

## **Linking micro-features of quality to children's academic, social-emotional, and executive function skills in a statewide population study of children's early education**

Emily C. Hanno, Kathryn E. Gonzalez, Rosa Guzman Turco,  
Stephanie M. Jones, & Nonie K. Lesaux

Theoretical and empirical support for the role of quality in children's development has fueled quality improvement efforts across the early education landscape (Markowitz, Bassok, & Hamre, 2017). Improvement efforts often rely on observational measures of quality to identify low performing programs and to evaluate the effectiveness of interventions aimed at improving quality. However, commonly-used observational measures of quality (e.g., the Classroom Assessment Scoring System or Early Childhood Rating Scales) tend to make sweeping global assessments, which provide little insight into the actionable moment-to-moment processes that are most relevant for children's learning. Understanding how micro-level features of quality relate to children's outcomes in a range of domains can serve to inform quality improvement efforts by illuminating concrete and actionable targets for improvement.

Leveraging data from a statewide study of early education, the present study seeks to identify the micro-level features of educator practices that are most relevant for children's academic, social-emotional, and executive function skills. Given that most early education settings have more than one adult present, we also examine whether *average* or *individual* (e.g., the lead teacher) adult practices are associated with children's development. The current standard is to examine links between average educator quality and child outcomes, but it may be that having just one high performing or low performing educator positively or negatively influences children's learning. It may also be that the degree of variability in educator practices in the same classroom influences child outcomes.

### **Method**

#### **Sample**

Data come from the first wave of a longitudinal population study of early education in Massachusetts in which children were followed over time beginning at age three or four. The study's unique sampling approach (e.g., an in-person household survey conducted with 95,000 families across the state) means that the sample includes children and educators in a diverse range of early education and care settings, including community child care (CCC), family child care (FCC), Head Start (HS), and public school prekindergarten (PSP) programs.

The present study includes educators and children who were observed in one of these four settings as either a three- or four-year-old. The sample therefore includes 1,773 assessed children and 1,413 educators working in 672 classrooms in 451 programs. Classrooms in the sample had an average of 2.10 adults ( $SD = 0.78$ ) and 12.21 children ( $SD = 4.64$ ). Of the 672 classrooms, 43.45% were in CCC, 19.64% were in FCC, 19.20% were in HS, and 17.71% were in PSP programs. Children were on average 3.93 years old ( $SD = 0.55$ ) and 66.48% were White, 10.28% were Hispanic, 5.43% were Asian, and 5.18% were Black.

#### **Procedures and Measures**

**Quality.** Trained assessors visited each of the 672 classrooms and collected information on educator practices using the Teacher Observation in Preschools (TOP; Bilbrey, Vorhaus, & Farran, 2007). During each observational period, assessors conducted a number of short “sweeps,” during which each adult’s behaviors were assessed along several dimensions. Table 1 presents the micro-level practices captured by the TOP that we examined in this study.

**Child outcomes.** Direct assessments captured children’s academic, social-emotional, and executive functioning skills. The Letter Word Identification and Applied Problems subscales from the Woodcock Johnson (WJ-III; Woodcock, McGrew, & Mather, 2001) and the Phonological Awareness Literacy Screener (PALS; Ford & Invernizzi, 2014) evaluated academic skills (i.e., math and literacy). The Leiter-3 (Roid, Miller, Pomplun, & Koch, 2013) assessed children’s social-emotional functioning and the Pencil Tap (Blair, 2002; Diamond & Taylor, 1996) and Minnesota Executive Function Scale (MEFS; Carlson & Zelazo, 2014) assessed executive functioning skills.

### Analytic Plan

First, to determine the links between micro-features of quality and child outcomes, we predicted each child outcome as a function of the micro-features of quality, including a host of covariates. Second, to determine whether *average* or *individual* educator practices were more relevant for child outcomes, we tested the relative predictive validity of *average* classroom TOP scores versus the *minimum* or *maximum* TOP score for individual educators in classrooms with more than one educator ( $n = 541$ ). We also examined whether differences between the *maximum* and *minimum* TOP score were related to child outcomes in this subset, under the assumption that a large difference represents more variable educator practices. Additional analyses will address the non-random sorting of children across different types of settings using propensity score matching.

