Developing the Early Childhood Workforce: an Investigation of Instructional Coaching

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An Investigation of Instructional Coaching

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Dedication Page

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Abstract

Research confirms that instructional quality in early childhood education is a strong predictor of children's school-readiness and subsequent achievement. However, little is known about the mechanisms through which common professional development strategies can be successful in influencing teaching quality, and, in turn, learning in early childhood. To address these issues, I take a mixed methods approach. Drawing on data from National Center for Research on Early Childhood Education's Professional Development Study, I first examine the predictive relation between observed teacher characteristics and dosage of a web-mediated instructional coaching initiative, and then estimate the effect of instructional coaching dosage on the quality of student-teacher interactions, as well as on student literacy performance. Subsequently, I draw upon original semi-structured interviews with early childhood practitioners and instructional coaches interacting in instructional coaching initiatives across public school districts in the northeastern United States to document what early childhood educators understand as the factors affecting their engagement with instructional coaching initiatives.

In my quantitative analyses, I find that teachers with more emotionally responsive pre-intervention interactions with students are likely to experience higher amounts of instructional coaching dosage, but that teachers working in higher need settings are likely to experience lower amounts of instructional coaching dosage. I also find moderate statistically significant impacts of instructional coaching dosage on the quality of student-teacher interactions, and small, non-significant impacts of instructional coaching dosage on student literacy performance. In my qualitative analysis, I find that participating early educators name factors at both the teacher and school levels that can impede and facilitate

the extent of their behavioral engagement with instructional coaching. Factors at the teacher level include practitioner understanding of the coaching role and initiative, as well as affective factors (i.e., fear of judgment, resistance to change, mental space). At the school level, factors include structures, scheduling, and principal support. Teachers report that time, perceived appropriateness and actionability of suggestions, extent of scaffolding, and seeing changes in student performance and/or personal practice all influence their likelihood of implementing practices suggested in coaching sessions. In addition, peer enthusiasm for instructional coaching is associated with increased teacher engagement with programming.

Together, these findings contribute to the extant literature regarding effective practices in early childhood professional development by providing key insights into how to optimize instructional coaching practices for teaching quality improvement. Specifically, the two studies deepen our understanding of the reasons why and ways in which teachers engage with instructional coaching, and the impact that such engagement has on pedagogy and student performance. These results suggest that practical factors promote and preclude teacher engagement with instructional coaching, and that actionability of pedagogical suggestions, as well as the participation of teacher peers, are a key potential mechanism for sustained engagement with such initiatives.

Introduction

Evidence suggests a positive impact of high-quality classroom-based early childhood educational experiences (i.e., preschool and pre-kindergarten) on children's cognitive and social-emotional development (Barnett, 1995; Center for Public Education, 2007). More specifically, instructional effectiveness may be particularly salient in determining such quality and associated long-term student outcomes (Barnett, 2013; Chetty, Friedman, & Rockoff, 2014; Neuman & Cunningham, 2009; Nye, Konstantopoulos & Hedges, 2004; RAND Corporation, 2012; Rivkin, Hanushek & Kain, 2005). And yet, teaching quality, characterized by emotionally and instructionally supportive student-teacher interactions and effective classroom management (Hamre et al., 2013), is highly inconsistent across classrooms and schools (Howes, Burchinal, Pianta, Bryant, Early, Clifford, & Barbarin, 2008). Furthermore, most programming often fails to offer the types of experiences required to promote exceptional early childhood development (Pianta, Barnett, Burchinal, & Thornburg, 2009).

Professional learning opportunities can be key to improving teacher practice and student academic performance, (e.g., Lewis & Perry, 2015; Matsumara, Garnier, & Spybrook, 2012), with instructional coaching as a particularly valuable form of professional development (e.g., Allen, Pianta, Gregory, Mikami, & Lun, 2011; Hsieh, Hammeter, McCollum, & Ostrosky, 2009). Although there is a multiplicity of ways in which the term "coaching" has been used in the literature and operationalized in practice (Cornett & Knight, 2009), there appears to be consensus that coaching includes a dialogical partnership between coach and teacher, observation and technical feedback, and modeling, all sustained over time (e.g., Cornett & Knight, 2009; Joyce & Showers,

1981; Joyce & Showers, 1982). For the purposes of the current studies, instructional coaching is conceptualized as ongoing individualized support in the form of observation and feedback cycles (Joyce & Showers, 1981). A recent wave of experimental research on the impact of instructional coaching has yielded mixed results. Research findings suggest that instructional coaching does often appear to positively influence teacher practice in both the early childhood and K–12 realms (Allen et al., 2011; Hsieh, et al., 2009; Neuman & Cunningham, 2009; Neuman & Wright, 2010; Rudd, Lambert, Satterwhite, & Smith, 2009; Stanulis, Little, & Wibbens, 2012). By contrast, though, instructional coaching seems far less likely to yield positive effects on student outcomes (e.g., Allen, Pianta, Gregory, Mikami, & Lun, 2011; Marsh et al., 2008; Matsuamara, Garnier, & Spybrook, 2012; Milburn, Hipfner-Boucher, Weitzman, Greenberg, Pelletier, & Girolametto, 2015).

Knowing the variable impact of instructional coaching, then, I seek to understand the factors underlying variability in instructional coaching outcomes. I posit that teacher engagement with instructional coaching initiatives may be particularly salient. In the current work, I rely on a three-component construct of engagement: behavioral engagement, or participation; emotional engagement, or positive and negative reactions to people and environment that influence willingness to complete tasks; and cognitive engagement, or investment of thought and effort necessary to comprehend ideas and master skills (Fredricks, Blumenfeld, & Paris, 2004). Both my qualitative and quantitative work relate to teachers' *behavioral* engagement with instructional coaching initiatives, guided by the following questions: (1) What teacher demographic, instructional quality, and classroom characteristic variables predict the amount of

coaching that early childhood teachers participating in an instructional coaching initiative received? (2) Does the dosage of instructional coaching received by early childhood teachers affect their teaching quality outcomes and/or the literacy outcomes of their students? (3) What do early childhood educators understand as the factors that impact their engagement with instructional coaching initiatives, specifically attendance at coaching sessions, interactions with the coach in and beyond coaching sessions, and application of promoted practices?

To answer these questions, I present two papers, drawing on data from a national randomized controlled trial and from an original qualitative interview study, respectively. In the first paper, I employ data collected by the National Center for Research on Early Childhood Education to examine the predictive relation between observed teacher characteristics (i.e., teacher demographic characteristics, proxies for instructional quality, contextual characteristics) and dosage of a web-mediated instructional coaching initiative and then to estimate the impact of such dosage on the quality of student-teacher interactions for 252 teachers, as well as on student literacy performance for 1,202 children. I build on previous correlational work suggesting efficacy of the coaching initiative in improving teacher outcomes to understand the types of teachers who self-select into greater amounts of instructional coaching, and to estimate the causal effect of dosage for these teachers, and for their associated students. In the second paper, I draw upon interviews with 28 early childhood practitioners and four instructional coaches participating in instructional coaching initiatives to examine how early childhood educators talk about the factors affecting their engagement with professional learning

initiatives, specifically what may promote or impede their participation in instructional coaching sessions and implementation of promoted practices.

Together, these papers can inform ongoing teacher improvement efforts, particularly within the realm of instructional coaching initiatives. The two studies deepen our understanding of the reasons why and ways in which teachers engage with instructional coaching, and the impact that such engagement has on pedagogy and student performance.

Paper 1

Predictors and Effects of Instructional Coaching Dosage in Early Childhood Settings

Abstract

Evidence suggests that instructional coaching initiatives can be key to improving teacher practice and student academic performance, but teacher and associated student outcomes as a result of such opportunities are mixed. One factor determining teacher and student outcomes may be the amount of coaching that teachers receive; therefore, I seek to understand the relation between teacher characteristics and instructional coaching dosage, as well as the relations between such dosage and outcomes at both the teacher and student levels. Using data from 252 teachers and 1,202 students from an evaluation of an early childhood professional development program, I first use regression analyses to examine the predictive relation between observed teacher characteristics (i.e., teacher demographic characteristics, proxies for quality, contextual characteristics) and dosage, and then examine the extent to which differences in instructional coaching dosage affect the observed quality of student-teacher interactions, as measured by the CLASS. I also examine the extent to which differences in instructional coaching dosage affect student performance on a battery of literacy assessments. I find that teacher-level variation in pre-intervention measures of instructional quality and contextual characteristics predict the amount of instructional coaching received. I also find moderate, statistically significant

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impacts of instructional coaching dosage on the quality of student-teacher interactions, but small, non-significant impacts on student literacy performance.

Introduction

Evidence suggests that instructional coaching initiatives can be key to improving teacher practice and student academic performance (e.g., Allen, Pianta, Gregory, Mikami, & Lun, 2011; Hsieh, Hammeter, McCollum, & Ostrosky, 2009), but teacher and associated outcomes as a result of such opportunities are mixed (e.g., Powell, Diamond, Burchinal, & Koehler, 2010; Neuman & Cunningham, 2009). One factor determining variation in teacher and student outcomes may be the amount of coaching that teachers receive. I therefore seek to understand the relation between teacher characteristics and instructional coaching dosage, as well as the relations between such dosage and outcomes at both the teacher and student levels.

In this paper I expand the knowledge base that examines instructional coaching in early childhood education by drawing on data collected in the Professional Development Study (PDS) designed and implemented by the National Center for Research on Early Childhood Education (NCRECE). The PDS is a randomized controlled trial of teacher professional development conducted between 2007 and 2011, which evaluated the effectiveness of a course and then the My Teaching Partner (MTP) web-mediated instructional coaching intervention, both aimed at improving teachers' instructional and social interactions with students. In this study I first investigate the factors affecting variation in amount of dosage received (i.e., number of coaching cycles, time spent viewing video exemplars, and number of prompts provided by the coach), and then use an instrumental variables approach to estimate the effect of instructional coaching dosage on the quality of student-teacher interactions and on student literacy performance.

Pianta and colleagues (2017) previously explored the relation of MTP coaching on student outcomes, finding no statistically significant effects on students' language and literacy performance. They did, however, find a positive association between MTP coaching dosage and the quality of student-teacher interactions (Pianta et al., 2014). I extend this prior work in several ways. First, I use regression analyses to examine the predictive relation between observed teacher characteristics (i.e., teacher demographic characteristics, measures of and proxies for quality, contextual characteristics) and dosage in order to understand what types of teachers may engage more or less in coaching interventions. In these analyses, I complement the investigations of Roberts and colleagues (2015) who found that teacher beliefs, readiness to change, and anxiety levels—but not classroom poverty levels—were related to teacher responsiveness to MTP, as measured by coach-reported teacher engagement, number of coaching cycles completed, web use, and self-reported teacher satisfaction. I narrow the focus of this work to examine dosage outcomes, only, and include additional variables related to teacher demographics, instructional quality, and contextual characteristics.

Second, I estimate the *causal effect* of varying levels of instructional coaching dosage on the quality of student-teacher interactions. Although Pianta and colleagues (2014) established a positive relation between coaching dosage in the NCRECE PDS and the quality of student-teacher interactions, a key concern with this original study is that results were correlational in nature because their treatment of the dosage variable did not take into account possible self-selection (i.e., teachers who received additional cycles of coaching may have been more motivated or needier of support). Further, the authors only examined teachers who received the instructional coaching treatment, without taking

advantage of the random offer to receive treatment. I thus argue that this previous work may be biased and overstate the effectiveness of increased dosage in improving teacher outcomes.

Therefore, I employ instrumental variables methods to take advantage of the full sample of treatment and control teachers, and leverage the random offer as an instrument to "carve out" plausibly exogenous variation in treatment dosage. More specifically, these methods allow me to account for the likely scenario that instructional coaching dosage varies with observed teacher characteristics, and exploit random variation in coaching dosage that is not confounded by individual and/or environmental factors (Gennetian, Magnuson, & Morris, 2008). In doing so, I am able to obtain more useful estimates due to the arguably increased accuracy of the estimate of the effect of dosage on teacher and student outcomes.

Third, in addition to exploring links with teacher-level outcomes, I also employ an instrumental variables approach to examine the impact of instructional coaching dosage on student literacy outcomes. In doing so, I aim to complement the non-significant findings of previous investigations of the NCRECE PDS treatment effect on student skills (Pianta et al., 2017). Results from this investigation have the potential to fill a gap in the literature around effective practices in early childhood professional development by providing key insights into the relation between instructional coaching dosage and its potential efficacy.

Literature Review

A robust body of literature suggests that early childhood educational experiences (i.e., preschool and pre-kindergarten) have a lasting impact on children's cognitive and

social-emotional development (Barnett, 1995; Center for Public Education, 2007).

However, preschool classroom quality varies widely within and between early childhood programs (Howes et al., 2008), with most programs failing to offer the types of experiences required to promote exceptional developmental trajectories (Pianta, Barnett, Burchinal, & Thornburg, 2009). Knowing this, there have been several substantial policy initiatives to improve the quality of early childhood education and care. These include the adoption of the Quality Rating and Improvement System (QRIS) and the Race to the Top—Early Learning Challenge, aimed at improving the quality of and access to early childhood programs.

Although what constitutes "high quality" in early childhood educational settings has long been debated (Vandell & Wolfe, 2000), the nature and quality of student-teacher interactions have been identified as an important component. There is compelling evidence that teachers' interactions with students are a particularly salient aspect of early childhood programming (Hamre et al., 2012; Howes et al., 2008; Jackson et al., 2006; Mashburn et al., 2008; Pianta et al., 2009): the nature and quality of these interactions have been linked with early childhood academic and social-emotional development, school readiness, and achievement (Curby et al., 2009; McCartney, Dearing, Taylor, & Bub, 2007; Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009). The Teaching Through Interactions framework identifies three aspects of these interactions that are central to promoting student learning and social development: Emotional Support, or the cultivation of healthy and supportive relationships; Instructional Support, or the employment of strategies to foster student learning; and Classroom Organization, or the establishment of procedural and structural classroom features that support productive learning

opportunities (Curby et al., 2009; Hamre et al., 2013). This framework is also supported by research: experimental studies have established that emotionally supportive teachers and classrooms are associated with student achievement and social skills (Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008; Hamre & Pianta, 2005; Howes et al., 2008; Mashburn et al., 2008; Reyes, Brackett, Rivers, White, & Salovey, 2012); teachers' instructionally supportive interactions predict student academic outcomes (e.g., Hamre & Pianta, 2005; Mashburn et al., 2008); and effective classroom management is linked with student learning (e.g., Ponitz et al., 2009; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009).

Despite these findings, the typical early childhood classroom is characterized by low-quality student-teacher interactions (e.g., Hamre & Pianta, 2005; Phillips, Gormley, & Lowenstein, 2009). Improving student-teacher interactions, then, is paramount to increasing the overall quality of early childhood education and optimizing student outcomes. We look to the field of professional learning, specifically instructional coaching, as a means to increase exposure to these vital interactions. Although instructional coaching may vary by program and context, for the purposes of this paper, it is conceptualized as ongoing individualized support in the form of observation and feedback cycles with an instructional coach (Joyce & Showers, 1981). Research findings suggest that instructional coaching does often appear to positively influence teacher practice in early childhood: several studies demonstrate that teachers who receive coaching are more likely to enact and apply desired teaching practices appropriately than are teachers receiving other forms of professional development (Hsieh, et al., 2009; Neuman & Cunningham, 2009; Neuman & Wright, 2010; Rudd, Lambert, Satterwhite, &

Smith, 2009). In addition, recent work suggests professional development that directly targets improvements in student-teacher interactions can also be effective in enhancing their quality (Hamre et al., 2012; Hsieh et al., 2009; Pianta, Mashburn, Downer, Hamre, & Justice, 2008). By contrast, though, instructional coaching seems far less likely to yield positive effects on student outcomes. While, in some instances, coaching has been shown to drive gains in student achievement (e.g., Biancarosa, Bryk, & Dexter, 2010), several studies of instructional coaching interventions have demonstrated minimal or nonsignificant effects on student learning (Milburn, Hipfner-Boucher, Weitzman, Greenberg, Pelletier, & Girolametto, 2015; Pianta et al., 2017). Other experimental studies of instructional coaching interventions have yielded positive impacts on teacher practice, although not on student and other teacher outcomes (Powell et al., 2010; Neuman & Cunningham, 2009; Yoshikawa et al., 2015).

Given these mixed results, it is essential to understand the factors underlying such variability in instructional coaching outcomes. I posit that one critical factor is dosage of instructional coaching, or the amount of instructional coaching that teachers experience. Data on teacher dosage of pre-K–12 coaching interventions reveal wide variability in the amount of coaching received, particularly relative to what was intended by program developers. For instance, we might consider the following three examples: in the My Teaching Partner coaching program, early childhood teachers largely participated in the program as prescribed, with most teachers reaching the target 8–12 coaching cycles for the school year (Pianta et al., 2014); in the Mathematical Quality of Instruction coaching program, although upper elementary and middle school teachers typically completed 8–10 coaching cycles per year, there was a large range, from 0–16 cycles, with many

teachers completing 0–2 cycles (Kraft & Hill, 2018); and, in the Content-Focused Coaching (CFC) program, dosage was quite low: at most 16 of the 54 treatment elementary school teachers engaged in designated coaching activities over the course of the school year at the intended level (Matsumara, Garnier, & Spybrook, 2012). Understanding the reasons underlying variation in dosage, as well as related teacher- and student-level outcomes, is key to increasing program efficacy.

Such observed variability in the amount of coaching that teachers receive may stem from multiple sources, at both the individual and organizational levels. Individual teacher variables, including demographics, prior beliefs, and instructional quality can play an important role in predicting dosage. Teacher *demographic characteristics*, including teacher identity and personal history, have been shown to influence teacher engagement with professional learning experiences, as has the extent to which teacher beliefs about instruction and learning align with those underlying such initiatives (Ball, 1994; Collopy, 2003; Roberts et al., 2015). Specific to My Teaching Partner, Roberts and colleagues (2015) detected associations between teacher beliefs, readiness to change, and anxiety, and responsiveness to the intervention. Factors representing *measures of and proxies for teaching quality*, such as prior educational and professional experience and expertise, as well as content and/or pedagogical knowledge, can also impact teachers' approach to instructional reform (Ball 1994; Britt, Irwin, & Ritchie, 2001; Collopy, 2003; Landry, Anthony, Swank, & Monseque-Bailey, 2009).

School-level factors can also promote or constrain instructional coaching dosage. Research findings indicate that *contextual characteristics*, such as the schools and classrooms in which teachers work and the students whom they teach, affect teachers'

responses to professional learning (Ball, 1994, Collopy, 2003). The extant literature also highlights the school leader as playing an influential role in teacher motivation to engage in professional learning initiatives (Desimone & Garet, 2015), and empirical research has demonstrated that principals' belief in and support of instructional coaching is directly related to teachers' participation in coaching activities (Matsumara, Garnier, & Resnick, 2010; Wanless, Patton, Rimm-Kaufman, & Deutsch, 2013). What we know less about, though, is how practitioner and organizational characteristics specifically shape the amount of instructional coaching that teachers receive, specifically how and why individuals opt for varying dosages of professional development. The current study aims to capitalize on the PDS's fine-grained data on instructional coaching dosage to explore the relationship between observed teacher characteristics and self-selection of instructional coaching dosage. Continued research is needed to understand the specific links between the amount of coaching that teachers receive and baseline demographic, quality-related, and contextual characteristics.

