkas, G. (2016). Mathematics content coverage and student learning in kindergarten. *Educational Researcher*, 45(5), 293-300.

Table 1

*Average Time Use in Kindergarten and First Grade*

Content type	Kindergarten (n=45)					First Grade (n=19)				
	Minutes per day	%	SD	Min	Max	Minutes per day	%	SD	Min	Max
<b>Core content</b>										
Literacy	89	24%	28.9	40	151	100	27%	38.5	15	173
Math	52	14%	18.7	16	108	64	17%	21.6	22	103
Science	7	2%	11.8	0	44	12	3%	17.8	0	44
Social studies	6	2%	8.8	0	34	7	2%	9.8	0	34
Social emotional	4	1%	8.5	0	53	4	1%	6.2	0	24
Art/music	20	5%	16.2	0	60	18	5%	27.9	0	87
Gross motor	16	4%	17.7	0	60	9	2%	14.9	0	43
Mixed	12	3%	16.4	0	66	10	3%	18.3	0	77
<b>Total minutes on core content</b>	<b>205</b>					<b>225</b>				
<b>No instructional content</b>										
Beginning or end of day	23	6%	15.2	2	74	23	6%	14.4	0	65
Lesson transitions	34	9%	15.4	10	72	35	9%	17.7	0	66
Going to specials/recess/lunch	41	11%	28.0	0	144	46	12%	29.8	12	107
Meals	43	12%	24	0	94	35	9%	19.7	11	85
Behavior management	2	1%	8.7	0	57	3	1%	6.6	0	23
Mixed/other	14	4%	10.6	0	58	4	1%	4.4	0	16
<b>Total minutes no instructional content</b>	<b>157</b>	<b>43%</b>	<b>32.7</b>	<b>91</b>	<b>254</b>	<b>146</b>	<b>39%</b>	<b>33.3</b>	<b>95</b>	<b>218</b>
<b>Total minutes</b>	<b>362</b>					<b>371</b>				

*Notes:* Kindergarten data is the average of all full-day observations in the fall and spring of years one and two (n=45). First grade data was collected in fall and spring of year two (n=19). "Mixed" content was coded 1) when no single content-related activity occurred for more than a minute (e.g., during calendar time students count to 21 for 30 seconds, sing a days of the week song for 45 seconds, and talk about the weather for 45 seconds), or, 2) when small groups or centers occurred simultaneously with different content (e.g., math, science, and literacy centers that students rotate through in small groups). "No instructional content" was coded as "Mixed" when multiple activities occurred during a transition but none was primary or "Other" for out of the ordinary events.