### Preliminary Results

Table 2 presents descriptive statistics of educator micro-level practices across the sample. In addition to illustrating average trends in micro-level practices (e.g., teachers were engaged in whole group practices approximately 30% of the time), it also shows great variation in adult practices within the same classroom. For example, in classrooms with more than one teacher, the most talkative teacher tended to speak with children 69% of the time, whereas the least talkative teacher tended to speak with children less than half that amount of time (31%).

Table 3 presents unweighted results of multi-level regressions predicting child outcomes as a function of average classroom-level micro processes. The majority of micro-level processes were not associated with child outcomes. However, children’s social-emotional and executive function skills tended to be lower in classrooms where teachers disapproved of child behaviors more. Additionally, children’s academic skills tended to be higher in classrooms where teachers used a more positive tone to communicate with children. Finally, we note that children’s social-emotional functioning was higher in classrooms in which more time was focused on math. This findings suggests that there might be important cross-domain associations between math and social-emotional functioning.

## **Conclusion**

Preliminary results highlight variation both across and within classrooms in educator practices. Moreover, results suggest that specific micro-level practices might be most relevant for child outcomes. The final presentation will include complete results and discuss the implications of the findings for quality improvement efforts in the early education sector.

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## Tables and Figures

Table 1. Micro-level practices observed using the Teacher Observation in Preschools (TOP)

<b>Area</b>	<b>Measure</b>	<b>Description</b>	<b>Magic 8?</b>
1. Language	Listening to children	% of sweeps where teacher listening to child or children (including child, small group with or without teacher, whole group with or without teacher)	Yes
	Talking to children	% of sweeps where teacher is talking to child or children	
	Talking to another adult	% of sweeps talking to another adult	
	Not talking or listening	% of sweeps during which teacher was neither talking or listening	
2. Schedule	Whole groups	% of sweeps during which teacher was engaged in whole group	
	Transitions	% of sweeps during which teacher was engaged in transitions	
	Centers	% of sweeps during which teacher was engaged in centers	
3. Task	Behavior approving	% of sweeps during which teacher was approving of children's behavior	Yes
	Behavior disapproving	% of sweeps during which teacher was disapproving of children's behavior	
	Instruction	% of sweeps during which teacher was engaged in instruction	
	Personal care	% of sweeps during which teacher was engaged in personal care for a child	
	None	% of sweeps during which teacher was not engaged in any task	
4. Instructional level	Instructional level	Average instructional level (when engaged in instruction)	Yes
5. Focus	ELA	% of sweeps during which teacher was engaged in ELA-focused activity	
	Math	% of sweeps during which teacher was engaged in math-focused activity	
	Science	% of sweeps during which teacher was engaged in science-focused activity	
	No focus	% of sweeps during which teacher was engaged in not engaged in a content focused activity	
6. Tone		Average teacher tone	Yes

*Note:* Magic 8™ practices were hypothesized by the measure's creators to influence children's development (Farran, Meador, Christopher, Nesbitt, & Bilbrey, 2017).