There is also a burgeoning body of literature that examines the impact of varying levels of dosage of professional development programming on student and teacher outcomes. Findings from a few experimental studies that vary the dosage of professional development programs for early childhood educators demonstrate that higher quantities of professional development are more effective in yielding improvements in teacher pedagogical skill and children's school readiness outcomes (Landry et al., 2009; Pianta, et al., 2008; Powell et al., 2010; Ramey, Ramey, & Stokes, 2009). Interestingly, Pianta and colleagues (2014) found that while initial dosage of the My Teaching Partner coaching intervention had positive effects on pedagogical quality, additional dosage

above a certain threshold did not yield continued gains except for emotional support; the threshold for fadeout was seven coaching cycles for classroom organization and 13 for instructional quality. However, these relationships were correlational in nature and therefore causal claims cannot be made regarding the impact of varying levels of dosage on changes in instructional quality.

While these results are promising, there is a need for more data on the relationship between dosage of instructional coaching and outcomes, both at the teacher and student levels, as well as what predicts such dosage. In the current study, I build on Pianta and colleagues' (2014) investigation by using regression analyses to examine the predictive relation between observed teacher characteristics (i.e., teacher demographic characteristics, proxies for quality, contextual characteristics) and dosage, and then by re-estimating the impact of varying levels of instructional coaching dosage on student-teacher interactions, accounting for the possibility that instructional coaching dosage may vary with observed teacher characteristics. Additionally, I examine the effect of instructional coaching dosage on student literacy performance. In this paper, I explore these topics with the following research questions: What teacher demographic, instructional quality, and contextual characteristic variables predict the amount of instructional coaching that early childhood teachers participating in the NCRECE PDS received? Does the dosage of instructional coaching received by early childhood teachers affect their teaching quality outcomes and/or the literacy outcomes of their students? In answering these questions, I aim to inform ongoing professional learning efforts by deepening our understanding of the factors influencing teacher participation in coaching

initiatives, as well as the impact that such participation has on pedagogy and student performance.

Methods

Dataset and Sample

National Center for Research on Early Childhood Education's Professional Development Study. My data come from the National Center for Research on Early Childhood Education's Professional Development Study. The Professional Development Study on teacher mentoring is a randomized controlled trial of teacher professional development conducted between 2007 and 2011. This study evaluated the effectiveness of two forms of professional development, both aimed at improving teachers' instructional and social interactions with students, as measured by the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008): in Phase One, a 14-week course, and, in Phase Two, web-mediated instructional coaching, delivered through the My Teaching Partner intervention.

The My Teaching Partner instructional coaching program of Phase Two—the focus of the current analyses—emphasized attention to teacher interactions with students and building of observational skills. Web-mediated coaching took place in repeated two-week cycles of directed analysis of video clips of teachers' own classrooms. Teachers videotaped their own instruction and sent the footage to their coach for feedback focused on a predetermined CLASS dimension. Coaches then edited the video into three segments demonstrating (a) effective student-teacher interactions, (b) less-effective student-teacher interactions, and (c) instructional interactions that facilitated lesson objectives, respectively. They then responded to teachers with feedback (called

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"prompts") designed to assist in identifying effective teacher behavior, making connections between teacher and child behaviors, analyzing alternative teaching strategies, and applying effective interactions to literacy instruction, all based on dimensions of the CLASS. In turn, teachers were meant to respond to these prompts in writing, and meet with the coach by phone to co-develop an action plan; positive models of student-teacher interactions (from a website of over 200 annotated video clips of exemplary interactions) accompanied this action plan (Pianta et al., 2008).

Randomization and attrition. Of the 427 teachers who participated in the Phase One course of the Professional Development Study, 332 completed and continued to the Phase Two instructional coaching consultancy. However, prior to randomization into Phase Two treatment and control conditions, 95 teachers exited the study and 69 new teachers were recruited for participation. Ultimately, 401 teachers enrolled in Phase Two, with 205 being randomly assigned to the treatment condition, and 196 to the business-as-usual control condition. Among the teachers who participated in Phase Two, those who are not included in the present analyses were dropped due to missing outcome and/or dosage data. I find that attrition rates are related to condition: teachers assigned to the control condition were more subject to attrition than their treatment counterparts.

I explore patterns of attrition by examining whether the relation between the probability of attrition and observed demographic characteristics differed across teachers in the treatment and control groups. To explore potential sources of bias, I regressed each demographic characteristic on an indicator for attrition, an indicator for receipt of the coaching treatment, and their interaction. In Table 1 I report the parameter estimates associated with these interaction terms, which test for differential attrition. I find no

Table 1. Parameter Estimates of the Difference in Demographic Characteristics of Attritors Across Treatment and Control Groups

(*n*=150)

	Coefficient	*p*-value
Site	0.87	0.25
Teacher age	1.43	0.55
Teacher gender	-0.06	0.22
Teacher ethnicity	-0.39	0.35
Years teaching	-0.86	0.68
Years education	-0.65	0.07*
Head Start?	0.18	0.12
Income/needs ratio	-0.37	0.32
CLASS: Emotional Support	-0.22	0.17
CLASS: Instructional Support	0.04	0.81
CLASS: Classroom Organization	-0.0003	1.00

Note. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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evidence of differential attrition across the observed teacher characteristics, apart from teacher years of education ($p<0.10$). These findings suggest that, overall, those teachers who experienced attrition were not systematically different across the treatment and control groups. Even so, it is possible that some selection or retention bias remains, further potentially limiting the validity and generalizability of results.

Procedures. Teacher and classroom demographic information was collected with a questionnaire administered at the beginning of the instructional coaching phase. Throughout the intervention period, teachers in both the treatment and control conditions were required to submit 30-minute videos of instruction. Teacher use of web-based coaching resources was logged automatically by the MTP website (Pianta et al., 2014).

Student and family demographic information were collected with a family questionnaire at the time of consent. Student assessments were administered at the beginning (fall) and end (spring) of the instructional coaching phase (Hamre et al., 2012). Enrollment and fall assessments occurred simultaneously: to enroll children in the study, participating teachers distributed recruitment materials to parents of all children in their classroom at the beginning of the coaching phase. Children were determined eligible if they had positive consent, had not been identified for special education services, and spoke English or Spanish at home; children who were four years old were prioritized. Assessments of language development, early literacy, and inhibitory control were administered in English to children. Teachers also provided ratings of children's classroom behavior. To administer direct assessments in the fall and the spring of Phase Two, trained data collectors randomly selected (by gender) and assessed four children from each classroom, among those who were deemed eligible (Pianta et al., 2017).

Table 2. Demographic Characteristics of Teachers by Condition

Measure	Full Sample				Analytic Sample			
		Treatment	Control			Treatment	Control	
	% missing	n (%) or M (SD)	n (%) or M (SD)	p-value on diff.	% missing	n (%) or M (SD)	n (%) or M (SD)	p-value on diff.
Observations		191 (47.39)	212 (52.61)			149 (60.82)	96 (39.18)	
Age	0.00	42.49 (11.01)	41.98 (10.31)	0.63	0.00	42.48 (11.30)	42.73 (10.52)	0.86
Gender (female)	0.00	180 (94.24)	203 (95.31)	0.63	4.49	140 (93.96)	94 (97.92)	0.14
Race/ethnicity	0.25			0.68	0.41			0.39
Black/African American		89 (46.60)	98 (46.45)	1.00		67 (44.97)	49 (51.58)	0.31
White/Caucasian		60 (31.41)	60 (28.44)	0.71		52 (34.90)	31 (32.63)	0.72
Hispanic/Latino		30 (15.71)	32 (15.17)	0.88		22 (14.77)	7 (7.37)	0.08
Asian/Asian American		5 (2.62)	11 (5.21)	0.18		3 (2.01)	3 (3.16)	0.46
Multiple		7 (3.66)	10 (4.74)	0.59		5 (3.36)	5 (5.26)	0.45
Years Teaching	2.48	14.15 (9.33)	14.31 (9.13)	0.87	1.22	14.34 (9.49)	15.24 (9.81)	0.48
Years of Education	0.00	15.63 (1.73)	15.81 (1.56)	0.26	0.00	15.82 (1.71)	15.93 (1.49)	0.61
Head Start (Yes)	17.12	92 (59.74)	119 (66.11)	0.23	20.00	63 (54.31)	51 (63.75)	0.19
Needs/income ratio	0.50	3.95 (1.73)	3.13 (1.59)	0.65	0.41	3.17 (1.79)	3.21 (1.47)	0.86

Note. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 3. Demographic Characteristics of Students by Teacher Treatment Condition

Measure	Full Sample				Analytic Sample			
	% missing	Treatment n (%) or M (SD)	Control n (%) or M (SD)	p-value on diff.	% missing	Treatment n (%) or M (SD)	Control n (%) or M (SD)	p-value on diff.
Observations		736 (52.31)	671 (47.69)			609 (50.67)	593 (49.33)	
Age	0.00	4.16 (0.48)	4.18 (0.45)	0.66	0.00	4.18 (0.47)	4.18 (0.45)	0.94
Gender (female)	0.00	367 (49.86)	345 (51.42)	0.56	0.00	308 (50.57)	304 (51.26)	0.81
Race/ethnicity	1.77			0.03**	1.66			0.07*
Black/African American		324 (44.69)	325 (49.47)	0.08*		265 (44.17)	280 (48.11)	0.17
White/Caucasian		92 (12.69)	66 (10.05)	0.12		74 (12.33)	58 (9.97)	0.20
Native American/Indian		4 (0.55)	6 (0.91)	0.43		4 (0.67)	6 (1.03)	0.49
Hispanic/Latino		266 (36.69)	204 (31.05)	0.03**		223 (37.17)	184 (31.62)	0.05**
Asian/Asian American		16 (2.21)	17 (2.59)	0.64		13 (2.17)	17 (2.92)	0.41
Multiple		22 (0.14)	35 (5.33)	0.03**		20 (3.33)	33 (5.67)	0.05**
Other		1 (0.14)	4 (0.61)	0.15		1 (0.17	4 (0.69)	0.17
Maternal years of education	2.63	12.73 (2.06)	12.74 (2.02)	0.96	2.75	12.75 (2.04)	12.76 (2.07)	0.88
Home language is English	0.21	632 (85.99)	588 (87.89)	0.29	0.17	526 (86.51)	518 (87.50)	0.61
Needs/income ration	9.24	1.12 (1.06)	1.07 (0.95)	0.37	8.82	1.13 (1.04)	1.09 (0.97)	0.51

Note. $^* p < 0.10$, $^{**} p < 0.05$, $^{***} p < 0.01$.

Analytic sample. For the present study, I restrict my sample to teachers and students who meet the following criteria. First, teachers must have participated in Phase Two of the study, during which the instructional coaching component of programming was delivered. To be included in my analytic sample, teachers must have post-intervention CLASS scores, collected at the end of Phase Two, as well as data related to at least one aspect of dosage. For students to be included in my analyses, they must have at least one outcome measure. With these restrictions imposed, the final sample includes 252 teachers and 1,202 students.

Teacher and student demographic characteristics are presented in Tables 2 and 3, respectively. I find few statistically significant differences between the analytic sample and the full sample of teachers who were assigned to the instructional coaching treatment or control condition in Phase Two. Teachers in the analytic sample were 96% female, and the majority identified as Black/African American (48%) or White/Caucasian (34%). They had, on average, 14.7 years of teaching experience, 15.9 years of education, and a household income-needs ratio of 3.17. Slightly more than half taught in Head Start programs (54%). In the randomization process, balance was achieved on key characteristics across teachers in the treatment and control groups, both in the full and analytic samples (see Table 2): there are no statistically significant differences in teacher age, gender, ethnicity, years of teaching, total years of education, employment by Head Start, or household income-needs ratio across the experimental conditions.

I also examine the analytic sample and the full sample of students. Students in the analytic sample were 51% female, and the majority identified as Black/African American (44%) or White/Caucasian (12%). They were, on average, just over four years old, and

87% spoke English at home. On average, students lived in households whose incomes placed them just above the poverty line (*M* income-needs ratio = 1.09, *SD* = 0.97). Their mothers had, on average, 12.76 years of education. Balance across treatment and control groups was also largely established for students in the full and analytic samples (see Table 3). Of note is the statistical imbalance across the treatment and control groups in the student analytic sample, which also occurs in the full student sample: in both the full and analytic student samples, there are statistically significantly more students who identify as Hispanic/Latino in the treatment group and statistically significantly more students who identify as Multiple racial/ethnic categories in the control group. This noted imbalance may compromise internal validity and therefore limit my ability to estimate an unbiased treatment effect; I address this concern by controlling for race/ethnicity in my analyses.

Measures

Outcome Measures. This study examines outcome measures for both teacher participants in the instructional coaching phase of the Professional Development Study and for their associated students.

Teacher level. The outcome of interest at the teacher level is the quality of student-teacher interactions, as measured by the Classroom Assessment Scoring System (CLASS, Pianta, La Paro, & Hamre, 2008). The CLASS is a tool for observing and assessing the effectiveness of student-teacher interactions in classrooms. The CLASS measures quality across 11 dimensions of interactions, each rated on a seven-point Likert-like scale, from low to high: positive climate, negative climate, teacher sensitivity, regard for student perspectives, behavior management, productivity, instructional

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learning formats, concept development, quality of feedback, language modeling, and literacy focus. Principal component analysis reveals a three-factor solution (Hamre et al., 2013) for ten of the dimensions; scores are averaged across dimensions to create aggregate scores for three domains: *Emotional Support* (positive climate, negative climate, teacher sensitivity), *Instructional Support* (concept development, quality of feedback, language modeling), and *Classroom Organization* (behavior management, productivity, instructional learning formats) (Curby et al., 2009). The literacy focus dimension does not load with any of the CLASS domains and is therefore typically analyzed separately (Hamre et al., 2012).

Videos submitted as part of the coaching program itself were double coded at the segment level by independent coders who were required to attend a two-day training and pass the CLASS reliability test (i.e., score five 15-minute video segments, rating 80% of codes within one scale point of the master code). Ninety-five percent agreement was achieved for data collected throughout the PDS, and intraclass correlations at the segment level ranged from 0.49–0.53 (Pianta et al., 2014). The validity of the CLASS is confirmed by its positive association with student achievement gains (Allen et al., 2011). Post-intervention CLASS scores were calculated based on the average score assigned to videos submitted at the end of the coaching intervention phase (Pianta et al., 2014), and are the focus of the current work. Preliminary analyses indicate that domain scores for Emotional Support, Classroom Organization, and Instructional Support are moderately positively correlated ($r = 0.52$–0.67). I therefore also create a composite CLASS score based on the three dimension scores by taking simple averages of the Emotional Support, Classroom Organization, and Instructional Support scores and then standardizing the

result.

Student level. The outcome of interest at the student level is literacy performance, as measured by the Peabody Picture Vocabulary Test–III and Print Knowledge and Phonological Awareness subtests of the Test of Preschool Early Literacy. The Peabody Picture Vocabulary Test–III (PPVT-III) (standard score, Dunn & Dunn, 1997) is a nationally norm-referenced tool for assessing receptive vocabulary skills for ages two to 90. For each item, the examiner says a word, shows the examinee a card with four pictures, and the examinee responds by selecting the picture that best illustrates the word's meaning. The test is comprised of 204 stimulus items—to establish a basal, the examinee must correctly identify eight consecutive items; to establish a ceiling (and terminate administration), the examinee must misidentify six of eight consecutive items. Items sample words from 20 content areas (e.g., actions, vegetables, tools) and parts of speech (nouns, verbs, adjectives) across a broad range of difficulty, from preschool through adulthood. Raw scores are standardized to reflect their relation to the expected performance of same-age children. In prior studies, the internal consistency reliability of the PPVT–III demonstrates ranges from 0.92 to 0.98 and test-retest reliability ranges from 0.91 to 0.94 (Dunn & Dunn, 1997). The PPVT-III also has an average correlation of 0.74 with the OWLS Oral Expression Scale, as well as 0.91 with the WISC-III (Dunn & Dunn, 1997).

The Test of Preschool Early Literacy (TOPEL) (standard score, Lonigan, Wagner, Torgesen, & Rashotte, 2007) is a nationally norm-referenced tool to assess early literacy skills, specifically print knowledge and phonological awareness, for preschoolers (ages three to five). The measure includes three subtests: Print Knowledge, Definitional

Vocabulary, and Phonological Awareness, although the Definitional Vocabulary subtest was not administered to participating children. The Print Knowledge subtest measures knowledge about the alphabet and about written language conventions and form. Over the course of 36 items, examinees are asked to identify specific letters, letters associated with specific sounds, and written words; they are also asked to name specific letters and their associated sounds. The Phonological Awareness subtest has 27 items; in the first 12 the child is asked to say a word, then say what is left after dropping specific sounds (elision, e.g., 'say frog without the fff'). In the remaining 15 items, the child is asked to listen to separate sounds and combine them to form a word (blending, e.g., /b/ /a/ /t/). Raw scores are standardized to reflect relation to the expected performance of same-age children. In prior work, the internal consistency reliability for subtests has ranged from 0.86 to 0.96, test-retest reliability ranges from 0.81 to 0.89, and concurrent validity for the subtests has ranged from 0.59 to 0.77 (Lonigan et al., 2007). Preliminary analyses indicate that scores for the PPVT-III and TOPEL Print Knowledge and TOPEL Phonological Awareness subtests are moderately positively correlated ($r = 0.25–0.48$). I therefore create a composite literacy score based on the three above-outlined measures of literacy by taking simple averages of the standardized components and standardizing the result.

Measures of Dosage. In the current paper, instructional coaching dosage is operationalized and measured using three indicators: (a) number of coaching cycles the teacher engaged in during the course of the consultancy; (b) time spent viewing video exemplars of others' instruction; and (c) number of "prompts" (or feedback) to which the teacher was exposed by the coach (Pianta et al., 2014). I also create a composite dosage

score based on the three above-outlined measures of dosage by taking simple averages of the standardized components and standardizing the result.

Covariates. In all analyses, I control for a host of student- and teacher-level covariates. Teacher-level covariates include age, gender, household income/needs ratio, race/ethnicity, total years of education, total years of teaching experience, current classroom poverty rates, whether the current classroom is classified as Head Start, and assignment in the Phase One (course) condition. Student-level covariates include age, gender, race/ethnicity, whether English is spoken at home, household income/needs ratio, and maternal education level.