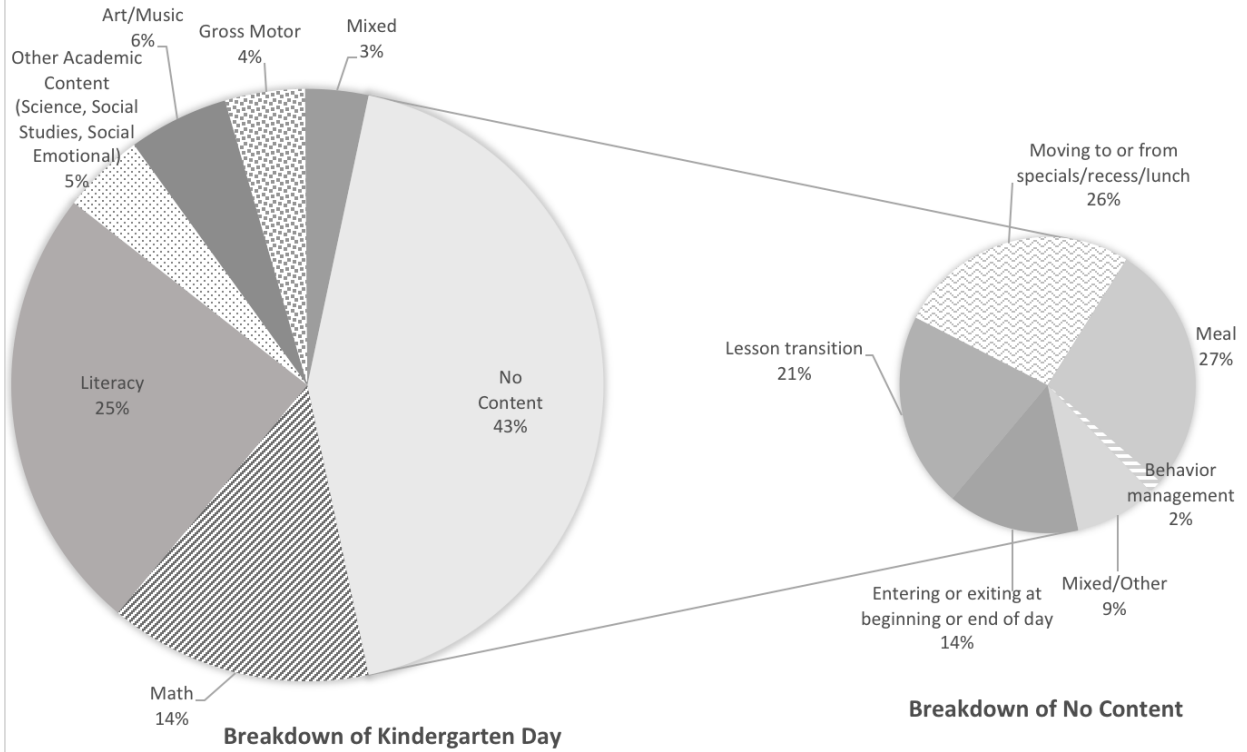
Table 2

*Grouping in Kindergarten During Literacy and Mathematics Instructional Time*

Type of Instructional Grouping	Literacy		Mathematics	
	Minutes per Day	%	Minutes per Day	%
Whole Group	52	59%	36	69%
Seat Work	23	26%	13	25%
Small Group with Other Students	8	9%	2	3%
Teacher Working with Small Group	1	1%	0	1%
Teacher Working with Individual	0	0%	0	0%
Other	4	5%	1	2%
<i>Total</i>	89		52	

*Notes:* Kindergarten data is based on the average of all full-day observations in the fall and spring of years one and two of observations (n=45). "Other" includes a few instances of math and literacy which were coded during specials and the instrument only allowed for one type of instructional grouping.

**Figure 1: Time use during the Average Kindergarten Day**



Note: Percentages are average percent of time spent on content area per day for all full-day kindergarten observations (n=45). No instructional content was coded as 'mixed' when multiple activities were occurring during a transition but none was primary (e.g., some students went to the bathroom, others put materials away, and the teacher took a call from the office) or 'other' for less common events such as a fire drill. See Table 1 for additional details and minutes spent in each area.