Table 2. Descriptive statistics of classroom- and teacher-level practices

	All classes (N = 692)	Classrooms with more than one adult (N = 541)			
	Mean	Mean	Minimum	Maximum	Difference
<b>Area 1. Language</b>					
Listening to children	0.06 (0.07)	0.06 (0.06)	0.02 (0.05)	0.10 (0.09)	0.07 (0.08)
Talking to children	0.57 (0.16)	0.54 (0.13)	0.39 (0.17)	0.69 (0.16)	0.31 (0.19)
Talking to another adult	0.09 (0.08)	0.10 (0.08)	0.05 (0.06)	0.16 (0.12)	0.11 (0.11)
Not talking or listening	0.27 (0.14)	0.30 (0.13)	0.17 (0.13)	0.43 (0.18)	0.27 (0.18)
<b>Area 2. Schedule</b>					
Whole group	0.31 (0.18)	0.31 (0.16)	0.27 (0.17)	0.34 (0.18)	0.08 (0.11)
Transitions	0.15 (0.10)	0.15 (0.10)	0.12 (0.10)	0.19 (0.12)	0.07 (0.08)
Centers	0.27 (0.20)	0.28 (0.19)	0.24 (0.19)	0.31 (0.21)	0.08 (0.11)
<b>Area 3. Task</b>					
Behavior approving	0.03 (0.04)	0.03 (0.04)	0.01 (0.02)	0.05 (0.06)	0.04 (0.06)
Behavior disapproving	0.08 (0.08)	0.08 (0.07)	0.03 (0.05)	0.12 (0.11)	0.09 (0.09)
Instruction	0.31 (0.16)	0.29 (0.14)	0.17 (0.14)	0.42 (0.19)	0.24 (0.17)
Personal care	0.12 (0.10)	0.13 (0.10)	0.06 (0.09)	0.19 (0.15)	0.13 (0.12)
No task	0.02 (0.05)	0.02 (0.04)	0.01 (0.02)	0.05 (0.08)	0.04 (0.08)
<b>Area 4. Instructional level</b>					
Instructional level	1.65 (0.33)	1.64 (0.33)	1.44 (0.40)	1.77 (0.34)	0.33 (0.34)
<b>Area 5. Focus</b>					
ELA	0.09 (0.08)	0.08 (0.07)	0.03 (0.05)	0.14 (0.11)	0.11 (0.10)
Math	0.04 (0.05)	0.03 (0.04)	0.01 (0.03)	0.06 (0.08)	0.05 (0.07)
Science	0.05 (0.07)	0.05 (0.06)	0.01 (0.04)	0.08 (0.09)	0.07 (0.08)
No focus	0.69 (0.16)	0.71 (0.14)	0.59 (0.19)	0.83 (0.14)	0.24 (0.17)
<b>Area 6. Tone</b>					
Average tone	3.41 (0.32)	3.39 (0.29)	3.25 (0.30)	3.55 (0.34)	0.31 (0.25)

Table 3. Models predicting child outcomes as a function of average classroom micro-level practices ( $N = 1,773$ )

	WJ: AP	WJ: LWI	PALS: BSA	PALS: RA	Leiter: Cog/Soc	Leiter: Emotions	MFES	PT
<b>Area 1. Language</b>								
Listening to children	-0.27 (0.40)	-0.27 (0.40)	-0.48 (0.41)	0.33 (0.41)	0.11 (0.45)	0.58 (0.47)	0.05 (0.42)	0.53 (0.41)
Talking to children	0.26 (0.17)	-0.10 (0.17)	0.07 (0.18)	0.09 (0.18)	-0.29 (0.19)	-0.29 (0.20)	0.15 (0.19)	-0.15 (0.18)
Talking to another adult	-0.01 (0.31)	0.26 (0.32)	0.10 (0.33)	-0.20 (0.32)	-0.02 (0.36)	0.16 (0.38)	0.01 (0.34)	0.23 (0.33)
Not talking or listening	-0.26 (0.19)	0.11 (0.19)	0.03 (0.20)	-0.12 (0.20)	0.34 (0.22)	0.12 (0.23)	-0.19 (0.21)	-0.04 (0.20)
<b>Area 2. Schedule</b>								
Whole group	0.01 (0.15)	-0.18 (0.15)	0.19 (0.16)	-0.15 (0.15)	0.21 (0.17)	0.15 (0.18)	0.09 (0.16)	-0.19 (0.15)
Transitions	0.09 (0.24)	0.19 (0.24)	0.36 (0.25)	0.09 (0.25)	0.19 (0.28)	0.37 (0.30)	-0.15 (0.26)	0.51* (0.25)
Centers	-0.09 (0.12)	0.01 (0.13)	-0.22 <sup>+</sup> (0.13)	0.21 (0.13)	0.17 (0.14)	0.05 (0.15)	0.10 (0.14)	0.00 (0.13)
<b>Area 3. Task</b>								
Behavior approving	0.06 (0.66)	0.66 (0.67)	-0.16 (0.69)	0.53 (0.68)	-0.18 (0.76)	-0.19 (0.79)	1.39 <sup>+</sup> (0.73)	1.00 (0.70)
Behavior disapproving	-0.75* (0.33)	0.20 (0.33)	-0.42 (0.35)	-0.79* (0.35)	-0.99** (0.38)	-0.68 <sup>+</sup> (0.39)	-0.63 <sup>+</sup> (0.35)	-0.71* (0.35)
Instruction	0.18 (0.17)	0.01 (0.17)	0.25 (0.18)	0.13 (0.18)	-0.08 (0.20)	0.00 (0.21)	0.12 (0.19)	-0.01 (0.18)
Personal care	0.13 (0.25)	0.15 (0.26)	-0.11 (0.26)	0.24 (0.27)	-0.31 (0.29)	-0.67* (0.31)	0.15 (0.28)	-0.10 (0.27)
No task	0.02 (0.51)	0.56 (0.52)	-0.14 (0.54)	-0.55 (0.53)	0.48 (0.58)	0.52 (0.61)	-0.19 (0.55)	0.36 (0.55)