Analytic Approach

Research question 1: Factors affecting instructional coaching dosage. In order to explore the relationship between observed characteristics of teachers assigned to treatment and the amount of instructional coaching received, I conduct a set of regression analyses. I fit a series of regression models in which I predict instructional coaching dosage using teacher-level characteristics, using the following form, where *DosageComposite* represents a given outcome for a teacher receiving treatment:

$$(1) \ DosageComposite = \gamma_0 + \gamma_1 X + \mu$$

Here, coefficient γ on the indicator for a specified observed teacher characteristic, X, is the parameter of interest. γ captures the predictive relationship of each observed teacher characteristic on instructional coaching dosage. In addition to examining the predictive relationship between individual teacher characteristics and amount of coaching received, I am also interested in how specific sets of characteristics predict instructional coaching dosage, together, and individually. I group teacher-level characteristics into three

categories, outlined in the literature review: teacher demographic characteristics (i.e., age, gender, race/ethnicity, income/needs ratio), measures of and proxies for instructional quality (i.e., total years of education, total years of teaching experience, pre-treatment CLASS scores on the Emotional Support, Instructional Support, and Classroom Organization domains), and contextual characteristics (i.e., classroom poverty level, Head Start designation). I conduct a series of post hoc Wald tests, and compare the amount of variation in the outcome that is explained by each set of predictors. I then conduct equivalent analyses using each individual dosage component as the outcome in equation (1) (i.e., number of coaching cycles, time spent viewing video exemplars, number of prompts received) to examine whether one component may be driving results[1].

Research question 2: Impact of instructional coaching dosage on outcomes.

Instrumental variables strategy and assumptions. In this paper an instrumental variables approach is employed to identify the effect of instructional coaching dosage on teacher and student outcomes. The instrumental variables strategy uses predicted values of a variable of interest, which are arguably not confounded by covariates, to obtain an asymptotically unbiased estimate of the causal effect of that predictor on an outcome (Murnane & Willett, 2011). In the current analyses, I use assignment to the treatment (i.e., instructional coaching) as an instrument for dosage of instructional coaching, such that instrumental variables estimates represent the effect of changes in instructional coaching dosage for teachers who were randomly assigned to the instructional coaching initiative.

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[1] Site is not related to dosage (F= 0.92); therefore clustering is not necessary for these models.

Importantly, to validly interpret the abovementioned instrumental variables estimates as such, certain assumptions must be met (Angrist, Imbens, & Rubin, 1996). First, the instrumental variable should be independent of the vector of potential outcomes and potential treatment assignments. Although this assumption is not testable, evidence of successful random assignment to treatment and control conditions in Phase Two is presented in Table 1. Second, the instrument should be a strong predictor for the treatment. To confirm monotonicity, I present below and in Table 5 results of the first stage, which demonstrate that being randomly assigned to the coaching treatment is strongly correlated with dosage of instructional coaching activities. Third, the instrument must satisfy the following exclusion restriction: random assignment to the coaching treatment can only affect the quality of student-teacher actions (i.e., teachers' CLASS scores) and student literacy performance (i.e., assessment scores) through the dosage of coaching received. Although this final assumption cannot be proven empirically, there is reason to believe that this assumption does hold, namely in that the thrust of the Phase Two intervention centered on the coaching initiative (and outlined dosage components), while not providing any additional materials or instruction to participants. Having provided evidence that these assumptions are correct, I develop a two-stage model to first estimate whether random assignment to the coaching condition predicts dosage of coaching and, second, whether dosage of coaching predicts both teacher and student outcomes.

Missingness. The dataset used for the current analyses was subject to high rates of missing data. In Tables 1 and 2 I present percentage of missingness for variables pertinent to my investigations at both the teacher and student levels. In the analytic

sample, at the teacher level, there were high rates of missing data for Head Start classification (20.00%). In the student sample there were high rates of missing data relative to race/ethnicity (1.66%), maternal education level (2.75%), and household needs/income ratio (8.82%). Outcome data were missing for treatment and control groups on the PPVT-III (0.66%; 0.17%), TOPEL Print Knowledge (0.16%; 0.67%), and TOPEL Phonological Awareness (2.79%; 2.87%). I address issues of missing data by employing multiple imputation (Peugh & Enders, 2004), a method previously used in the current dataset (Pianta et al. 2014; Pianta et al., 2017). I imputed student and teacher outcomes and covariates separately using Stata's multiple imputation algorithm. Specifically, I used the multiple imputation chained equations (MICE) method, also known as imputation using fully conditional specifications or sequential regression multivariate imputation (SRMI). This technique is similar to the Gibbs sampling algorithm to impute multiple variables in which sequentially univariate fully conditional specifications are used (StataCorp, 2017). I imputed ten full datasets; ten burn-in iterations of the algorithm were performed before the first imputation.

Instrumental variables estimates: The effect of instructional coaching dosage on quality of student-teacher interactions. Subsequently, I employ instrumental variables to examine whether levels of instructional coaching dosage mediate the effects of instructional coaching on the quality of student-teacher interactions. I estimate a two-stage model that exploits variation in the amount of coaching received, driven by random assignment to the instructional coaching treatment.

I fit the following first stage model for the effect of treatment on teachers' composite dosage scores, where *DosageComposite*$_{jk}$ is a composite dosage score for

teacher j at center k:

$$(2) \quad DosageComposite_{jk} = \alpha_0 + \alpha_1 Treat_{jk} + \alpha_2\, T_{jk} + \pi_k + \epsilon_{jk}$$

Here, coefficient α on the indicator for whether a teacher was randomly offered the opportunity to participate in the instructional coaching program, $Treat_{jk}$, is my parameter of interest. α captures the effect of offering teachers instructional coaching on the amount of dosage received. I include center fixed effects, π_k, as well as a vector of teacher characteristics, T_{jk}. In addition to controls for age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, and classroom poverty rates, I include an indicator for Head Start, as well as for Phase 1 treatment condition. Finally, I cluster standard errors at the center level, ϵ_{jk} to account for nesting of students within classrooms within schools. I repeat this process for the three components of the dosage composite (i.e., number of coaching cycles, time spent viewing video exemplars, and number of prompts to which the teacher was exposed) as outcomes.

In the second stage, I use the predicted values of $DosageComposite_{jk}$ from (2) to estimate the effect of variation in dosage driven by random assignment to the coaching treatment on the quality of student-teacher interactions, where $CLASSComposite_{jk}$ is a composite CLASS score for teacher j at center k utilizing the same variables[2] defined previously:

$$(3) \quad CLASSComposite_{jk} = \beta_0 + \beta_1 \widehat{DosageComposite}_{jk} + \beta_2\, T_{jk} + \pi_k + \epsilon_{jk}$$

In this model, the coefficient β_1 captures the estimated effect of instructional coaching dosage on the quality of student-teacher interactions, as measured by the composite

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[2] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

CLASS score. I also examine the estimated effect of instructional coaching dosage on the quality of student-teacher interactions at the domain level.

Instrumental variables estimates: The effect of instructional coaching dosage on student literacy performance. To estimate the effect of changes in instructional coaching dosage on student literacy performance, I estimate a two-stage model similar to that described above, which again exploits variation in the amount of coaching received, driven by random assignment to the instructional coaching treatment.

In the current study, students are nested within classrooms within schools; therefore I reexamine the first stage at the student level to confirm prior first stage results. I fit the following first stage model for the effect of treatment on teachers' composite dosage scores, where *DosageComposite*$_{jk}$ is a composite dosage score for child *i* taught by teacher *j* at center *k*:

(4) $DosageComposite_{jk} = \gamma_0 + \gamma_1 Treat_{jk} + \gamma_2\,T_{jk} + \gamma_3 X_{ijk} + \pi_k + \varepsilon_{ijk}$

Here, coefficient γ on the indicator for whether a teacher was randomly offered the opportunity to participate in the instructional coaching program, *Treat*$_{jk}$, is my parameter of interest. γ captures the effect of offering teachers instructional coaching on the amount of dosage received. I include center fixed effects, π_k, as well as a vector of child covariates, X_{ijk}. In addition to controls for age, gender, household income/needs ratio, race/ethnicity, and maternal education level, I include an indicator for whether English was spoken at home. T_{jk} is a vector of teacher covariates, described above. Finally, I cluster standard errors at the teacher level, ε_{ijk} to account for nesting of students within classrooms. I repeat this process for the three components of the dosage composite (i.e., number of coaching cycles, time spent viewing video exemplars, and number of prompts

to which the teacher was exposed) as the outcomes.

In the second stage, I use predicted values of $DosageComposite_{jk}$ from (4) to estimate the effect of variation in dosage driven by random assignment to the coaching treatment on child literacy performance, where $LiteracyComposite_{ijk}$ is a composite literacy score for child i taught by teacher j at center k utilizing the same variables[3] defined previously:

(5) $LiteracyComposite_{ijk}$

$$= \delta_0 + \delta_1 \widehat{DosageComposite}_{jk} + \delta_2 T_{jk} + \delta_3 X_{ijk} + \pi_k + \varepsilon_{ijk}$$

In this model, the coefficient δ_1 captures the estimated effect of instructional coaching dosage on student literacy performance, as measured by the composite literacy score. I also examine the estimated effect of instructional coaching dosage on the three individual student literacy performance assessments.

Finally, I conduct sensitivity analyses to confirm the robustness of my findings, by first examining treatment effects at both the teacher and student levels for the disaggregated components of dosage and then examining the same treatment effects when including additional data on the three named dimensions of dosage.

Results

Descriptive Results

I present descriptive statistics for both teachers and students in Table 4. In Panel A of Table 4 I present raw data on the amount of instructional coaching dosage that treatment teachers received: on average, teachers receiving the instructional coaching

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[3] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

treatment participated in 10.81 coaching cycles ($SD = 3.64$), spent 72.14 minutes viewing video exemplars ($SD = 35.43$), and received 32.28 prompts from coaches ($SD = 10.97$) during the instructional coaching phase of the PDS. There was, however, wide variability in these dosage figures: teachers participated in between one and 21 coaching cycles, watched between zero and 195 minutes of video, and received between three and 63 prompts. Such observed differences in levels of instructional coaching motivates further investigation into the which teacher characteristics might predict this variation.

In Panels B and C of Table 4 I present raw data on the end-of-year outcome CLASS scores that treatment and control teachers received, respectively. Figures displayed in Panels B and C highlight similar trends between treatment and control group teachers: overall, teachers tended to receive relatively higher CLASS scores in the Emotional Support and Classroom Organization domains, and relatively lower CLASS scores in the Instructional Support domain. On average, teachers participating in the instructional coaching treatment received a score of 4.58 ($SD = 0.52$) on the CLASS, overall. On the three domains, treatment teachers received a score of 5.25 ($SD = 0.45$) in Emotional Support, 2.09 ($SD = 0.45$) in Instructional Support, and 5.35 ($SD = 0.45$) in Classroom Organization. By comparison, teachers assigned to the control group received, on average, a score of 4.30 ($SD = 0.45$) on the CLASS, overall. On the three domains, control teachers received a score of 5.14 ($SD = 0.44$) in Emotional Support, 2.05 ($SD = 0.46$) in Instructional Support, and 5.38 ($SD = 0.44$) in Classroom Organization.

In Panels D and E of Table 4 I present raw data on outcome literacy performance scores for students whose teachers were assigned to treatment and control, respectively, which are consistent with findings of Pianta et al. (2017). On average, student scores

Table 4. Predictor and Outcome Characteristics for Treatment and Control Teachers, Students

	Mean (SD)	Range
A. Teacher Predictors, Treatment (*n*=154)		
Composite Dosage	1.74 (0.53)	0.11–3.31
Coaching Cycles	10.81 (3.64)	1–21
Minutes Viewing Video	72.14 (35.43)	0–195
Number of Prompts	32.28 (10.97)	3–63
B. Teacher Outcomes, Treatment (*n*=154)		
Composite CLASS	4.58 (0.52)	2.75–5.60
Emotional Support	5.25 (0.45)	3.88–6.25
Instructional Support	2.09 (0.45)	1.00–3.63
Classroom Organization	5.35 (0.45)	3.75–6.21
C. Teacher Outcomes, Control (*n*=98)		
Composite CLASS	4.30 (0.45)	3.18–5.47
Emotional Support	5.14 (0.44)	3.84–5.89
Instructional Support	2.05 (0.46)	1.25–3.67
Classroom Organization	5.38 (0.44)	4.00–6.15
D. Student Outcomes, Treatment (n=609)		
Literacy Composite	0.02 (0.99)	-3.18–2.94
PPVT-III	90.38 (16.19)	36–132
TOPEL Phonological Awareness	93.46 (15.07)	54–136
TOPEL Print Knowledge	102.23 (14.48)	67–139
D. Student Outcomes, Control (n=593)		
Literacy Composite	-0.04 (1.01)	-2.64–3.15
PPVT-III	89.59 (15.92)	39–141
TOPEL Phonological Awareness	92.47 (14.98)	54–129
TOPEL Print Knowledge	101.63 (14.70)	69–141

overall and on individual measures was similar across both groups, with large ranges in performance. Specifically, on average, students whose teachers received the instructional coaching treatment had a standard score of 90.38 (SD = 16.19) on the PPVT-III; 93.46 (SD = 15.07) on the Phonological Awareness subtest of the TOPEL; and, 102.23 (SD = 14.48) on the Print Knowledge subtest of the TOPEL. By comparison, students who teachers were assigned to the control condition had, on average, a standard score of 89.59 (SD = 15.92) on the PPVT-III; 92.47 (SD = 14.98) on the Phonological Awareness subtest of the TOPEL; and, 101.63 (SD = 14.70) on the Print Knowledge subtest of the TOPEL.

Research Question 1: Factors Affecting Instructional Coaching Dosage

In order to explore whether teachers who received varying levels of instructional coaching differ from one another on observed characteristics, I first look at covariate distributions for treatment teachers. Results of my analysis of the predictive relationship between teacher-level characteristics and instructional coaching dosage indicate that the amount of instructional coaching received was, in fact, predicted by observed teacher characteristics. In Table 5 I present coefficients from all models, with associated p-values.

In Panels A, B, and C of Table 5 I present the results of regression analyses that include teacher-level covariates associated with teacher demographic characteristics, proxies for instructional quality, and contextual characteristics, respectively. I also present the results of joint tests of the hypothesis that the observed teacher characteristics

Table 5. Relationships Between Instructional Coaching Dosage and Observed Teacher Characteristics

	Dosage Composite	Coaching Cycles	Viewing Video	Prompts
	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
A. Demographic Characteristics				
Age	0.01 (0.01)	<0.01 (0.01)	0.01 (0.01)	<0.01 (0.01)
Gender	0.23 (0.32)	0.40 (0.32)	-0.15 (0.31)	0.40 (0.32)
Race/Ethnicity				
Black/African American	-0.06 (0.33)	-0.01 (0.33)	-0.15 (0.33)	-0.01 (0.33)
White/Caucasian	0.14 (0.34)	0.22 (0.34)	-0.04 (0.33)	0.21 (0.34)
Native American/Indian	0.32 (0.37)	0.29 (0.37)	0.35 (0.37)	0.28 (0.37)
Hispanic/Latino	0.02 (0.52)	0.04 (0.04)	-0.34 (0.52)	0.20 (0.52)
Income/needs ratio	0.04 (0.04)	0.04 (0.04)	0.04 (0.04)	0.04 (0.04)
Joint test				
F-statistic	$(7, 235) = 0.98$	$(7, 235) = 1.02$	$(7, 235) = 1.49$	$(7, 235) = 1.02$
p-value	0.45	0.42	0.17	0.42
B. Instructional Quality				
Years of education	0.03 (0.04)	0.06 (0.04)	-0.02 (0.04)	0.06 (0.04)
Years teaching	-0.01 (0.01)	-0.01 (0.01)	<0.01 (0.01)	-0.01 (0.01)
Pre-Treatment CLASS Score				
Emotional Support	0.66*** (0.22)	0.77*** (0.22)	0.35 (0.22)	0.77*** (0.22)
Instructional Support	-0.03 (0.18)	-0.06 (0.18)	0.03 (0.18)	-0.05 (0.18)
Classroom Organization	-0.35 (0.22)	-0.45** (0.22)	-0.11 (0.22)	-0.44** (0.22)
Joint test				
F-statistic	$(5, 214) = 2.20$	$(5, 214) = 3.18$	$(5, 214) = 0.77$	$(5, 214) = 3.17$
p-value	0.06*	0.01***	0.57	0.01***
C. Contextual Characteristics				
Classroom poverty level	-0.50 (0.32)	-0.64** (0.32)	-0.17 (0.33)	-0.62* (0.32)
Head Start status	-0.19 (0.14)	-0.19 (0.14)	-0.17 (0.14)	-0.19 (0.14)
Joint test				
F-statistic	$(2, 230) = 3.25$	$(2, 230) = 4.33$	$(2, 230) = 1.13$	$(2, 230) = 4.21$
p-value	0.04**	0.01**	0.33	0.02**

Note. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Both panels and columns contain estimates from separate regressions.

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in each of the three sets are jointly zero in the models. In the case of teacher demographic characteristics, I am unable to reject the null hypothesis that these observed teacher characteristics are jointly zero in the model. Results related to measures of and proxies for instructional quality suggest that indicators of baseline instructional quality do explain variation in dosage at the composite and component level beyond what is explained by other observed characteristics (F=2.20, p=0.06). Within indicators of instructional quality, pre-intervention Emotional Support and Classroom Organization scores on the CLASS are statistically significantly predictive of dosage. Specifically, for every one unit difference in baseline Emotional Support scores between teachers in the treatment group, on average, observations differ by 0.66 standard deviation units of the dosage composite. In practice, this translates to participating in 3.78 more coaching cycles, viewing 28.22 more minutes of video exemplars, and receiving 11.30 more prompts from coaches throughout the instructional coaching intervention. For every one unit difference in baseline Classroom Organization scores between teachers in the treatment group, we observe that, on average, teachers participate in 0.45 fewer standard deviation units of coaching cycles and 0.44 fewer standardized units of prompts. In practice, this translates to participating in 2.68 fewer coaching cycles and receiving 7.90 fewer prompts from coaches throughout the instructional coaching intervention.

In addition, the results of regression analyses indicate that classroom poverty level and Head Start status jointly explain variation in composite dosage (F=3.25, p=0.04) in the negative direction. While neither classroom poverty level nor Head Start status explains variation in the dosage composite, classroom poverty level is statistically

significantly negatively associated with the number of coaching cycles (p=0.05) and prompts received (p=0.05) by treatment teachers.

The results presented above suggest a critical relationship both between indicators of instructional quality and classroom characteristics and the amount of instructional coaching dosage received by treatment teachers. I now turn to an instrumental variables approach in which I am able to estimate the effect of instructional coaching dosage on teacher and student outcomes while taking into account that dosage may be driven, in part, by observed teacher characteristics.

Research Question 2: Impact of Instructional Coaching Dosage on Outcomes

First stage estimates: The effect of assignment to treatment on instructional coaching dosage. Results of the teacher-level first stage analysis, presented in Panel A of Table 6, indicate that random assignment to the instructional coaching treatment had a large impact on dosage of treatment. Specifically, early childhood teachers who were offered the instructional coaching treatment received 1.90 standard deviation units more dosage, on average, than early childhood teachers who were not offered the consultancy; those teachers not offered treatment received, on average, zero dosage. This difference appears quite large, particularly in light of the distribution of the composite dosage variable (1.85 SD) (see Table 4). I also examine the extent to which the different components of dosage used to operationalize the composite are related to the instrument. The individual measures of dosage demonstrate large impacts, similar in magnitude to that of the dosage composite: number of coaching cycles (1.82 SD), time spent viewing video exemplars (1.62 SD), and number of prompts provided by the coach (1.82 SD).

