Observed Classroom Practices in Relation to Differential Gains in Kindergarten and First Grade

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Recent studies of early elementary classroom quality have employed measures captured at the individual student level rather than at the global classroom level because children experience various aspects of classrooms in different ways (Cabell et al., 2015). Classroom practices that have been shown to promote children's gains in key domains (e.g., literacy, language, math, executive functions, and/or social skills) include *teacher-child language exchanges*, *instructional content exposure*, and *classroom settings*. Frequent exchanges between caregivers and children in which caregivers engage in multi-turn conversations, elaborate on child language, ask open-ended questions, and/or elicit further comments from the child provide the foundation for optimal development (Pentimonti et al., 2017; Wasik et al., 2006; Weizman, & Snow, 2001; Whorrall & Cabell, 2015). Frequent exposure to early literacy and numeracy instruction that is sequenced and provides varied opportunities to apply key constructs can promote the acquisition of literacy and math skills (Bierman et al., 2008; Clements & Sarama, 2007; Powell et al., 2010). Synchronized use of whole group and small group instructional settings can influence children's gains in a range of domains through systematic and meaningful exposure to instruction and interactions with teachers or peers (Clements & Sarama, 2007; Connor et al., 2006; Foorman, & Torgesen, 2001; Lonigan et al., 2011). Nonetheless, the potential of these instructional "best practices," particularly as experienced by individual children, has remained underexplored in studies of early elementary classrooms.

Study Purpose

This study aimed to identify the classroom practices that promoted growth in early elementary school for children who attended kindergarten in 2017-18 and first grade in 2018-19. Specifically, this study examined relations between *teacher-child language exchanges*, *instructional content exposure*, and *classroom settings* and children's fall-spring gains in literacy, language, math, executive function, and social skills during kindergarten and first grade.

Participants and Procedures

This study was conducted in six rural counties in North Carolina, where 63 state-funded prekindergarten (PK) classrooms, and 455 children within classrooms, were randomly selected to participate in a longitudinal cohort study designed to examine PK-3 policies and practices. PK students were followed into 188 kindergarten classrooms, where a sample of 246 students who had not attended any formal center-based care were recruited. Students were then followed into 270 first grade classrooms. Due to attrition following PK, the current sample included 655 students who had kindergarten and/or first grade assessment data. Of the participating children, 49% were boys, 29% were African American, 45% spoke Spanish as their home language, and

mothers on average had a high school diploma (see Table 1). Students were assessed in the fall and spring of each year, and classrooms were observed during the winter of each year.

Measures

Classroom practices were captured through the Language Interaction Snapshot (LISn; Atkins-Burnett et al., 2010). The LISn involved observing individual target children, one at a time, in 30-second intervals to capture teacher-child language exchanges. At the end of 5-min observation windows, data collectors marked the instructional content and classroom settings experienced by each individual child. Each LISn classroom observation totaled 120 minutes (20–30 min per child), with the aggregated classroom values included in this study. *Teacher-child language exchanges* were measured as high-quality talk between a teacher and child (e.g., teacher using elaborating or eliciting talk). *Instructional content exposure* included: 1) *language and literacy* content (child participated in language and/or literacy activities), and 2) *math* content (child participated in math activities). Classroom settings included: 1) *whole group* (child participated in teacher-led activity with more than half the class), and 2) *small group* (child participated in a teacher-led activity with less than half the class).

Outcome measures included Woodcock Johnson-III Letter-Word Identification, Picture Vocabulary, and Applied Problems; DIBELS Phoneme Segmentation Fluency; NIH Toolbox Flanker Inhibitory Control and Dimensional Change Card Sort; and a composite of teacher ratings of social skills (α>.70) from Teacher-Child Rating Scale, Learning Behavior Scale, and Student-Teacher Relationship Scale (see Table 1).

Analytic Method

This study used two-level hierarchical linear modeling (HLM) to account for the repeated nature of the data. Separate HLM models for each outcome were run, each predicted by the identified classroom practices and dummy variables representing year (kindergarten/first grade) and season (fall/spring). Interactions of the classroom practices by year, by season, and by year and season were included to understand how and when classroom practices were related to growth during kindergarten and/or first grade. Controls included county, gender, age at kindergarten, race (African American), home language (Spanish), maternal education, and PK attendance status. Multiple imputation accounted for missing values. All variables were standardized (*M*=0, *SD*=1).

Results

Standardized coefficients and standard errors from the separate HLM models are shown in Table 3. Results indicated that children showed the following relation of LISn variables with fall-spring gains: kindergarten letter-word identification skills with more content exposure and whole-group settings; first grade vocabulary skills with fewer whole-group settings; kindergarten math skills with more math exposure; first grade math skills with more teacher-child language exchanges and fewer whole-group and small-group settings; first grade phonemic awareness skills with more small-group settings; and kindergarten/first grade social skills with more whole-group settings.