Table 3. Models predicting child outcomes as a function of average classroom micro-level practices ( $N = 1,773$ ) (continued)

	WJ: AP	WJ: LWI	PALS: BSA	PALS: RA	Leiter: Cog/Soc	Leiter: Emotions	MFES	PT
<b>Area 4. Instructional level</b>								
Instructional level	0.08 (0.07)	0.04 (0.08)	0.05 (0.08)	0.04 (0.08)	0.13 (0.09)	0.04 (0.09)	0.11 (0.08)	0.27*** (0.08)
<b>Area 5. Focus</b>								
ELA	0.17 (0.32)	-0.01 (0.32)	-0.21 (0.34)	0.16 (0.33)	-0.23 (0.37)	0.11 (0.39)	-0.04 (0.36)	0.61 <sup>+</sup> (0.34)
Math	0.51 (0.48)	0.52 (0.48)	0.23 (0.50)	0.06 (0.50)	1.14* (0.56)	1.47* (0.57)	-0.77 (0.51)	-0.10 (0.51)
Science	0.69 <sup>+</sup> (0.38)	-0.56 (0.39)	0.36 (0.40)	0.20 (0.39)	0.07 (0.44)	0.26 (0.46)	0.54 (0.40)	0.23 (0.39)
No focus	-0.18 (0.17)	-0.01 (0.17)	-0.26 (0.18)	-0.12 (0.18)	0.07 (0.20)	0.00 (0.21)	-0.12 (0.19)	0.01 (0.18)
<b>Area 6. Tone</b>								
Average tone	0.16 <sup>+</sup> (0.08)	-0.00 (0.08)	0.17* (0.09)	0.23** (0.09)	-0.09 (0.10)	0.00 (0.10)	0.05 (0.09)	0.14 (0.09)

Note: Stars represent statistical significance: + $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; Each cell represents the coefficient from a separate multi-level model predicting child outcome as a function of the quality indicator and a host of covariates; Models include a center-level random intercept; All child outcomes were z-scored prior to analysis; WJ: AP = Woodcock-Johnson Applied Problems, WJ:LWI = Woodcock-Johnson Letter Word Identification, PALS: BSA = Phonological Awareness Literacy Screener Beginning Sound Awareness, PALS: RA = Phonological Awareness Literacy Screener Rhyming Awareness; Cog/Soc = Cognitive/Social; MFES = Minnesota Executive Function Scale; PT = Pencil Tap.