Table 6. First Stage Estimates: Effect of Assignment to Treatment on Dosage of

Instructional Coaching

	Composite Dosage	Coaching Cycles	Viewing Video	Prompts
A. Teacher Level				
Treat	1.85***	1.82***	1.62***	1.82***
	(0.07)	(0.10)	(0.08)	(0.10)
Observations	252	252	252	252
B. Student Level				
Treat	1.87***	2.97***	1.65***	2.95***
	(0.05)	(0.09)	(0.06)	(0.09)
Observations	952	952	952	952

Note. Standard errors clustered at the center and teacher levels are included in parentheses, respectively. All models include controls for teacher age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition, and site fixed effects. Student models also include controls for child age, gender, race/ethnicity, language spoken at home, household income/needs ratio, maternal education level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Because students are nested within classrooms within schools I reexamine the first stage at the student level to include additional student covariates and cluster standard errors at the classroom level, rather than at the center level. I again establish a strong first stage through these methods, demonstrating a strong relation between random assignment to the instructional coaching intervention and dosage. The results of this first stage analysis, presented in Panel B of Table 6, also indicate that random assignment to the instructional coaching treatment had a large impact on overall dosage of treatment (1.87 SD), as well as on number of coaching cycles (2.97 SD), time spent viewing video exemplars (1.65 SD), and number of prompts provided by the coach (2.95 SD).

Instrumental variables (IV) estimates: The effect of instructional coaching dosage on quality of student-teacher interactions. Having established a strong first stage at both the teacher and student levels, I now answer my research question by estimating the effect of instructional coaching dosage on teacher and student outcomes. First, I examine the effect of instructional coaching dosage, as measured by the dosage composite, on the quality of student-teacher interactions, captured by composite CLASS scores. The instrumental variables analyses are presented in Table 7, with OLS results displayed in Panel A for comparison; robust standard errors are included in parentheses.

Instrumental variables estimates reveal a moderate statistically significant mediating effect of instructional coaching dosage on the quality of student-teacher interactions, as measured by composite CLASS scores. The second panel of Table 7 presents the results for the instrumental variables estimations of the effect of instructional coaching dosage on the quality of student-teacher interactions. The first column of the first row shows that, by instrumental variables estimation, an additional standard

Table 7. Effect of Instructional Coaching Dosage on Quality of Student-Teacher

Interactions

	Composite CLASS	Emotional Support	Instructional Support	Classroom Organization
A. OLS estimates				
Dosage Composite	0.27***	0.18**	0.41***	0.06*
	(0.06)	(0.05)	(0.08)	(0.03)
Observations	252	252	252	252
B. IV estimates				
Dosage Composite	0.22***	0.16**	0.38***	-0.00
	(0.06)	(0.06)	(0.05)	(0.07)
Observations	252	252	252	252
F statistics	5.04	3.74	8.87	0.00
C. Reduced form estimates				
Treatment	0.41***	0.30**	0.70***	-0.00
	(0.10)	(0.11)	(0.15)	(0.06)
Observations	252	252	252	252

Note. Standard errors clustered at the center level are included in parentheses; for IV estimates robust standard errors[4] clustered at the center level are included in parentheses. All models include controls for teacher age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition, and site fixed effects. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

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[4] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

deviation unit of composite dosage was associated with a 0.22 standard deviation unit higher score on the CLASS composite ($p<0.01$). For comparison, treatment teachers falling in the 25th percentile for dosage of instructional coaching received 1.60 standard deviation units of dosage, on average, while those in the 75th percentile received 2.19 standard deviation units, on average. The second through fourth columns show relative heterogeneity in the instrumental variables coefficients of the Emotional Support, Instructional Support, and Classroom Organization domains that served as the component parts of the CLASS composite. The differences in the estimates of each component demonstrate that the largest observed effect of instructional coaching dosage on the composite CLASS score is derived from the Instructional Support domain (0.38 SD), with some additional effect derived from Emotional Support domain (0.16 SD), and no significant effect from the Classroom Organization domain.

Instrumental variables (IV) estimates: The effect of instructional coaching dosage on quality of student literacy performance. I next examine the effect of the instructional coaching intervention, as measured by the dosage composite, on student literacy outcomes, captured by a composite of PPVT-III and TOPEL Phonological Awareness and Print Knowledge scores. The instrumental variables analyses are presented in Table 8, with OLS results displayed in Panel A for comparison; robust standard errors are included in parentheses. Estimates of the second stage of the instrumental variables results, presented in Panel B, suggest a correspondingly small and statistically non-significant effect of instructional coaching dosage on student literacy performance, overall, as well as of the three component parts, respectively.

Table 8. Effect of Instructional Coaching Dosage on Quality of Student-Teacher

Interactions on Student Literacy Performance

	(1) Composite Literacy	(2) PPVT-III	(3) TOPEL Phon. Awareness	(4) TOPEL Print Knowledge
A. OLS estimates				
Dosage Composite	0.04	0.03	0.02	0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Observations	952	949	923	948
B. IV estimates				
Dosage Composite	0.02	0.02	0.01	0.02
	(0.03)	(0.03)	(0.03)	(0.03)
Observations	952	949	923	948
F statistics	18.54	19.69	8.25	15.14
C. Reduced form estimates				
Treatment	0.04	0.05	0.02	0.03
	(0.06)	(0.06)	(0.06)	(0.06)
Observations	952	949	923	948

Note. Standard errors clustered at the teacher level are included in parentheses for IV estimates robust standard errors[5] clustered at the teacher level are included in parentheses. All models include controls for child age, gender, race/ethnicity, language spoken at home, household income/needs ratio, maternal education level, a vector of teacher-level characteristics (age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition), and site fixed effects. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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[5] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

Sensitivity Analyses

The results presented above demonstrate that increased dosage of instructional coaching activities is positively associated with outcomes at the teacher, but not student, level. To confirm the robustness of these findings, I explore additional or alternate explanations, as well as sources of potential bias; two sensitivity analyses can be found below.

Disaggregation of the dosage composite. I test the sensitivity of my results to alternative specifications by first examining the effect of the individual components of instructional coaching dosage (i.e., number of coaching cycles, time spent viewing video exemplars, and number of prompts received) on the quality of student-teacher interactions and on student literacy performance. The teacher-level instrumental variables analyses are presented in Table 9, with previously-reported dosage composite results displayed in Panel A for comparison. Examining the components of the dosage composite separately yields moderate statistically significant estimates similar to those presented for the dosage composite in Panel A. Specifically, instrumental variables estimates presented in Table 9 reveal a moderate statistically significant mediating effect of each component of the instructional coaching dosage composite on the quality of student-teacher interactions, as measured by composite CLASS scores. The magnitude of these detected effects appears to be similar across each component of the CLASS.

The student-level instrumental variables analyses are presented in Table 10, with previously-reported dosage composite results displayed in Panel A for comparison. Examining the components of the dosage composite separately yields small and statistically non-significant estimates similar to those presented for the dosage composite

Table 9. Sensitivity Analysis: Effect of Instructional Coaching Dosage on Quality of

Student-Teacher Interactions, by Dosage Component

	(1) Composite CLASS	(2) Emotional Support	(3) Instructional Support	(4) Classroom Organization
A. Dosage Composite	0.22***	0.16**	0.38***	-0.00
	(0.06)	(0.06)	(0.05)	(0.07)
Observations	252	252	252	252
F statistics	5.04	3.74	8.87	0.00
B. Coaching Cycles	0.22***	0.16**	0.38***	0.00
	(0.06)	(0.07)	(0.06)	(0.07)
Observations	252	252	252	252
F statistics	5.02	3.74	8.45	0.01
C. Time Viewing Videos	0.25***	0.18***	0.43***	0.00
	(0.07)	(0.08)	(0.06)	(0.08)
Observations	252	252	252	252
F statistics	4.69	3.60	8.40	1.94
D. Prompts Received	0.22***	0.16***	0.38***	0.00
	(0.06)	(0.07)	(0.06)	(0.07)
Observations	252	252	252	252
F statistics	5.02	3.74	8.46	1.94

Note. Standard errors clustered at the center level are included in parentheses; for IV estimates robust standard errors[6] clustered at the center level are included in parentheses. All models include controls for teacher age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition, and site fixed effects. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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[6] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

Table 10. Sensitivity Analysis: Effect of Instructional Coaching Dosage on Student

Literacy Performance, by Dosage Component

	(1) Composite Literacy	(2) PPVT-III	(3) TOPEL Phon. Awareness	(4) TOPEL Print Knowledge
A. Dosage Composite	0.02	0.02	0.01	0.02
	(0.03)	(0.03)	(0.03)	(0.03)
Observations	952	949	923	948
F statistics	18.54	19.69	8.25	15.14
B. Coaching Cycles	0.01	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	952	949	923	948
F statistics	18.54	19.68	8.25	15.14
C. Time Viewing Videos	0.03	0.03	0.01	0.02
	(0.03)	(0.03)	(0.04)	(0.04)
Observations	952	949	923	948
F statistics	18.54	19.71	8.24	15.15
D. Prompts Received	0.01	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	952	949	923	948
F statistics	18.54	19.68	8.25	15.14

Note. Standard errors clustered at the teacher level are included in parentheses for IV estimates robust standard errors[7] clustered at the teacher level are included in parentheses. All models include controls for child age, gender, race/ethnicity, language spoken at home, household income/needs ratio, maternal education level, a vector of teacher-level characteristics (age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition), and site fixed effects. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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[7] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

in Panel A. The magnitude of the effects appears to be similar across each type of student outcome.

Results from this sensitivity analysis suggest that my main findings are robust. In addition, this extended analysis corroborates the apparent heterogeneity in the effect of instructional coaching dosage on individual CLASS domains, established in my main analysis. However, although the individual dosage components functioned similarly to one another and to their composite in this analysis, it is important to note that considering number of coaching cycles, time spent viewing videos, or prompts provided by the coach independent of one another violates the exclusion restriction and therefore cannot be deemed causal.

Additional data on dosage. I next test the sensitivity of my results to alternative specifications by including additional data on the three dosage components in my analyses. Although my main analyses include all three facets of instructional coaching dosage (i.e., number of coaching cycles, time spent viewing video exemplars, and number of prompts received), other data may provide an even more nuanced view of these components, including the amount of time teachers spent using the web-mediated coaching program (i.e., to view videos and coach prompts), as well as the number of CLASS videos each submitted as a requirement of each coaching cycle during the instructional coaching intervention phase. It is possible that these factors could have affected both teacher and child outcomes, as measured by CLASS and literacy scores, respectively. Therefore, I expand my dosage composite to include these two indicators as well as the original three dimensions of dosage (i.e., number of coaching cycles, time

Table 11. Sensitivity Analysis: First Stage Estimates: Effect of Assignment to Treatment

on Dosage of Instructional Coaching, with Additional Data

	Composite Dosage	Coaching Cycles	Viewing Video	Prompts	CLASS Videos	Web Time
A. Teacher Level						
Treat	1.81***	1.82***	1.62***	1.81***	1.16***	0.99***
	(0.09)	(0.10)	(0.08)	(0.10)	(0.08)	(0.10)
Observations	252	252	252	252	252	252
B. Student Level						
Treat	1.78***	2.97***	1.65***	2.95***	1.37***	1.02***
	(0.06)	(0.09)	(0.06)	(0.09)	(0.08)	(0.11)
Observations	947	947	947	947	947	947

Note. Standard errors clustered at the center and teacher levels are included in parentheses, respectively. All models include controls for teacher age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition, and site fixed effects. Student models also include controls for child age, gender, race/ethnicity, language spoken at home, household income/needs ratio, maternal education level. $^*p <$ 0.10, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 12. Sensitivity Analysis: Effect of Instructional Coaching Dosage on Quality of

Student-Teacher Interactions, with Additional Data

	(1)	(2)	(3)	(4)
	Composite	Emotional	Instructional	Classroom
	CLASS	Support	Support	Organization
A. OLS estimates				
Dosage Composite	0.27***	0.18**	0.41***	0.08**
	(0.06)	(0.06)	(0.09)	(0.03)
Observations	252	252	252	252
B. IV estimates				
Dosage Composite	0.23***	0.16**	0.39***	-0.00
	(0.06)	(0.07)	(0.06)	(0.07)
Observations	252	252	252	252
F statistics	5.06	3.80	8.34	2.05
C. Reduced form estimates				
Treatment	0.41***	0.30***	0.70***	-0.00
	(0.10)	(0.11)	(0.15)	(0.06)
Observations	252	252	252	252

Note. Standard errors clustered at the center level are included in parentheses; for IV estimates robust standard errors[8] clustered at the center level are included in parentheses. All models include controls for teacher age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition, and site fixed effects. $^*p <$ 0.10, $^{**}p < 0.05$, $^{***}p < 0.01$.

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[8] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

Table 13. Sensitivity Analysis: Effect of Instructional Coaching Dosage on Student

Literacy Performance, with Additional Data

	(1) Composite	(2) PPVT-III	(3) TOPEL Phon.	(4) TOPEL Print
	Literacy		Awareness	Knowledge
A. OLS estimates				
Dosage Composite	0.05*	0.04	0.03	0.05
	(0.03)	(0.03)	(0.03)	(0.03)
Observations	947	944	920	943
B. IV estimates				
Dosage Composite	0.02	0.03	0.01	0.02
	(0.03)	(0.03)	(0.03)	(0.03)
Observations	947	944	920	943
F statistics	18.55	19.57	8.22	15.26
C. Reduced form estimates				
Treatment	0.04	0.05	0.02	0.03
	(0.06)	(0.06)	(0.06)	(0.06)
Observations	947	944	920	943

Note. Standard errors clustered at the teacher level are included in parentheses for IV estimates robust standard errors[9] clustered at the teacher level are included in parentheses. All models include controls for child age, gender, race/ethnicity, language spoken at home, household income/needs ratio, maternal education level, a vector of teacher-level characteristics (age, gender, household income/needs ratio, race/ethnicity, years of education, total years of teaching experience, classroom poverty rates, a Head Start indicator, assignment to Phase 1 condition), and site fixed effects. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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[9] Stata does not allow for clustered standard errors to be employed with instrumental variables. Therefore, robust standard errors were instead included in all instrumental variables models.

spent viewing video exemplars, and number of prompts received). Sensitivity analyses have therefore been conducted to minimize potential sources of bias.

As with my main analyses, I establish a strong first stage at both the teacher and student levels, demonstrating a strong relationship between the instrument and new dosage variables of interest (see Table 11 for results). Having established a strong first stage, I reexamine my research question by estimating the effect of instructional coaching dosage on teacher and student outcomes, employing the original and additional data on dosage. The instrumental variables estimates for the effect of instructional coaching on the quality of student-teacher interactions, captured by composite CLASS scores, and on student literacy performance, captured by a composite of PPVT-III and TOPEL scores, are presented in Tables 12 and 13, respectively. Estimates of the effect of instructional coaching dosage on the quality of student-teacher interactions presented in Table 11 demonstrates that the results including additional dosage data do not appear to differ from my original estimation of 0.22 standard deviation units. In Table 12, I present estimates for the effect of instructional coaching dosage on student literacy performance, which are again small and non-significant. The similarity of these findings at both the teacher and student levels suggest that my main analysis findings are robust to alternate model specifications.

Discussion

Evidence suggesting that instructional coaching initiatives can be key to improving early childhood teacher practice and student academic performance is mixed. One factor determining variability in the relation between coaching and outcomes may be the amount of coaching that teachers receive. Therefore, in this paper I explore factors

hypothesized to explain this variability, specifically the relation between teacher characteristics and instructional coaching dosage, as well as the relation between dosage and both teacher and student outcomes. I report results from an experimental study of a web-mediated professional development intervention designed to improve early childhood practitioners' instructional and social interactions with students. Regression analyses indicate that amount of instructional coaching received was, in fact, predicted by observed teacher characteristics, including pre-treatment CLASS scores in both the Emotional Support and Classroom Organization domains, as well as the poverty level and Head Start status of the classroom in which teachers taught. In addition, instrumental variables analyses demonstrate that instructional coaching dosage had a moderate statistically significant effect on the quality of student-teacher interactions. This overall effect seems to be largely driven by improvements in teachers' instructional interactions and emotional support of students. On the other hand, instrumental variables analyses demonstrate that instructional coaching dosage had no detectable effect on student literacy outcomes.

The current analyses offer new insight into how and why practitioners may self-select to receive varying amounts of instructional coaching. Previous literature has documented variation in the amount of instructional coaching that teachers receive (e.g., Kraft & Hill, 2018; Matsumara et al., 2012; Pianta et al., 2014), and posited the causes of this observed variability, including teacher buy-in to initiatives (e.g., Kraft et al., 2016) and the influential role of school leaders (Desimone & Garet, 2015; Matsumara et al., 2010; Wanless et al., 2013). Specific to My Teaching Partner instructional coaching, Roberts and colleagues (2015) found that teacher beliefs, readiness to change, and

anxiety levels were related to teacher responsiveness to the intervention, as measured by coach-reported teacher engagement, number of coaching cycles completed, web use, and self-reported teacher satisfaction. However, they found a non-significant relationship between classroom poverty levels and teacher responsiveness. The findings of the current study add to and complement this understanding by highlighting the ways in which individual teacher characteristics my predict receipt of instructional coaching, relative to number of coaching cycles, amount of web use, and number of prompts received. In particular, results suggest that indicators of pre-treatment instructional quality and characteristics of the context in which teachers work explain variation in instructional coaching dosage, but the same is not true for teacher demographic variables. Teachers' pre-intervention emotionally supportive interactions with students were positively associated with the amount of instructional coaching received, whereas teachers' pre-intervention classroom organization, classroom poverty level, and Head Start status were negatively associated with the amount of instructional coaching received. This poses a contrast to previous findings of explorations from the same data, possibly due to distinct operationalizations of responsiveness and dosage.

I speculate that the respective positive predictive relation between pre-intervention Emotional Support scores and negative relation between pre-intervention Classroom Organization scores and instructional coaching dosage are likely explained by teachers' prior beliefs about pedagogy and learning. Research indicates that these philosophies affect the ways in—and extent to—which teachers engage with professional learning (Ball, 1994; Collopy, 2003; Roberts et al., 2015). Specifically, if there is a misalignment between the stance of the teacher and initiative toward instruction and

learning, teachers may be less apt to engage with programming (Collopy, 2003; Roberts et al., 2015). Therefore, we might consider how the Teaching Through Interactions philosophy that is foundational to the PDS could influence the amount of instructional coaching that treatment teachers receive. The TTI promotes healthy and supportive student-teacher interactions as key to optimizing student learning (Curby et al., 2009; Hamre et al., 2013), and I argue that teachers who subscribe to this viewpoint would be more to likely to have relatively higher pre-intervention CLASS scores in the Emotional Support domain and thus invest and engage in the PDS. By contrast, teachers whose teaching philosophy is driven by strict classroom management likely have relatively higher pre-intervention CLASS scores in the Classroom Organization domain. Although emotionally supportive interactions and classroom interactions are not mutually exclusive, research suggests that ideas of effective classroom management remain largely focused on compliance and obedience (McCaslin & Good, 1992; Martin, 2004)—and that management systems that emphasize behavioral control can undermine integration of progressive best practices for instruction (McCaslin & Good, 1992), such as emotionally supportive student-teacher interactions.