Conclusions

 The LISn uniquely captured classroom practices at the individual student level rather than global classroom level. As shown in Table 1, kindergarten and first grade classrooms varied in classroom practices, particularly regarding high-quality language exchanges (K<G1) and literacy content exposure (K<G1). HLM findings were complex, indicating that different classroom practices appeared to promote different skills in the two different grades. Results did not converge on any one classroom practice being significant across domains and grades, and effect sizes were low. Gains in literacy and math skills were related to exposure in the corresponding content area, but only in kindergarten. Whole-group settings were related to a number of domains, but, again, associations were only positive in kindergarten. Findings are suggestive that it is possible to capture variability in student outcomes with a student-level observation measure. Nonetheless, elementary classrooms are complex environments that are challenging to measure, and more work needs to be done to capture the variability and promise of early elementary classroom practices.

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Table 1. *Descriptive statistics*

		Kindergarten			First Grade		
		N	*Mean*	*Std*	*N*	*Mean*	*Std*
Outcomes							
WJ (w)							
Letter-Word	Fall	629	358.09	28.34	603	422.44	30.84
Identification	Spring	592	410.22	29.10	593	449.70	30.08
Picture Vocabulary	Fall	629	462.44	16.49	603	473.18	12.09
	Spring	592	469.07	12.48	593	476.93	11.95
Applied Problems	Fall	628	416.06	21.17	603	443.44	14.95
	Spring	590	437.15	16.78	593	457.37	14.87
DIBELS Phoneme	Fall	630	13.51	13.34	603	41.87	13.80
Segmentation Fluency	Spring	607	39.34	17.37	593	44.63	12.57
NIH Toolbox (raw)							
Flanker Inhibitory	Fall	588	31.46	10.73	532	37.04	6.82
Control	Spring	544	35.36	8.12	587	38.31	4.94
Dimensional Change	Fall	564	23.38	13.99	530	32.35	11.28
Card Sort	Spring	538	28.79	13.13	586	35.04	9.02
Teacher-reported	Fall	551	3.91	0.72	494	3.99	0.67
social skills	Spring	542	4.06	0.70	472	4.01	0.64
Classroom practices (LISn)							
Teacher-child language exchanges		566	23.37	9.33	440	35.85	13.83
Instructional content exposure							
Literacy		566	49.07	22.83	440	71.99	21.67
Math		566	15.42	17.77	440	17.99	20.15
Classroom settings							
Whole group		566	41.83	17.64	440	38.53	19.33
Small group		566	10.15	10.97	440	10.06	11.02
Covariates							
Male		634	48.42	0.50	605	48.93	0.50
Age (fall kindergarten)		634	5.50	0.34	605	5.50	0.33
Race (African American)		574	29.44	0.46	560	29.29	0.46
Home language (Spanish)		634	44.64	0.50	605	45.45	0.50
Maternal education		619	12.07	2.50	594	12.06	2.52
PK attendance status		634	61.20	0.49	605	62.81	0.48

Note: WJ = Woodcock Johnson. DIBELS = Dynamic Indicators of Basic Early Literacy Skills. LISn = Language Interaction Snapshot. PK = prekindergarten.

Table 2. *Comparisons of classroom practices between kindergarten and first grade estimated from separate HLM models for each outcome*

	Letter-Word Identification		Picture Vocabulary		Applied Problems		Phoneme Segmentation Fluency		Flanker and Inhibitory Control		Dimensional Change Card Sort		Social Skills	
	β	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*
Teacher-child language exchanges														
Kindergarten	0.02	0.03	0.00	0.04	-0.01	0.04	0.05	0.06	-0.06	0.08	-0.03	0.08	0.01	0.06
First grade	0.03	0.03	0.07	0.04	0.10*	0.04	-0.05	0.06	0.03	0.07	-0.05	0.08	-0.08	0.06
Instructional content exposure														
Language and literacy														
Kindergarten	0.07***	0.02	-0.02	0.03	0.06	0.04	0.01	0.05	0.00	0.06	-0.13	0.07	-0.04	0.04
First grade	-0.01	0.04	0.00	0.04	0.06	0.05	-0.02	0.07	0.01	0.08	0.03	0.08	-0.03	0.06
Math														
Kindergarten	0.04*	0.02	0.03	0.03	0.09***	0.03	0.03	0.04	-0.04	0.05	-0.10	0.06	-0.08*	0.04
First grade	0.00	0.03	-0.01	0.04	0.01	0.04	0.04	0.05	0.07	0.06	0.04	0.07	-0.06	0.05
Classroom settings														
Whole group														
Kindergarten	0.05*	0.02	0.05	0.03	0.06	0.04	0.00	0.05	-0.04	0.07	0.08	0.07	0.12*	0.05
First grade	-0.05	0.03	-0.15***	0.04	-0.11*	0.05	0.08	0.06	-0.11	0.08	0.02	0.08	0.16*	0.06
Small group														
Kindergarten	0.04	0.02	0.04	0.03	0.05	0.03	-0.02	0.04	-0.05	0.05	0.04	0.05	0.00	0.04
First grade	0.01	0.03	-0.06	0.03	-0.08*	0.03	0.12***	0.04	-0.05	0.06	0.00	0.06	0.01	0.05

Note: *** $p < .001$; ** $p < .01$; * $p < .05$. Covariates included county, gender, age at kindergarten, race (African American), home language (Spanish), maternal education, and PK attendance status. All variables were standardized (*M*=0, *SD*=1) so that standardized coefficients represent effect sizes.