Figure 2: Comparison of Kindergarten and First Grade Time Use

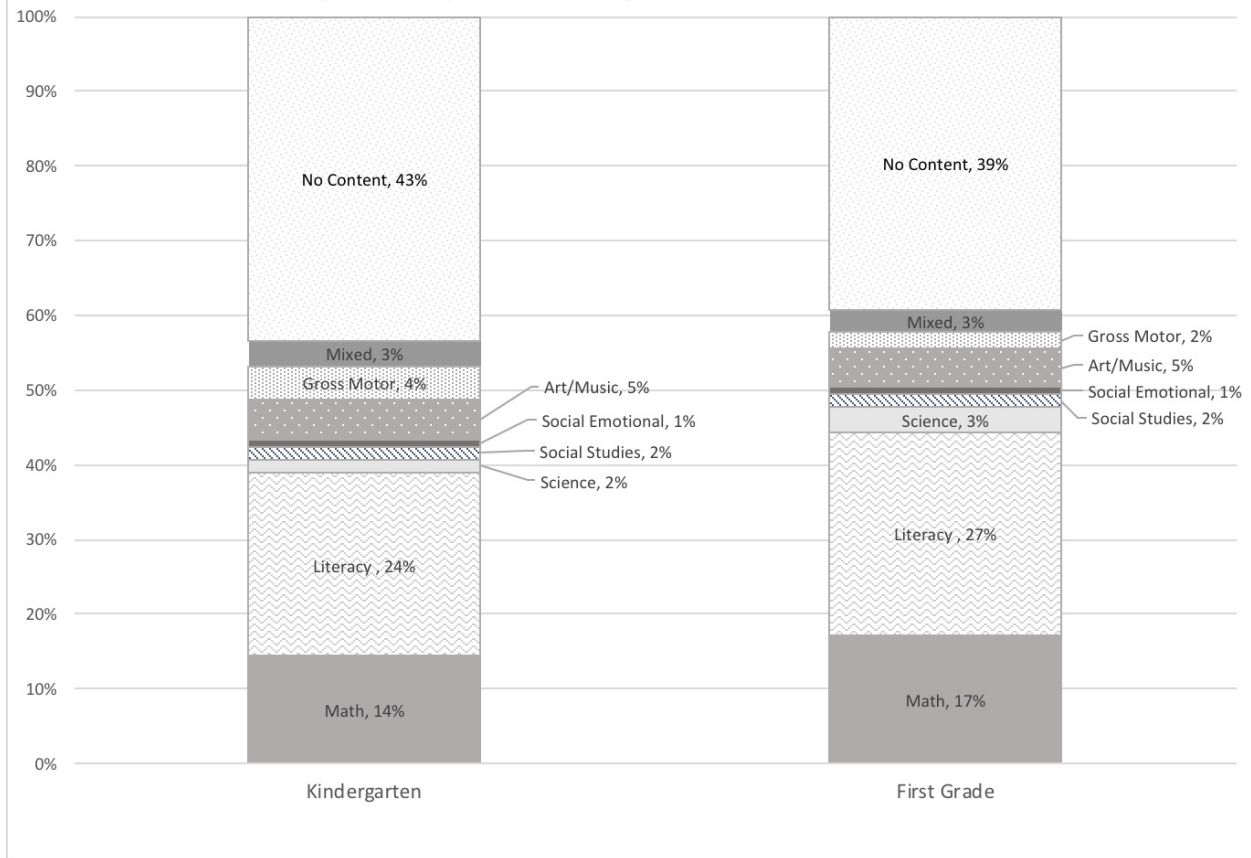
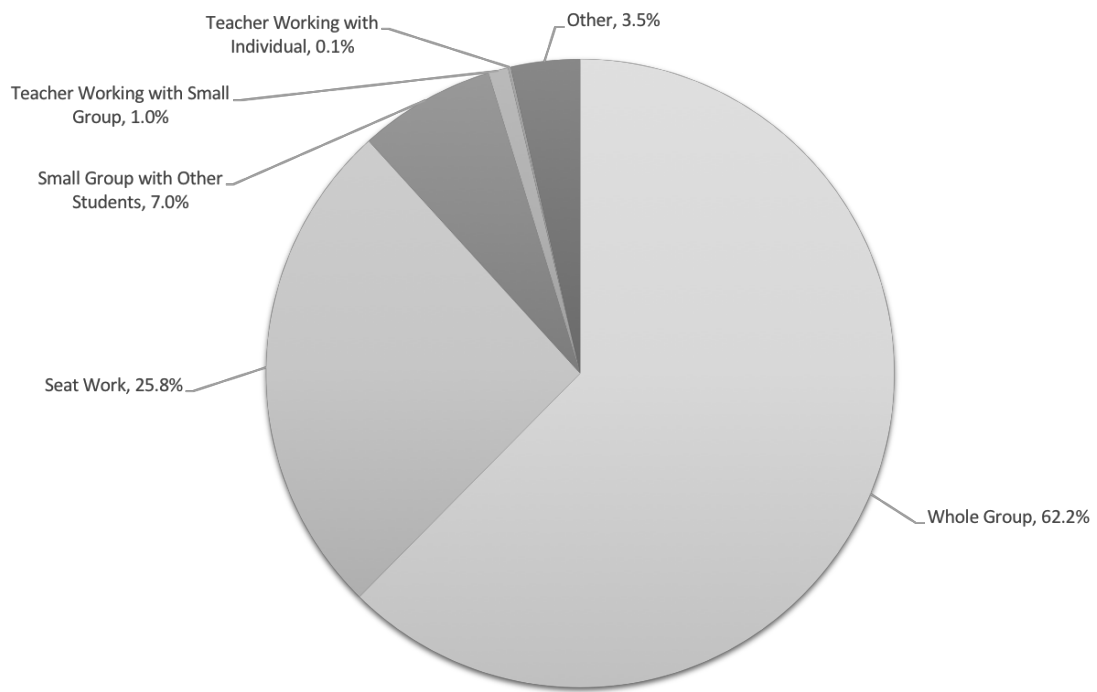




Figure 3: Activity Type in the Average Kindergarten Day



Note: Percentages are the average percent of time spent per activity type per day for all full-day kindergarten observations (n=19). See Table 2 for full breakdown of minutes.