In addition, in light of the extant literature, the predictive relationship between contextual indicators and amount of instructional coaching received by treatment teachers is not surprising. Extensive research indicates that difficult working conditions are most common in schools that serve high-poverty populations (Johnson, Kraft, & Papay, 2012; Ladd, 2011; Luczak & Loeb, 2013). Teachers report low job satisfaction in these settings stemming from myriad sources, including a lack of resources, support from the school leadership, and autonomy; inadequate preparation time and compensation; and school

culture (Ingersoll, 2004). These contextual factors not only make working conditions difficult, but also often constrain teacher engagement with reform efforts (Ball, 1994). Applying these findings to the current study, then, it would be logical that teachers employed by early childhood centers that serve high-poverty populations (i.e., high classroom poverty levels, Head Start designation) would then participate less in professional learning programming, reflected in lower observed instructional coaching dosage. If dosage is linked to teacher outcomes, and those teachers exhibiting higher quality instruction are more apt to engage with instructional coaching, then it is paramount to understand and take into account the factors that motivate or preclude teachers with lower quality instruction from engaging with instructional coaching initiatives. Continued exploration of this topic may be critical to engaging those teachers most needy of support in order to increase the impact of instructional coaching initiatives.

Beyond contributing to our understanding of how teacher characteristics predict instructional coaching dosage, this study also adds to the body of literature related to the impact of dosage on teacher outcomes. There is evidence that dosage of instructional coaching is one factor central to the effect of instructional coaching initiatives: findings from experimental studies that vary the dosage of professional development programming demonstrate that higher quantities of professional development are related to greater pedagogical change over time among early childhood practitioners (Landry et al., 2009; Pianta, et al., 2008; Powell et al., 2010). Specific to previous explorations of the data collected through the PDS, Pianta and colleagues (2014) found positive correlations between the dosage of exposure to coaching cycles, videos viewed, and coaching prompts and the quality of student-teacher interactions. Overall, Pianta and

colleagues' results demonstrated that improvement in student-teacher interactions was associated with a greater number of instructional coaching cycles. Specifically, growth in Instructional Support was associated with increased exposure to prompts, to a certain point, and growth in Emotional Support increased steadily, commensurate with increases in number of video exemplars viewed, but only after a certain amount of initial dosage. By contrast, growth in Classroom Organization was negatively associated with watching video exemplars. The findings of the current study add confirmatory support to the above outlined results regarding emotionally and instructionally supportive interactions, demonstrating that additional instructional coaching dosage was associated with increases in the quality of student-teacher interactions in these domains. Of note in the current study, though, is that detected effects of dosage on teachers' CLASS scores were not driven by the Classroom Organization domain. This may have been a result of participating teachers, on average, having relatively greater exposure to instructional coaching feedback related to the Instructional Support domain throughout the intervention (Pianta et al., 2014). Relatedly, because the CLASS instrument was employed as both an instructional and assessment tool for teachers in the instructional coaching initiative, heterogeneity in domain CLASS scores may imply increased uptake in both suggested pedagogical strategies and in the quality of student-teacher interactions commensurate with the extent to which each domain was emphasized during coaching.

Conclusions drawn from the current study regarding the impact of instructional coaching dosage on student achievement also offer support and extensions of the existing canon. My finding of a non-significant impact of dosage of instructional coaching on student assessment performance aligns with those of several experimental studies of

instructional coaching interventions that demonstrate minimal (Marsh, McCombs, Lockwood, Gershwin, & Martotell, 2008) or non-significant effects on student learning (Milburn et al., 2015). In their investigations of main effects of both the professional development course and instructional coaching components of the PDS on student achievement, Pianta and colleagues (2017) found largely disappointing results: while positive impacts were observed from the course on children's observed language behavior and from the consultancy on inhibitory control, no significant effects on any directly assessed literacy or language skills were observed. The findings of the current study add to this understanding by presenting estimates of the impact of the specific features of the instructional coaching intervention (i.e., dosage) on student academic performance. Such non-significant results are not the full story, though; rather, the literature also shows that, in some cases, coaching can drive gains in student achievement (Allen et al., 2011; Biancarosa, Bryk, & Dexter, 2010; Lockwood et al., 2010; Matsuamara et al., 2012; Van Keer & Verhaeghe, 2005; Wei et al., 2009). Understanding the differences in the conditions that produce distinct results promises to advance the field of professional learning.

Even more noteworthy, though, are the cases in which singular professional learning opportunities yield positive effects for practitioners, yet not for their associated students. In the current investigation, I find such mixed results of the impact of instructional coaching dosage on the quality of student-teacher interactions and student literacy performance; overall, these results are consistent with prior investigations of the impact of both professional development, writ large, and instructional coaching, specifically. In the larger professional development literature, there are examples of such

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discrepant results, demonstrating positive impacts of professional learning on teachers'

knowledge and practice, but not on their students' (Dash, Magidin de Kramer, O'Dwyer,

Masters, & Russell, 2012; Garet et al., 2008; Rimbey, 2013). This pattern has been

replicated in investigations of instructional coaching (Powell et al., 2010; Neuman &

Cunningham, 2009). These mixed results raise the question of the mechanisms and

conditions that promote improvement in student performance outcomes, beyond teacher

outcomes.

There are several factors hypothesized to contribute to the incongruence between

teacher and student outcomes as a result of instructional coaching. One factor may be

format through which the initiative was delivered: those studies exploring the impact of

on-site instructional coaching have found improvements in targeted teacher practices

(Hsieh et al., 2009; Neuman & Cunningham, 2009; Neuman & Wright, 2010), but both

positive (Biancarosa et al., 2010) and null impacts on student learning (Milburn et al.,

2015). Investigations of web-mediated instructional coaching have similarly found

positive effects on instructional practice, but minimal or nonsignificant impacts on

student outcomes (Pianta et al., 2008; Pianta et al., 2017; Powell et al., 2010). Another

factor may be misalignment between the content focus of a professional learning

initiative and the child outcome(s) being assessed. Researchers have posited that

synchronization between professional learning/mentoring opportunities and assessment

tools are critical in determining the extent to which student achievement measures

capture the range of skills targeted by professional development (Bierman et al., 2008;

Fukkink & Lont, 2007). And, in some cases of empirical studies of instructional coaching

in ECE that found increases in student achievement, professional learning was tightly

aligned to assessed skills (Biancarosa et al., 2010; Downer, Pianta, Fan, Hamre, Mashburn, & Justice, 2011; Landry et al., 2009). A final potential explanation for why impacts on student achievement were non-significant could be the inherently indirect nature of the impact of professional learning on student learning. Student learning is characteristically governed by teacher knowledge and classroom practice (Rimbey, 2013; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). Teachers need to be granted the opportunity to implement practices promoted in professional learning (Dash et al., 2012), and sufficient time needs to elapse between implementation and assessment to detect impacts on student learning (Rimbey, 2013).

Limitations

There are several apparent limitations in the present study that require discussion—and motivate future research. The first limitation of this work is that, due to missing data and attrition, only a subsample of participants was used for analysis. I chose to include only those teachers who participated in Phase Two of the intervention and had both dosage and outcome CLASS scores, reducing the 401 participants involved in Phase Two to 252. Although I find little evidence that the teachers included in these analyses differ from the full sample on an array of baseline characteristics (see Table 1), it is possible that these sample restrictions caused some sort of undetected bias, thus limiting the validity and generalizability of the presented results. In addition, the largely low-income sample and web-mediated coaching intervention used in this study may not be nationally representative of the early childhood population or programming, as a whole. This, too, could limit generalizability to other types of coaching or other student populations.

Furthermore, as suggested in previous work conducted by Pianta and colleagues (2014, 2017) and mentioned previously, the Professional Development Study experiment was subject to nontrivial attrition. I explored patterns of attrition (see above) and found that, overall, those teachers affected by attrition were not systematically different across the treatment and control groups. Even so, it is possible that some selection or retention bias remains, further potentially limiting the validity and generalizability of results. In addition, as noted in prior evaluations of NCRECE (Pianta et al., 2008; Pianta et al., 2014), in the Professional Development Study experiment, the CLASS functions as both treatment tool and outcome measure. Such circumstances may raise concerns about a "teaching to the test" mechanism present in all analyses related to these data (Pianta et al., 2014). A final limitation of this work is that the results reported regarding the predictive relation between observed teacher characteristics and instructional coaching dosage are correlational in nature. Although these findings suggest interesting pathways by which teachers select into certain amounts of instructional coaching, more rigorous work is needed to establish the causality of these mechanisms, and to rule out alternate factors influencing teacher engagement in programming (e.g., peers).

Conclusion and Impact

The results of the current analyses highlight the predictive relation between observed teacher characteristics and the amount of instructional coaching, and demonstrate the impact of instructional coaching dosage on teacher and student outcome. However, the present work is unable to obtain causal estimates of the predictive relationship between teacher characteristics and coaching dosage nor of the extent to which the individual components of the dosage composite affect these outcomes.

Therefore, future randomized controlled trials investigating how teachers receiving varying amounts of instructional coaching differ on observed characteristics would be critical for better understanding how to engage a broader range of teachers in such professional learning initiatives. In addition, future research regarding the impact of how each component of dosage contributes to increases in the quality of student-teacher interactions would be useful for understanding the factors critical for designing and implementing professional development for pedagogical improvement.

Furthermore, the argument could be made that, practically speaking, dosage of professional learning is often a proxy for teacher engagement with initiatives. The construct of engagement is hypothesized to have three components: behavioral engagement, or participation; emotional engagement, or positive and negative reactions to people and environment that influence willingness to complete tasks; and cognitive engagement, or investment of thought and effort necessary to comprehend ideas and master skills (Fredricks, Blumenfled, & Paris, 2004). Much of the dosage seen in the current study can be conceptualized as evidence of teachers' behavioral engagement with the PDS. However, it is also possible that the extent to which a teacher engages with the instructional coaching initiative is also a function of their emotional and cognitive engagement: theorists posit that these three components are dynamically interrelated (Fredricks et al., 2004). Without question, teacher engagement is critical to implementation of any type of professional learning (Desimone & Garet, 2015). Specific to instructional coaching, programming will likely fail to impact pedagogy if teachers are not invested in the coaching (Kraft, Blazar, & Hogan, 2016). In particular, findings also suggest that teacher engagement may be an important factor affecting the amount of

coaching or professional development received (Kraft et al., 2016). Therefore, (re)conceptualizing dosage as a product of engagement may open up pathways for continued qualitative and quantitative research.

This research contributes to the extant literature regarding effective practices in early childhood professional development by providing key insights into how to optimize instructional coaching practices for teaching quality improvement. It offers enhanced understanding of factors influencing the amount of instructional coaching that teachers receive, as well as the ways in which instructional coaching dosage can affect teaching quality, and, in turn, learning in early childhood.

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Paper 2

Engagement with Instructional Coaching Initiatives in Early Childhood Settings

Abstract

Research confirms that instructional quality in early childhood education strongly predicts children's school readiness and subsequent achievement. However, little is known about how teacher engagement with instructional coaching opportunities can be successful in influencing teaching quality, and, in turn, learning in early childhood. In the current study I draw upon semi-structured interviews with 32 early childhood practitioners and instructional coaches participating in instructional coaching initiatives to examine the factors that impact teachers' engagement with instructional coaching initiatives. I find that practitioners and coaches identify factors at both the individual and organizational levels that both promote and hinder such engagement. At the individual level, these factors include understanding of what instructional coaching might entail; affective factors; time; and perceived appropriateness of suggestions received. At the organizational level, these factors include school structures and scheduling, as well as whether colleagues are also participating in instructional coaching.

Introduction

Evidence suggests a positive impact of high-quality classroom-based early childhood educational experiences (i.e., preschool and pre-kindergarten) on children's cognitive and social-emotional development (Barnett, 1995; Center for Public Education, 2007). More specifically, teaching quality may be particularly salient in determining associated long-term student outcomes (Barnett, 2013; Chetty, Friedman, & Rockoff, 2014; Neuman & Cunningham, 2009; Nye, Konstantopoulos & Hedges, 2004; RAND Corporation, 2012; Rivkin, Hanushek & Kain, 2005). And yet, teaching quality is highly inconsistent across classrooms and schools (Howes et al., 2008), with programming often failing to offer the types of experiences required to promote exceptional early childhood development (Pianta, Barnett, Burchinal, & Thornburg, 2009). That is, early childhood practitioners' pedagogy rarely includes the practices associated with optimal student learning, such as offering frequent oral language opportunities, instruction in letter-sound correspondence, reading aloud, and having high-quality interactions with students (Howes et al., 2008; Mashburn et al., 2008).

To improve instruction, I look to the field of professional learning. Instructional coaching may be a particularly impactful form of professional development (e.g., Allen, Pianta, Gregory, Mikami, & Lun, 2011; Hsieh, Hammeter, McCollum, & Ostrosky, 2009), but evidence suggests that teachers enrolled in instructional coaching programs engage at varied levels, behaviorally, emotionally, and cognitively (Kraft, Blazar, & Hogan, 2016; Reinke, Herman, Stormont, Newcomer, & David, 2013; Wanless, Rimm-Kaufman, Abry, Larsen, & Patton, 2015). In this paper, I review evidence that instructional coaching is a promising form of professional development, then present an

empirical study aimed at exploring the factors contributing to the effectiveness of instructional coaching opportunities. In particular, I present the results of a qualitative interview study implemented with 28 early childhood practitioners (ECPs) and their four associated instructional coaches designed to answer the question: What do early childhood educators understand as the factors that impact their engagement with instructional coaching initiatives, specifically attendance at coaching sessions, interactions with the coach in and beyond coaching sessions, and application of promoted practices? The findings from this investigation have the potential to contribute to the advancement of professional learning experiences that improve teaching quality in early childhood settings by offering insight into how early childhood practitioner participation in such opportunities may be facilitated.

Literature Review

In this section I define instructional coaching and review experimental research related to its efficacy as a form as a professional learning. I then suggest factors at both the individual and organizational levels that can lead to variation in the observed impact of instructional coaching initiatives. Finally, I suggest teacher engagement with such initiatives as a key pathway for exploring and understanding such variation.

Instructional coaching efficacy

Instructional coaching has been identified as a relatively promising form of professional development, but it has no formal definition nor method for execution. Although coaching has deep roots in the field of professional learning, there is a multiplicity of ways in which the term "coaching" has been used in the literature and operationalized in practice (Cornett & Knight, 2009). While these definitions are at times

in conflict, there appears to be consensus that coaching includes a dialogical partnership between coach and teacher, observation and technical feedback, and modeling, all sustained over time (e.g., Cornett & Knight, 2009; Joyce & Showers, 1981; Joyce & Showers, 1982). Instructional coaching embodies what theorists and researchers name as the essential components of effective professional development: it is content-focused; includes active learning; coheres with teacher knowledge and beliefs, as well as school goals; is prolonged; and builds strong working relationships (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Desimone, 2009; Desimone & Garet, 2015; Garet, Porter, Desimone, Birman, & Yoon, 2001; Joyce & Showers, 1981). Certainly, instructional coaching is multifaceted and shaped by those who engage in it; for the purposes of the current study, instructional coaching is conceptualized as ongoing individualized support in the form of observation and feedback cycles (Joyce & Showers, 1981).

A recent wave of experimental research on the impact of instructional coaching has returned both promising and disappointing results. Research findings suggest that instructional coaching does often appear to positively influence teacher practice in both the early childhood and K–12 realms: several studies demonstrate that teachers who receive coaching are more likely to enact and apply desired teaching practices appropriately than are teachers receiving other forms of professional development (Allen, Pianta, Gregory, Mikami, & Lun, 2011; Hsieh, et al., 2009; Neuman & Cunningham, 2009; Neuman & Wright, 2010; Rudd, Lambert, Satterwhite, & Smith, 2009; Stanulis, Little, & Wibbens, 2012). By contrast, though, instructional coaching seems far less likely to yield positive effects on student outcomes. While, in some instances, coaching

has been shown to drive gains in student achievement (Allen, Pianta, Gregory, Mikami, & Lun, 2011; Biancarosa, Bryk, & Dexter, 2010; Lockwood, McCombs, & Marsh, 2010; Matsumara, Garnier, & Spybrook, 2012; Van Keer & Verhaeghe, 2005; Wei et al., 2009), several studies of instructional coaching interventions have demonstrated minimal (Marsh, McCombs, Lockwood, Gershwin, & Martorell, 2008) or non-significant effects on student learning (Milburn, Hipfner-Boucher, Weitzman, Greenberg, Pelletier, & Girolametto, 2015). Furthermore, some investigations of instructional coaching, specifically in early childhood, that have yielded positive impacts on teacher practice yet not on student and other teacher outcomes (Powell, Diamond, Burchinal, & Koehler, 2010; Neuman & Cunningham, 2009; Yoshikawa et al., 2015).

Sources of variation in outcomes

To improve the enterprise—and outcomes—of instructional coaching, then, we might try to understand variation in teachers' experiences with such initiatives, as well as in professional learning, generally. Indeed, most approaches to professional development are effective in some circumstances and ineffective in others (Goldsmith, Doerr, & Lewis, 2014). The extant literature identifies factors at both the individual and organizational level that have the potential to impact teacher experiences and associated outcomes.

Individual level. Factors affecting outcome variability may occur at the individual level and might include: prior personal and teaching experience (Ball, 1996); content and/or pedagogical knowledge (Britt, Irwin, & Ritchie, 2001); confidence (or lack thereof) in the efficacy of their current pedagogy and content knowledge (Collopy, 2003; Spillane, 2000); and beliefs about content, teaching, and learning (Ball, 1996;

Borko, 2004; Timmerman, 2000). For example, while Landry and colleagues (2009) found an effect of professional learning on overall teaching quality, this impact was conditional on educators' baseline measures.

Teacher engagement with professional learning opportunities may be another individual factor affecting observed variation in outcomes. Like the term instructional coaching, "engagement" is inherently multifaceted in nature and has also been characterized and applied in the literature in numerous ways. To unpack the construct, I draw on learner engagement literature, which characterizes engagement as being comprised of three components: behavioral engagement, or participation; emotional engagement, or positive and negative reactions to people and environment that influence willingness to complete tasks; and cognitive engagement, or investment of thought and effort necessary to comprehend ideas and master skills (Fredricks, Blumenfeld, & Paris, 2004). Theorists posit that these three components are dynamically interrelated, and that levels of intensity and duration of engagement can vary in each domain. For example, in the case of instructional coaching, emotional engagement might range from enjoying coaching sessions to regarding instructional coaching as critical to improving pedagogy and student achievement (Fredricks et al., 2004).

Research on teacher engagement with professional learning opportunities suggests that there can be variation across multiple aspects of engagement, as well as associated outcomes. Behavioral engagement can be operationalized as teacher participation in coaching initiatives and therefore measured as the amount of coaching that teachers receive. Findings from experimental studies that systematically vary amount of instructional coaching demonstrate that higher quantities of the professional development

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are more effective in yielding improvements in early childhood educators' pedagogical

skill and children's school readiness outcomes (Landry et al., 2009; Pianta et al., 2014;

Pianta, Mashburn, Downer, Hamre, & Justice, 2008; Powell, Diamond, Burchinal, 2012;

Ramey, Ramey, & Stokes, 2009). A related examination of the existing literature reveals

wide variability in number of coaching cycles teachers complete, implying associated

variability in behavioral engagement with instructional coaching programming. For

example, Pianta and colleagues (2014) found that early childhood teachers participated in

the My Teaching Partner web-mediated coaching program as prescribed: although there

was some variability in the sequence of biweekly coaching cycles, coach-teacher teams

largely reached the target of 8-12 cycles for the school year. However, other

investigations have surfaced greater discrepancies in teacher engagement with coaching.

For example, in their evaluation of the Mathematical Quality of Instruction web-based

coaching program, Kraft and Hill (2018) found that upper elementary and middle school

teachers on average completed 8-10 biweekly coaching cycles per year, but with a range

from 0-16 cycles, with many teachers completing only 0-2 cycles. Even more extreme,

Matsumara, Garnier, and Spybrook (2012) reported that at most 16 of the 54 treatment

elementary school teachers engaged in Content-Focused Coaching (CFC) activities (i.e.,

grade-level and individual meetings with the coach; coach modeling, observation, and

coteaching) at the intended level over the course of the school year. In the present study I

focus on behavioral engagement due to my ability to directly measure levels of such

engagement for participating teachers.

Although less quantifiable, teachers' emotional and cognitive engagement with

instructional coaching programming may also be key in determining their impact.

Without question, teachers' emotional and cognitive engagement with programming is critical to the success of any type of professional learning (Desimone & Garet, 2015). Such engagement may be an important factor affecting the amount of coaching or professional development received (Kraft, Blazar, & Hogan, 2016). Furthermore, studies examining the emotional and cognitive aspects of engagement have reported positive associations between teachers' engagement with professional learning and uptake of promoted practices (Reinke, Herman, Stormont, Newcomer, & David, 2013; Wanless, et al., 2015). Ultimately, instructional coaching initiatives will likely fail to impact pedagogy if teachers are not invested in coaching (Kraft, Blazar, & Hogan, 2016). In light of these findings, increasing teacher engagement—in each domain and overall—with learning opportunities may be one way to improve professional development outcomes. Emotional and cognitive engagement were not directly measured in the present study and therefore will not be explicitly emphasized.

Organizational level. The extant literature also highlights organizational factors affecting the impact of professional learning. Extensive research on various types of professional development has identified the school leader as a strong influence on the success of school change efforts (Desimone & Garet, 2015; Goldsmith, 2001; Ippolito, 2010; Obara, 2010; Poglinco et al., 2003), playing an influential role in teacher motivation to engage in initiatives and uptake promoted practices (Desimone & Garet, 2015). Empirical research has demonstrated that principals' belief in and support of an initiative is directly related to teachers' participation in coaching activities, as well as their uptake of suggested pedagogy (Matsumara, Garnier, & Resnick, 2010; Wanless, Patton, Rimm-Kaufman, & Deutsch, 2013). Administrator involvement with coaching

initiatives may also moderate success: research findings indicate that coaching may be more effective in schools where principals engage directly with coaching programming (Desimone & Garet, 2015; Matsumara, Sartoris, Bickel, & Garnier, 2009). The importance of the principal-coach relationship is also clear (Obara, 2010; Poglinco et al. 2003)—coach effectiveness may be determined, at least in part, by the amount and type of support school leaders offer the coach (Poglinco et al., 2003).

School leaders may also facilitate or impede professional learning initiatives through determining school structures and cultivating school culture around instructional improvement. To build capacity for effective professional learning, school leaders can ensure the development of the school structures necessary to facilitate investment in improvement efforts, including common planning time (Goldsmith, 2001). In addition, administrators are largely responsible for fostering culture around instructional improvement (Goldsmith, 2001). Specifically, school cultures characterized by openness, improvement, and trust among staff and administrators seem key to promoting teacher investment in professional development (Bryk & Schneider, 2003; Kraft & Papay, 2014; Matsumara et al., 2010; Wanless et al., 2013). Research findings further indicate that teachers working in more supportive professional environments improve their effectiveness more over time than teachers working in less supportive contexts (Kraft & Papay, 2014). The potential success of coaching programs may, too, hinge on the presence of conditions necessary for all professional learning (Lofthouse, Leat, Towler, Hallet, & Cummings, 2010).

In addition to school leaders, teacher peers are also key to fostering school culture around improvement. Collaboration among teachers is essential to effective professional

development (Garet et al., 2001; Desimone, 2009; Desimone & Garet, 2015): it can lead to instructional improvement by helping teachers to tailor new learning and skills to their unique classroom settings, developing a shared investment in experimentation and progress, and sustaining reform (Coburn, Russell, Kaufman, & Stein, 2012; Garet et al. 2001; Joyce & Showers, 2002; Matsumara et al., 2010; Obara, 2010). Experimental studies of peer effects have extended this work by demonstrating a positive relationship between teacher collaboration and improvements in student performance (Goddard, Goddard & Tschannen-Moran, 2007; Little, 1982; Vescio, Ross, & Adams, 2008). And additional studies have highlighted mechanisms that might explain such peer effects, including norms of interaction and effort, increased motivation, and transfer of knowledge between peers (Jackson & Bruegmann, 2009; Little, 1982; Sun, Loeb & Grissom, 2015; Papay, Taylor, Tyler, & Laski, 2016).

The present study

Although the extant literature provides evidence of an association between individual and organizational factors on the success of professional learning opportunities, in the field of early childhood education there is limited empirical work exploring how such factors influence teacher engagement with professional learning opportunities. Specifically, a critical extension of the above-outlined investigations would be to examine how practitioners conceptualize the impact of individual (e.g., educational level, teaching experience, beliefs about teaching and learning, time) and organizational factors (e.g., school leaders, structures, culture, peers) on their behavioral engagement with coaching initiatives. Therefore, the principal question guiding this research is: What do early childhood educators understand as the factors that impact their behavioral

engagement with instructional coaching initiatives, specifically attendance at coaching sessions, interactions with the coach in and beyond coaching sessions, and application of promoted practices?

Methods

Site and Sample

This research occurred across four urban sites in the northeast United States with 28 early childhood practitioners (ECPs) and their four associated instructional coaches. In all sites, ECPs were working in settings where instructional coaching was available, although the nature and intensity of this coaching varied: coaching cycles ranged in duration from eight weeks to the full academic year, and, within observation and feedback cycles, coaches met with teachers both one-on-one and in pairs or groups of teachers. For more detailed information on coaching sites, formats, and objectives, as well as on participants, please refer to Table 1.

Participating ECPs' teaching experience ranged from five to 36 years, with an average of approximately 15 years. Of the 28 participants, 11 described their current position as preschool or pre-kindergarten teacher, 11 as preschool inclusion teacher or special educator, and five as kindergarten teacher. Participants possessed varying levels of education, ranging from no high school diploma to a master's degree. Most post-secondary degrees were in or related to early childhood, and, at the time of the study, all of the teachers were certified in early childhood education. All but two of the participants identified as female; 21 identified as White, three identified as Latinx, one identified as Black, and three identified as multiracial. ECPs opted into instructional coaching for a variety of reasons, including (but not limited to) seeking to improve personal practice and

Table 1. Participating Early Childhood Practitioner Coaching Data

Site; Coaching Type	District	Participant	Grade Level	Coaching Duration	Frequency	Observation & Feedback Cycles Completed
1: Single, in-house instructional coach; teacher-identified goal	A	Abigail	K	2 months	Weekly	8
		Ariel	K	2 months	Weekly	8
2: Coach assigned by district; support in grade level expectations, prescribed curriculum	B	Betty	PK, K	Full year	Monthly	10
		Audrey	K	5 months	Monthly	5
		Bobbi	K	Full year	Monthly	10
		Briana	K	Full year	Monthly	10
3: Two district-level coaches; teacher-identified goal, derived from classroom quality instrument	C	Caitlyn**	PS	8–10 weeks	Weekly	27
		Carmela**	PS	8–10 weeks	Weekly	27
		Bella**	PS, PK	8–10 weeks	Weekly	18
		Amanda**	PS	8–10 weeks	Weekly	9
		Beth*	PK	8–10 weeks	Weekly	18
		Bianca*	PK	8–10 weeks	Weekly	18
		Caroline*	PS	8–10 weeks	Weekly	27
		Brenda	PS	8–10 weeks	Weekly	18
		Bridget**	PS	8–10 weeks	Weekly	18
		Arlene**	PS, PK	8–10 weeks	Weekly	9
4: Single state-assigned coach; teacher-identified, inclusion and/or literacy goals	A	Ana	PK	Full year	Monthly	5***
		Ariana	PK	Full year	Monthly	8
	D	Amy	PS, PK	Full year	Monthly	9
	E	Alice	PK	Full year	Monthly	3
		Adele	PK	Full year	Monthly	2
		Addison	PK	Full year	Monthly	2
	F	Autumn	PK	Full year	Monthly	9
		Aidan	PK	Full year	Monthly	6***
		Ali	PS	Full year	Monthly	8
		Ashley	PS	Full year	Monthly	6***
	G	Austen	PK	Full year	Monthly	3
		Aria	PS	Full year	Monthly	3

* coach in-house
** community childcare center
*** opted out of additional coaching

better serve current students, a lack of other instructional supports, and being privy to peers' positive experiences with initiatives. Of those ECPs interviewed, about half volunteered for or sought out coaching opportunities; about a tenth were automatically offered coaching because of their grade level and/or prescribed curriculum, and readily accepted; the remainder's supervisors promoted initiation of instructional coaching by facilitating meetings with teachers, or asking teachers to participate in the opportunity.

Four out of the five coach participants were employed by the school districts that they served; the remaining coach, who is the principal investigator of the current study, was employed as a contractor to state education agencies. The five coaches each possessed a master's degree and had a range of educational experience, from six to 33 years, with an average of 21 years. Of the five coaches, three described their current position as instructional coach, one as literacy coach and reading specialist, and one as program developer in early childhood; all had at least one year of experience in their current role.

Data Collection and Analysis

I conducted interviews with teacher and coach participants at the first three sites; a trained research assistant conducted interviews with teachers at my own site. Data were collected in early 2018 through single, approximately one-hour interviews with each participant. These semi-structured interviews collected first baseline and demographic information about participants. Interview questions then elicited information about participants' experiences with professional learning generally, as well as with instructional coaching specifically. To answer the research question, the interview was guided by a series of questions about participant perceptions of the factors impacting

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teacher behavioral engagement with instructional coaching initiatives in three dimensions: attending instructional coaching sessions; interacting with the coach in and beyond coaching sessions; and applying practices promoted in instructional coaching. See online appendix for interview guide and protocol.

I present data related to ECP behavioral engagement with instructional coaching. Specifically, I report the duration of instructional coaching programming (defined by how long a coaching initiative lasted, from outset to completion); the frequency with which teachers were observed by their instructional coaches and met to formally receive feedback during initiatives; and the total number of observation and feedback cycles teachers completed. Of note is the wide variability of the number of observation and feedback cycles that teachers experienced, ranging from three to twenty-seven. This variability appears to be driven both by differences in the intensity of instructional coaching between programs, as well as the number of times teachers opted into instructional coaching. Therefore, because the sample experienced varying levels of engagement with instructional coaching, through these interviews I was able to capture the factors they perceived as related to such variability on teacher engagement.

In pursuit of a derived etic approach to data analysis (Berry, 1999), I considered the data both in light of the findings from qualitative and quantitative research on instructional coaching, as well as themes about how and why ECPs engaged with instructional coaching. To answer my research questions, I took an interpretivist approach, seeking to understand how participants perceived teacher engagement with instructional coaching initiatives, as reported by the early childhood educators, themselves, and their coaches (Charmaz, 2000, 2006).

Each interview was audio-recorded and then professionally transcribed. I then systematically employed techniques proposed by Boyatzis (1998) to analyze the interview data. I began with inductive development of codes by reading interview transcripts and summarizing data in the margins and in memos, paying particular attention to moments related to teacher engagement with instructional coaching. After reducing the raw information, I identified recurring patterns and themes related to teachers' engagement with instructional coaching. As a result of this phase, eight categories were created for coding all interview data (i.e., standardized professional development; initial involvement in instructional coaching[10]; working with the coach; sticking with instructional coaching; uptake of practices; influences on instructional coaching; ideal coach; ideal professional development). In addition, 30 sub-codes were created to provide additional granularity to the initial codes. For example, under the category of "uptake of practices," sub-codes "motivation to," "implementation," and "seeing changes in practice, students" were added for specification. For the next stage of coding, an outside researcher with relevant doctoral-level methodological and content-area expertise was trained in the coding scheme, joining the primary investigator in coding twenty percent of the interview data. Disagreements in coding were analyzed and resolved, and the coding scheme adjusted to ensure greater clarity. An 80% interrater agreement was achieved. In the final stage of coding, the researcher employed NVivo, a qualitative data analysis software program, to perform systematic line-by-line coding for all interview data with the finalized coding scheme.

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[10] While initiation of the instructional coaching relationship was one focus of the interview, results were aligned to the themes presented for engagement and uptake.

The aim of the current study is to investigate factors impacting teachers' varying behavioral engagement with instructional coaching initiatives. As Fredricks and colleagues (2004) note, however, all three components of engagement—behavioral, emotional, and cognitive—are dynamically interrelated. Therefore, when I observe aspects of emotional and cognitive engagement in the data, I will also note them.

Results

This study explored what early childhood practitioners understand as the factors affecting their engagement with instructional coaching initiatives. Specifically, this investigation sought to understand the ways in which and reasons why ECPs engage behaviorally with the coach. The findings from this inquiry indicate that participating early educators name factors at both the individual and organizational levels that can impede and facilitate the extent of their engagement.

Individual Level

Interactions with the coaching in and beyond coaching sessions. ECPs reported three factors that influenced the extent of their engagement in coaching sessions and cycles: clarity on the coaching role, fear of judgment and openness to change, and ability to focus.

Clarity on coaching. Even after having enrolled in instructional coaching initiatives, some teachers noted that they lacked information on what exactly they had signed up for, and with whom. This, in turn, impacted their engagement with the instructional coach and program, in two dimensions. First, some teachers expressed confusion regarding what coaching was, exactly, and how it might work. This, teachers

remarked, negatively affected their engagement with their assigned coach, and, in at least one case, resulted in unsuccessful coaching. One teacher noted:

> I felt like she was there for me, but I didn't know how to use her. And maybe part of that was, it really wasn't clear what her role was. [The coaching relationship] was warm and I liked the idea of [coaching], but I didn't know what to do with it. (Ashley)[11]

Similarly, another teacher added, "At first it wasn't super engaging because [my co-teacher] and I were kind of like, we don't understand what's going on, who this lady is, or what we're doing here?" (Amanda) Coaches confirmed that they, too, noted several instances in which participants lacked an "understanding of how coaching could improve their practice" (Diana). This, they speculated, suppressed teacher engagement in coaching cycles. For example, one coach noted, "When I first connected with [one teacher], she wasn't very responsive because I think she…didn't know what this [coaching] was about" (Darcey).

Second, participants noted that it was often not made clear who the instructional coach was, relative to school administration. In particular, coaches were aware that their role in schools is "weird—you're not quite a teacher but you're not an administrator. So it's a weird—it's a blurry line maybe" (Diana). Related to this question of "'Who are you?'" (Deborah) was the underlying concern that coaches "know it all and they're here just to tell you what to do" (Briana). One teacher expressed the worry of many: "I felt like [the coaches] were just going to kind of come in and just kind of overhaul things.

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[11] All names are pseudonyms. Names beginning with "A," "B," and "C" denote teachers who completed between 0–9, 10–19, and 20–29 coaching cycles, respectively. Names beginning with "D" denote coaches.

Like they were just going to, you know, make it the way that it 'should be'" (Caitlyn).

Coaches, themselves, were aware of teachers' trepidation around top-down control and potential loss of agency: "I don't know that always it is an assumption on the part of the teacher that this is an opportunity to grow and learn. [The assumption is] that you're there to tell them what to do" (Darcey). Knowing this, coaches described making an essential effort to convince teachers that "I'm your peer, not your supervisor…. So I'm an ally" (Deborah). Such preliminary negative reactions to instructional coaches are also related to a lack of emotional engagement on the part of some teachers. Therefore, for both teachers and coaches in the sample, building positive rapport was key to understanding the coaching role, overcoming initial apprehensions, and facilitating behavioral participation in the instructional coaching relationship.

Fear of judgment and openness to change. Apart from understanding the coaching role, the extent to which teachers engaged with the work of instructional coaching was moderated by their willingness to be coached. Integral to this "willingness" was the extent to which each of the ECPs in the sample opted into their instructional coaching programs. As noted in the Methods section, about half of participating teachers volunteered for coaching opportunities; about a tenth were offered and accepted grade level- or curriculum-specific coaching; the remainder had supervisors who promoted and facilitated participation in instructional coaching. These varying levels of voluntary-ness may have impacted teacher willingness to be coached, exhibited as what ECPs and coaches described as fear of judgment and resistance to change. One teacher described anxiety prior to an observation and feedback session:

I was nervous. I was like, I like feedback, but I was like, is it going to be too

much, like constructive feedback and either going to be like too much where I'm

like, I feel like I'm doing everything wrong? Um, am I like, have I been teaching

this wrong the whole year? So definitely, I was totally nervous.... I mean I was

totally scared about being judged about my teaching. (Abigail)

This fear could, at times, translate into teachers performing for coaches during

observations, as opposed to allowing their classrooms to be seen: "Sometimes when, you

know, someone is watching, you tend to, at least I do, tend to try to be absolutely perfect,

which doesn't give an accurate description of your daily teaching" (Alice).

Beyond such fears, some ECPs in the sample were also skeptical of the need to

change. Teachers described—and coaches confirmed—instances in which they were

"very stuck in their ways and very comfortable and sure in their ways" (Danielle) and

therefore made little progress during coaching cycles. One teacher explained herself as

such:

Just the fact that I was set in my ways. I know I'm still a new teacher, but

sometimes you're like, this works, why do I want to change it if it works? So just

that nervousness of changing things when it wasn't necessarily needed to be

changed. (Caroline)

Furthermore, coaches identified lacking motivation for change as systemic to certain

work environments: "'Why should I do this? I get paid crap. You know, like you want me

to do this work or you want me to change? I'm doing this kind of work and I'm okay.

Like what's my incentive to change? What I'm doing is working fine, we're NAEYC

accredited, QRS1, the kids are happy'" (Deborah). This apparent lack of willingness to be

coached can be characterized as low emotional and cognitive engagement, and precluded about a quarter of teachers from fully investing the effort necessary to complete coaching tasks, understand and master promoted skills, and therefore reap the potential benefits of the initiative.

Conversely, ECPs described being motivated by the positive feedback offered by the coach. Teachers illustrated the ways in which such validation of pedagogy inspired them to engage in instructional coaching. Several teachers noted that the coach offered "validation and suggestions to continue on the path" (Addison). For example, one teacher commented:

> So [the coach] was able to really validate that practice [of integrating whole body movement] for me, that really stuck out in my mind, a light bulb kind of switched on and I said, so I can do more movement and I should be doing more movement because that's something, that proprioceptive movement, helps them solidify concepts, whatever they are, into their brain. And she made me relax about that.... And not only that, she tells my principal and the principal sees so much value in there that it reinforces that, too.... I think it's like this trickling connection and it just dominoes. (Bobbi)

Moments such as those described above only served to increase teachers' emotional and behavioral engagement with the work of instructional coaching.

Ability to focus. In addition, allocating time to engage in coaching sessions could be burdensome, particularly because of demanding schedules and responsibilities. This was true for physically meeting with the coach, as well as reviewing materials and

feedback provided between observations. One teacher described her exhaustion at the end of a school day, prior to meeting with her coach:

> Sometimes at the end of the day I'm tired and I'm like, ugh, I don't want to have a meeting. So there's that. I'm like, okay, we have to talk about it or you know, it was a crazy day and you're like, oh man, I don't have any more brain power (Beth)

Many others described resource and feedback review as sometimes "falling by the wayside" (Aria) due to not having "a ton of time to spend looking at that stuff, unfortunately" (Amy).

Some teachers also identified distractions that diverted their focus from the instructional coaching relationship, both inside and outside the school. For at least one teacher, distractions in her personal life impeded full engagement with coaching; for several others, classroom-based challenges were the culprit. For example, one teacher described distractions that absorbed him during coaching sessions:

> It was the general timing and distractions of the nature of what was happening that made it hard for me. And I told her, yeah, I'm sorry, I'm not focused on what you're saying because I've got a lot of things going on....Having a lot of behavioral challenges in the classroom. And I think also managing time, managing the new curriculum, managing figuring out like what kindergarten kids can do as a new teacher, juggling all those expectations. (Bobbi)

Not only did responsibilities and distractions influence ECPs' behavioral participation in coaching, but they also impacted the extent to which teachers were able to cognitively

invest the thought and effort necessary to master material promoted in coaching initiatives.

Application of promoted practices. Participating teachers' implementation of pedagogical suggestions offered by the instructional coach was impacted by how appropriate and realistic such suggestions were for the classroom and the time that teachers were able to put into such practices.

Appropriate and realistic suggestions. ECPs emphasized that, in order to adopt a promoted practice, they must first view it as appropriate for their student population. In fact, a large proportion of teachers described moments in which they perceived a misalignment between the recommendations of the coach and ability levels of their students. One teacher found the rigor of proposed practices to be beyond the scope of preschool capabilities: "I mean, I think some of them were a little over the head. I think that sometimes the concepts were a little over the head of a preschooler" (Autumn). Similarly, another teacher perceived the coach as overestimating early childhood skill levels:

> I also feel the, she thinks that our children are older, like sometimes I'd wish that, the way she talks, a lot of times I catch myself thinking, but our children cannot do that. I dunno because she's used to older children, you know, she thinks that they just can write whatever or read whatever. (Arlene)

Coaches noticed such difficulties, as well. Specifically, coaches described multiple instances in which teachers declined to implement endorsed practices, citing lack of appropriateness:

The teacher that was disengaged was in an integrated classroom. Some typically developing kids and some kids on IEPs and, "Yeah, I can't do that. That's not gonna work for these kids." And then you're just, "Well, how can we make it work?" And they're just like, "Yeah it's not going to work." (Deborah)

ECPs also reported that they decided to implement coach suggestions based on whether they deemed them as feasible to implement in their classrooms. While they appreciated the feedback and resources provided by instructional coaches, teachers did lament that some suggestions were more "ideal" than practical:

One thing that I think it's important to note is a lot of the things that [our coach] and us two spoke about doing is ideal. We want to do it, but finding the time in our schedule, it's kind of like impossible. Like [the coach] would mention like important things like slowly, like with each kid, like try this and it's kind of like, yeah, like I want to sit down with each kid, but it's unrealistic. So maybe I'll just add, like making a note that like, yes, we understand the um, we understand the importance of one on one and going slow and labeling and taking our time, but it's not realistic. (Amanda)

Issues of perceived feasibility may have precluded teachers from even attempting to apply some or all coach-endorsed best practices.

Actionable steps. It logically follows, then, that when asked about the factors positively affecting their uptake of practices promoted through instructional coaching, teachers consistently noted that they were more prone to implement those that were readily actionable. Practitioners celebrated "tangible goals that we can meet within that week" (Caitlyn), as well as receiving "specific suggestions that I clearly could put in

place, doable things, and, you know, that's always uplifting to see something that you can put in action" (Addison). Relatedly, coaches asserted that they strove to present recommendations in this manner, due to their observation that "if we really talk about specific things, people are willing to try" (Darcey). In addition, teachers in the sample found that coach scaffolding aided and motivated their implementation:

> I feel like with lecture style PD, you know, you might hear like 10 good things but only one really sticks and hopefully you can like bring that back and remember to bring it back. And not because you don't want to, but you get back in the room and it's like you're bombarded with all this other stuff and you kind of, it's hard to keep up with it. But I think the coaching, there's more accountability maybe, right. So they're here, which is good because you have to sort of stay focused, and you can get more hands-on help and you can ask questions and if it doesn't work the first time or you don't understand something, it's just more of a back and forth as opposed to just like, do this, do this, do this. (Beth)

Overall, coaches hoped that such purposeful scaffolding would help teachers to build toward more comprehensive changes, over time: "And so if I can make smaller changes, if I can help teachers to make smaller changes, or focus on one little thing at a time, then hopefully they're building over time" (Diana).

Seeing changes in students and practice. ECPs noted that the changes they saw in their classrooms and students as a result of coaching encouraged them to continue to adopt promoted practices. One teacher illustrated a moment in coaching that opened her eyes to her practice:

I said to the coach, what was your opinion or your thought process when this child was drawing? And I said, who knew that I was judging this kid for scribbling? I shouldn't have been. So that's exciting to learn that all these years I'm saying, "Stay in the line" and they're on a swing.... So that was really encouraging and it helped me to say like, I'm gonna do this. (Bella)

Such changes in practice also translated into changes in student performance. In turn, these improvements motivated teachers to stick with coaching and to implement new practices:

I think the evidence of the change [encouraged me to implement practices], like seeing it, like her modeling was helpful and then her having me try it and see the, like the change, like seeing the immediate shifts in the way that [my students] were behaving and acting and doing. (Audrey)

Coaches, too, witnessed moments in which observable improvements in student performance translated into shifts in teacher practice and mindset:

I feel like in the beginning sessions with her, she was just kind of like yessing me and then always making excuses for why certain things wouldn't happen. Well, you know, my kids can't…So that was, that was challenging, and eventually I did end up going to do a modeling of storytelling in there, which, you know, she did some translating in it, but I never saw her children as vivacious as I saw them when I took a story and when I told them a story and when we acted it out, they like came alive on the stage, and she saw it too, and there was no denying it that something special was happening. And so since then she's tried to incorporate like little tidbits of storytelling. (Darcey)

These positive responses to improvements in personal and student practice highlight the role of emotional engagement in increasing ECP willingness to participate in coaching initiatives.

Lack of time. Almost all teachers in the sample noted the pressures of time on their ability to implement practices. For example, one teacher said that she did not have adequate time to prepare materials for implementation, due to her other school duties:

> Time. Time, time, time. Trying to make the materials probably is the biggest issue was time to make the materials. My calendar is like meeting, meeting, out, half day. You know, all of my IEP meetings happen most of the time during my prep time, so I lose a lot of my preps some days because of IEP meetings. (Bobbi)

Another teacher, representing the opinion of almost all teachers in the sample, noted that she might be able to reach full implementation, if she only had more time:

> Just sort of, you know, balancing curriculum planning with all the paperwork and the meetings. And I just think that we always want more time. And there's so much we would do if we had the time, but it doesn't always happen. (Briana)

Furthermore, teachers in the sample asserted that, among all of their other obligations, the tasks and preparation associated with coaching might increase their workload and lengthen the workday: "…trying new things, making my life harder doing all this documentation, it's 4:30 and I'm still sitting here typing everything up, getting it ready so it can be seen by children, by parents, by supervisors, by myself" (Caroline). In all instances, teachers were required to put in extra time to implement what had been suggested by the coach. It is important to note, though, that participating early educators

appeared to be split on whether this was merely an inconvenience or an actual obstacle to implementation.

Organizational Level

Interactions with the coaching in and beyond coaching sessions. Administrator support of instructional coaching, as well as the extent to which school structures and schedules allowed for teachers and coaches to make time for coaching, influenced the extent to which ECPs engaged in the instructional coaching sessions and cycles.

Administrator support. ECPs and their coaches observed that administrator support for instructional coaching impacts teacher engagement with programming. Administrators must first allow teachers to participate in instructional coaching, and their subsequent orientation toward the coaching relationship can dictate teacher engagement in the partnership. For example, administrators can show their support for instructional coaching initiatives through buying materials necessary for making the changes suggested by the coach. One teacher described the utility of administrator support in implementing coach suggestions:

> I think [our director] has done a nice job with just supporting what [the coaches have] been asking us to do.... Like buying materials for us and helping us get what we need, you know, so the classroom can reflect what we want to do.... Like everything that we ran by her has been like "Yes, of course." (Caitlyn)

Coaches in the sample noted being aware of the effect of administrator buy-in on ease of coaching. In at least one school, teachers illustrated how coaches promoted such buy-in:

> Coaches are always grabbing administrators, "Look what they're doing, look how great this is, come check it out." So they want the administrators to see the great

work that we're all doing and showing it off, how great everything is going.

(Caroline)

Administrator investment in coaching enables teacher participation in instructional coaching initiatives and sets the tone for ECP emotional engagement with change.

Structures and scheduling. Within the sample, the extent to which formal structures were in place to facilitate the coaching model impacted teacher engagement with coaching. Although similar to teachers' individual ability to focus on instructional coaching, structures and scheduling defined and bound by school and district administration had an additional impact on teacher engagement with instructional coaching. About a third of teachers expressed appreciation for the implementation of common planning time and its positive impact on participation in coaching: "Our school system implemented common planning time last year, so we meet once a week now for like 40 minutes. [Teachers] are covered, which is great.... Prior to that, that would have been really difficult." (Aidan). On the other hand, another large group of teachers noted that there is often no formal time allocated for instructional coaching, and so coaches are "asking teachers to give up their lunches, to give up their planning and developing time, their P&D times, sometimes before school, sometimes after school, depending on what's going on with them" (Darcey). And coaches recognized the burden of such requests: "Teachers are so pressed for time that to ask them to give up more than an hour of their prep time or more than an hour before or after school is tough" (Diana).

In some cases, particularly at community childcare centers, teachers were forced to meet during rest time – while still monitoring children. This was distracting for both teachers and coaches. A teacher described such a scene:

We would [meet] during nap time and not all the children sleep. So it's like sometimes my mind would be like, "Let me take care of this child real quick." So I feel like sometimes I'll like miss something while I'm like tending to them and then doing the coaching…. Like it would've been nice if we had like a meeting…outside [of the classroom], not really worrying about them. I would be able to pay attention a little bit better. (Bridget)

Coaches were well aware of this conundrum: "We met during rest time, but [the teachers] were really cognizant of the fact that they weren't as focused as they could have been if we weren't meeting in the classroom" (Danielle). It seems, then, that improvement of school-level structures to allow for teacher professional learning might plausibly have positive impacts on teacher behavioral and cognitive engagement with instructional coaching.

Beyond a lack of structures conducive to coaching, teachers were often unable to prioritize instructional coaching among their myriad obligations. Coaches, in particular, mentioned that instructional coaching is always competing with teachers' and coaches' other commitments. Not only are there frequent interruptions, but teachers are often tacitly asked to choose other duties over coaching. As one coach described, "I feel like teachers are always pulled into conferences, almost randomly, like so-and-so's parents showed up and [the interpreter] is here to translate, can you meet? So teachers are trying to do the right thing by meeting with parents" (Diana). These sort of tensions can make it difficult for teachers to fully engage with a coaching cycle, particularly since "it's really hard to make up [lost] time" (Deborah).

In addition to obstacles with teachers' schedules, coaches are also pressed for time. On the one hand, coaches may be spread thin over their caseloads within and across schools, making it difficult to schedule visits and sit-down meetings. Furthermore, although—in theory—coaches should be focused on instructional coaching duties, they are regularly called upon for fill-in support, depending on the needs of the school during the coaching cycle. This, in turn, can make finding time to meet with coachees more difficult. One teacher described such a situation:

> Finding time to meet with her is tricky. I don't feel like she's always available, but it is because, you know, with the [state testing] and everything, she was totally like, thrown into like different parts around the school, so that's kind of tricky. (Abigail)

These pieces of evidence raise the question whether engagement with instructional coaching might be fuller were there formal time dedicated to the work of coaching.

Application of promoted practices. Participating teachers' implementation of pedagogical suggestions offered by the instructional coach was impacted by collaborating with peers also engaged in instructional coaching, and the time that they were able to dedicate to application. Furthermore, lack of continued support at the school level made maintenance of such practices difficult.

Collaborating with peers. Participation of peers in instructional coaching may influence a teacher's decision to take up the pedagogical recommendations promoted by the coach. In particular, ECPs noted that it is "affirming" (Betty) to see strategies suggested by the coach in other teachers' classrooms. In addition, if a teacher had been

unsure whether to implement a strategy or technique, knowing that someone else was trying it out could be motivating:

>So I think that seeing the practices that we have taught, but like something that I might not necessarily be doing and I go to another colleague's classroom. I hear that they're doing something that I didn't try yet that makes me want to try it. (Audrey)

ECPs also valued being able to discuss suggested strategies and practices with peers who were also being coached, whether they are working in a teaching team teaching, in the same grade level, or school. This also extends to having a network of teachers with whom they can talk about how coaching is going; in particular, they might discuss how implementation of certain practices is going: "So it was nice to hear from different viewpoints and different people say, well I tried this, I tried this.... [The other teachers being coached and I] frequently get together and talk about what's working, what's not working" (Alice). Another teacher described similar collaboration:

>Well my colleagues … have talked about some of those things and you know, how they're having different pieces of it or how they use it in their classroom. And I think that's been very helpful because we, the three of us [had the same coaching] and we all learned something different and we were all in the same place. But it was, I don't know, something resonated with us more than others.... That I found very helpful. (Adele)

Such collaboration highlights the impact of peers on cultivating ECP emotional engagement with coaching by way of increasing willingness to experiment, which could

translate into increased uptake of promoted practices among those teachers engaged in instructional coaching.

Lack of continued support. ECPs noted that, after having completed a coaching cycle, maintaining full implementation of promoted practices was difficult. In particular, teachers noted that, without the continued presence of the coach they were tasked with "figuring out how to keep up the momentum of it" (Beth). One teacher described a common feeling of a loss of a sense of security when left to her own devices:

> Yeah, I think that my math center learning with [my coach] was really good when she was here and was really robust and I have kind of like lost the support on my end for it. It's still something I struggle with and I feel like without the support I was not as strong in creating more and robust opportunities for my children to engage. (Brenda)

In some instances, teachers felt that it was not simply the absence of the coach that impacted implementation, but also the loss of increased human resources in the classroom:

> Sometimes it's harder when I find the coach is here and we're doing the change and she's here to help support me, but then when she leaves I'm like, how am I going to be able to do this when you're not here? I'm changing my math center. I was able to do a lot more when she was sitting at the table supporting the six kids that, yes, they all loved it, but I might be with two or three and then you have a kid tapping you and she was able kind of steer them away or help them or engage them, but now she's not here. I'm like, I want her back. That support that she was

able to show the kids and myself and I'm like, how are you able to do four

children at once? I can't do that yet. (Caroline)

In interviews, coaches also noted regression in teacher practice post-coaching—

and an associated frustration felt as a side effect of the backslide. One coach described

her experience:

No, I mean, you know, it can be really frustrating job. The most frustrating part is

when you, for example, when you work with a teacher who you had a really

successful coaching cycle that the teacher did it almost like a [180] in their

practice and then you go in the second year for another coaching cycle to work on

a different area of literacy and something that you already had in place is already

gone. (Deborah)

These realities raise the question of the extent to which practices are sustainable, and how

coaching programming can be adapted, and school-level systems put into place, to

promote sustainability.

Discussion and Conclusions

Evidence suggests that instructional quality in early childhood education is a

strong predictor of children's school-readiness and subsequent achievement, but little is

known about how teacher engagement with instructional coaching opportunities can be

successful in influencing teaching quality, and, in turn, learning in early childhood.

Therefore, in this paper I draw upon semi-structured interviews to examine what early

childhood educators understand as the factors that impact their behavioral engagement

with coaching sessions and maintenance of the coaching relationship, as well as their

uptake of promoted practices. The findings from this inquiry indicate that participating

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ECPs name factors at both the individual and organizational levels that can either impede or facilitate the extent of their engagement with instructional coaching.

At the individual level, ECP understanding of who the coach is and what instructional coaching might entail impacted teacher engagement in coaching sessions. In addition, affective factors, such as fear of judgment, resistance to change, and the mental space to focus on the work of coaching, also moderated such engagement. When it came to applying practices promoted by the instructional coach, ECPs were deterred by their lack of time and perceptions of how appropriate and/or realistic the suggestions were for their students and for themselves, as teachers, despite coach expertise and skill. On the other hand, ECPs were motivated to adopt practices when recommendations were actionable and scaffolded; furthermore, ECPs expressed feeling inspired by the changes they saw in their own practice, as well as in their students.

At the organizational level, structures and scheduling both impeded and facilitated ECP engagement with instructional coaching sessions; those teachers who perceived their schools as providing organized time for meetings and common planning were able to participate with ease, while their counterparts were required to multitask or utilize their personal time to do so. Relatedly, both tacit and explicit principal support impacted ECPs' ability to fully engage. The largest school-level influence on uptake of promoted practices appeared to be peers who were also involved in instructional coaching: positive teacher-to-teacher "peer effects" stimulated additional application. Interestingly, though, ECPs struggled to maintain applied practices with fidelity after the conclusion of coaching cycles.

The above-outlined findings highlight several compelling themes that both align with and extend the extant literature. At the individual level, ECPs suggested that pedagogical suggestions were most actionable when they were small enough to be digestible, such that they could be realistically implemented between coaching sessions. For example, coaches might suggest a change in the layout of a math center, and then support the teacher in reformatting prior to the next math lesson. Although, to the best of my knowledge, experimental research has not been conducted on the efficacy of incremental change in teacher education, it has been identified as a potentially valuable approach to increasing pedagogical efficacy. Theorists have encouraged replacing large, sweeping overhauls with smaller, critical changes that can be applied with relative ease for incremental improvement (Star, 2016). An approach to instructional modification that is characterized by realistic and manageable suggestions that enhance current instruction may increase the likelihood of application (Star, 2016). These changes must also be accompanied by proper scaffolding, or what Janssen, Westbroek, and van Driel (2014) call a "stepwise progression from teachers' existing practices to a realization of the innovative teaching approach" (p. 88). By balancing rigor with perceived appropriateness and digestibility, coaches may be able to encourage behavioral engagement with reform by facilitating teachers' cognitive engagement. Specifically, ECPs may be more likely to participate in pedagogical experimentation for improvement if the amount of effort and thought needed to master promoted skills is perceived as manageable. This, in turn, may subsequently result in more consistent and lasting change.

At the organizational level, teacher participation in instructional coaching and uptake of practices appear to be driven, in part, by school culture. Research has identified

school cultures characterized by openness, improvement, and trust among staff and administrators as key to promoting teacher investment in professional development (Bryk & Schneider, 2003; Kraft & Papay, 2014; Matsumara et al., 2010; Wanless et al., 2013). Importantly, such school cultures around professional learning opportunities are often established by school leaders. Specifically, research suggests a positive relationship between administrator belief in and support of professional learning and teacher perception of and participation in instructional coaching activities (Matsumara et al., 2010). Furthermore, implementation is directly related to principals' belief in and support of an initiative (Wanless et al., 2013). The findings of the current study add nuance to this understanding by highlighting ways in which administrators' stances toward instructional coaching can be evidenced. In their approval of such programming, school leaders facilitate ECPs' emotional engagement with coaching initiatives. Evidence of leader support of initiatives may be demonstrated in the degree to which instructional coaching is present and utilized at the school and organizational structures that facilitate coaching are established (i.e., formal time for both teachers and coaches). According to the results of this study, such factors are critical to stimulating teachers' cognitive investment in professional learning opportunities, as well as their ability to behaviorally engage with programming.

While administrators may establish foundational school culture around professional learning, this study underscores the importance of teachers' peers in the vigor of that culture. There is a robust body of literature confirming peer effects: several studies have demonstrated a positive relationship between teacher collaboration and improvements in student performance (Goddard et al., 2007; Little, 1982; Vescio et al.,

2008). And other studies have uncovered mechanisms related to improvement, including norms of interaction and effort, increased motivation, and transfer of knowledge between peers (Jackson & Bruegmann, 2009; Little, 1982; Sun et al., 2015; Papay et al., 2016). The current study did not aim to directly explore teacher peer effects; rather, it probed potential influences on ECP engagement with instructional coaching initiatives. Thus it is even more striking to find that peers served as a substantial school-level influence on uptake of promoted practices, namely in that peers fostered emotional engagement—and therefore willingness—to participate in instructional coaching initiatives and the work of reform. This, in turn, may signal the influence of peers in increasing emotional and behavioral engagement with professional learning, and in heightening norms of improvement at the school level.

Limitations

The analyses and associated results presented above have clear limitations. A limitation of this work is that the conclusions drawn from this study represent the unique settings and participants in the research sites, and therefore should be applied to other contexts with caution. In addition, although I was able to examine ECP engagement with instructional coaching opportunities, I did not observe the opt-in process; it is possible that these practices were characteristically different from one another at each site and from others in early childhood education, overall. Moreover, the extent to which ECPs were able to volunteer to participate in instructional coaching initiatives may have varied between the selected sites. Even so, the findings from this study warrant consideration, as the sample experienced variability in exposure to instructional coaching, thus allowing me to capture and comment on ECPs' diverse levels of engagement with coaching

initiatives. In addition, in interviews, participants were able to talk fluently about their reasons for participation, and instructional coach perceptions of ECP participation presented a useful complement for triangulating teacher claims.

Conclusions

The results of this study suggest that instructional coaching approach, school culture and structure, and teacher peers are critical factors in determining ECPs' engagement with instructional coaching. Future practice and research may explore the efficacy of incremental change for pedagogical quality improvement, as well as the role of school environment in shaping the impact of professional learning programming. Specifically, we may need to examine the structure and culture of early childhood educational settings to better understand how to create the conditions necessary for optimal outcomes. This may be particularly pressing because the early childhood teacher population have education and certification levels markedly below those of primary and secondary school teachers (Lemoine, 2008; Whitebook, 2014); often do not participate in pre-service or continuing education, instead relying on professional development offerings for learning opportunities (Whitebook, 2014); and, are offered significantly lower levels of compensation than K–12 teachers (Feistritzer, 2011). These realities highlight the value of additional inquiry into the extent to which the structure and culture of the work setting facilitate or preclude ECP engagement in professional learning, especially within coaching contexts. The results of continued studies investigating these mechanisms will be critical to advancing professional learning experiences that improve teaching quality in early childhood settings.

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Conclusion

This collection of studies is among the few attempts to identify the mechanisms through which common professional development strategies, particularly instructional coaching, can be successful in influencing teaching quality, and, in turn, learning in early childhood. To my knowledge, it is the only study to date that seeks to understand why, how, and how much early childhood practitioners engage with instructional coaching initiatives using both qualitative and quantitative approaches. As such, results from these two studies have the potential to inform ongoing teacher improvement efforts in several ways.

Both studies offer new practical insight into factors related to teacher engagement with instructional coaching initiatives. The results of my quantitative analyses offer deepened understanding of how and why practitioners may self-select to receive varying amounts of instructional coaching. Specifically, these findings highlight the influence of teachers' baseline emotionally supportive interactions with students, as well as the poverty levels of the students with whom they work, on receipt of instructional coaching. Because it is difficult to standardize the amount of instructional coaching that teachers receive, understanding the factors that motivate or preclude teachers from participation is critical for targeting those most in need of individualized mentoring support.

In addition to providing insight into the factors predicting teachers' differential participation in instructional coaching, this study also highlights a potential mechanism for sustaining engagement with programming. Results from my qualitative interview study indicate that incremental change to instructional improvement may be key to engaging teachers in the process of advancing pedagogy in early childhood settings.

Specifically, findings suggest that pedagogical suggestions are most actionable for teachers when they are small enough to be digestible, such that they would be realistic to implement between coaching sessions. For example, coaches might suggest a change in the layout of a math center, and then support the teacher in reformatting prior to the next math lesson. Although this idea has received some theoretical backing, its efficacy has not been tested in the realm of instructional coaching, to date. Therefore, continued efforts to explore these incremental approaches to change, as compared to more standard approaches, and to gather data on their impact on teacher engagement—and teacher and student outcomes—would be important for the field of professional learning.

Beyond practical suggestions, these two investigations also offer theoretical contributions regarding the concept of engagement to the field of professional learning. Practically speaking, dosage of professional learning and teacher engagement with initiatives may speak to similar concepts. As noted in my Introduction, both studies currently presented rely on a three-component construct of engagement: behavioral, emotional, and cognitive (Fredricks, Blumenfeld, & Paris, 2004). Although my qualitative work directly explores the underlying reasons for teacher behavioral engagement, much of the dosage seen in the quantitative study can be conceptualized as evidence of teachers' behavioral engagement with the instructional coaching initiative, as well. Furthermore, it is also possible that the extent to which teachers engaged with instructional coaching programming in both studies is also a function of their emotional and cognitive engagement: theorists posit that these three components are dynamically interrelated (Fredericks et al., 2004). Therefore, (re)conceptualizing dosage as

engagement may open up pathways for continued qualitative, quantitative, and mixed methods research.

Finally, this thesis also raises theoretical questions about the role of teacher engagement in determining the impact of instructional coaching initiatives. My qualitative work demonstrates that teacher engagement with professional learning opportunities is essential to sustained interaction and uptake of promoted practices. However, it does not provide evidence that what teachers perceive as "engaging" in professional learning aligns with research-based conceptions of "high quality," or impactful, professional development. In other words, are professional learning opportunities that are engaging for teachers characterized by the features that have been deemed "high quality" in the literature, and are such opportunities related to exceptional teacher and student outcomes? Exploratory research on the connections between teacher engagement and the measured quality of professional development could thus help to optimize professional learning.

Enhancing the quality of early childhood classrooms and instruction is paramount to ensuring superior experiences for young children in their first years of schooling, as well as their long-term success. Professional learning opportunities can be a key contributor to improvement efforts, particularly for early childhood practitioners whose position is distinct from their K–12 counterparts. Empirical contributions to our understanding of how to optimize professional development for this population is a critical first step in increasing the efficacy of early childhood education, overall.

Appendix

Teacher Interview Protocol

Interviewer's Role
Thanks for taking the time to talk with me. We are interested in understanding your experiences with professional learning, particularly instructional coaching. Specifically, we are looking to understand the ways in which you and other teachers engage with coaching initiatives in three ways, including being able to attend the component parts of the PD, how you engaged with the coach in and beyond coaching sessions, and the extent to which you were able to apply practices promoted in PD to your classroom and teaching.

Address confidentiality
These interviews are confidential. Nothing you say will be shared with any staff or other teachers. The only information we will report and focus on is when the same idea or opinion is shared another interviewee. Your name will never be in a report.

Audiotaping
I would like to audiotape our conversation if you'll permit it, so I can focus on the conversation rather than transcribe it while you're talking, and so I don't make mistakes when I am interpreting it. The recording is not shared with anyone beyond our research team. Would this be ok?

If we get to the end of the interview and there's something we haven't covered that you think is important, please let me know and we'll have time to talk about it then.

GO-TO PROMPTS:
- *Tell me more about that.*
- *What do you mean by…*
- *Why…?*

Part 1: Demographic Survey	
Topics & Annotation	Guiding questions
Interviewer will ask the interviewee to fill out a demographic survey for data purposes.	First I would just like to get a little bit of information about your professional background so we can understand the different teachers in the program. This survey **(see below)** is confidential. Nothing you say will be shared with any staff or other teachers. The purpose of this survey is to get information about early childhood teachers.

Part 2: General teaching experience/trajectory	
Topics & Annotation	Guiding questions
Interviewer and Interviewee will introduce themselves to one another. *I want to know about the interviewee's professional life and build rapport; I will start off with asking general questions about their current work and career path.*	[Interviewer introduces him/herself and his/her role]. First, I would love to learn a little bit about you. You just filled out our demographic survey, but it would be great to hear a bit from you about your current role, as well as what lead you to this role. *Prompts (as needed):* − How would you describe your current role? − How long have you been in this role? − What position(s) did you hold before this? − How long have you been in early childhood education?

Part 3: Experience with professional learning	
Topics & Annotation	Guiding questions
I want to know about the interviewee's experiences with professional learning, I also want to explore how different PD experiences compare, particularly relative to instructional coaching opportunities.	*Past experience with professional learning/instructional coaching* Tell me about your past experiences with professional development programs. - How did you become involved with each program (i.e., What was the impetus)? - What were the components of the different PD programs? - Describe what meetings looked like and how often they occurred. Tell me about your experiences with instructional coaching. How were these programs different from your past professional development experiences, if it was different?

	Current instructional coaching program
	– How did you get involved with the program? Why?
	– Who helped/suggested you get involved?
	– What considerations did you make for your involvement in the program? Were there particular reasons for or barriers to your involvement? What made enrolling seem worthwhile?
	Ideal PD components
	What components of each would you want to experience again in future?

Part 4: Engagement—Showing up	
Topics & Annotation	Guiding questions
I want to know about the teachers' literal ability to show up to instructional coaching sessions, and the factors that facilitated and/or precluded them from attending. This will help me to answer my first research regarding engagement my targeting one kind of engagement.	We know that carving out time in your day to participate in professional development programs can be really difficult. Knowing this, I'd like to learn about how much of the program you were able to participate in and why.
	Participation frequency with IC
	– Tell me about the components of this instructional coaching?
	– Were you able to attend all instructional coaching sessions/parts? Why or why not?
	o What prevented you from attending?
	Participation frequency relative to other PD
	– How does this participation compare to other PD opportunities you've had in the past?
	– What factors do you consider when you're deciding to sign up for and/or attend a PD session?
	– Have you ever signed up for a PD session and not been able to go? Why?

	After/between sessions
	Were you able to review and/or use any of the resources that were offered in or after coaching sessions, or meetings between sessions? Why or why not? − How much time did were you able to dedicate to their use?

Part 5: Engagement—Participating in sessions	
Topics & Annotation	Guiding questions
Having established the frequency of teachers' participation in the component parts of the initiative, I now want to explore how cognitively engaged, or present, teachers were during sessions and throughout the program. This will help me to gather data about another dimension of engagement, but will also help to learn about how the teacher-coach relationship might have impacted engagement.	*Being present in sessions* Tell me about a session or coaching meeting in which you were really interested and/or participated in a lot. − What made you interested in the session? − What encouraged you to participate? Now tell me about a session or coaching meeting in which you were NOT interested or didn't participate a lot. − What made you uninterested in the session? − What made it difficult to participate?
I also want to know more about the different roles that coaches might play in the instructional coaching relationship, and how these roles relate to teacher engagement.	*Checklist* I am now going to show you a checklist of roles that instructional coaches often fill. Which of the following activities would you want your coach to engage in? Which would be most motivating for you? Please check all that apply. *[Allow participant to complete in Appendix].* Tell me about the items you checked and why. Tell me now about the items you did NOT check and why. Anything you'd like to add to the checklist?

	Relationship with the coach What was it like working with your instructional coach? Have you ever had a mentoring relationship—formal or informal—with another teacher or with a supervisor? – If so, how did this compare to the instructional coaching relationship? From your experience with instructional coaching, what kinds of practices should get implemented into coaching programs to make them go (more) smoothly?

Part 6: Engagement—Uptake of promoted practices

Topics & Annotation	Guiding questions
I want to know about the uptake of practices promoted in the instructional coaching. Specifically, to what extent did teachers integrate suggested new practices and resources, who helped them to do so, and what elements of the instructional coaching relationship promoted the implementation of novel practices. This will largely help to answer the second research question.	*General uptake* Were any of the resources and strategies discussed in the program useful to you? *Relationships & uptake* Can you identify a novel practice that you implemented as a result of this instructional coaching relationship? – What encouraged you to implement this practice? – How did implementation of the practice go? – Is there anything else that you integrated into your practice because of this coaching relationship? – Is there something that you learned through coaching that you wish you could have tried (or will in the future)? o What were some of the barriers to implementation? Tell me about how other people (in or outside of the school) influenced your use of the resources and strategies.

Part 7: Wrap up	
Topics & Annotation	Guiding questions
Interviewer will conclude the interview and ask for additional comments and/or questions.	That's all I wanted to ask you about today. Is there anything you would like to add that we haven't talked about? Thank you very much for your time.

Instructional Coaching Checklist

☐ Designing and providing presentations to the school staff about instruction
☐ Leading teacher study groups
☐ Modeling instruction in and outside of the classroom
☐ Observing instruction and providing constructive feedback to teachers
☐ Summarizing student data for the school
☐ Managing the details of curriculum, including buying and organizing materials
☐ Helping to group students into instructional groups
☐ Ensuring that teachers implement curricula and assessments with fidelity

Coach Interview Protocol

Interviewer's Role

Thanks for taking the time to talk with me. I am interested in understanding your experiences as an instructional coach of early childhood teachers. Specifically, I am looking to understand the ways in which you see teachers engage with coaching initiatives in three ways, including being able to attend the component parts of the PD, how they engaged with you, the coach, in and beyond coaching sessions, and the extent to which they were able to apply practices promoted in PD to their classrooms and teaching.

Address confidentiality

These interviews are confidential. Nothing you say will be shared with any staff or other teachers. The only information we will report and focus on is when the same idea or opinion is shared another interviewee. Your name will never be in a report.

Audiotaping

I would like to audiotape our conversation if you'll permit it, so I can focus on the conversation rather than transcribe it while you're talking, and so I don't make mistakes when I am interpreting it. The recording is not shared with anyone beyond our research team. Would this be ok?

If we get to the end of the interview and there's something we haven't covered that you think is important, please let me know and we'll have time to talk about it then.

GO-TO PROMPTS:
- *Tell me more about that.*
- *What do you mean by…*
- *Why…?*

Part 1: Demographic Survey	
Topics & Annotation	Guiding questions
Interviewer will ask the interviewee to fill out a demographic survey for data purposes.	First I would just like to get a little bit of information about your professional background so we can understand the different teachers in the program. This survey **(see below)** is confidential. Nothing you say will be shared with any staff or other teachers. The purpose of this survey is to get information about instructional coaches of early childhood teachers.

Part 2: General teaching experience/trajectory	
Topics & Annotation	Guiding questions
Interviewer and Interviewee will introduce themselves to one another. *I want to know about the interviewee's professional life and build rapport; I will start off with asking general questions about her current work and career path.*	[Interviewer introduces him/herself and his/her role]. First, I would love to learn a little bit about you. You just filled out our demographic survey, but it would be great to hear a bit from you about your current role, as well as what lead you to this role. *Prompts (as needed):* – How would you describe your current role? – How long have you been in this role? – What position(s) did you hold before this? – How long have you been in early childhood education?

Part 3: Experience as a mentor/instructional coach	
Topics & Annotation	Guiding questions

I want to know about the interviewee's experiences with professional learning, I also want to explore how different PD experiences compare, particularly relative to instructional coaching opportunities.	*Past experience with instructional coaching*
	Tell me about your past experiences as an instructional coach.
	  - How did you become involved with each program (i.e., What was the impetus)?
	  - What were the components of the different programs?
	  - Describe what meetings looked like and how often they occurred.
	Current instructional coaching program
	– How did you get involved with the program? Why?
	– How does this instructional coaching role compare to past roles that

	you've held, either as an instructional coach, or as a(n) in/formal mentor?

Part 4: Engagement—Logistics	
Topics & Annotation	Guiding questions

I want to know about how coaches view the teachers' literal ability to show up to instructional coaching sessions, and the factors that facilitated and/or precluded them from attending. This will help me to answer my first research regarding engagement my targeting one kind of engagement.	*Components of the IC*
	– Tell me about the components of this instructional coaching initiative?
	– How did you (or your supervisor) decide what to include in this programming? Were there certain considerations?
	IC logistics and frequency
	– How do you typically schedule meetings with teachers?
	    o How easy is it to do so?
	– What factors do you consider when you are scheduling instructional coaching sessions with teachers?
	    o What are the typical barriers/challenges to scheduling?
	– How often do you meet with teachers and for how long?
	    o Do you find that you typically have enough time to debrief/cover the topic of interest?
	– Do teachers ever cancel or not show up? Why?
	    o Do any other reasons come to mind?

Part 5: Engagement—Participating in sessions	
Topics & Annotation	Guiding questions
Having established the frequency of teachers' participation in the component parts of the initiative, I now want to explore how cognitively engaged, or present, teachers were during sessions	*Being present in sessions* Do you find that teachers are engaged during instructional coaching sessions? How do you know?

and throughout the program. This will help me to gather data about another dimension of engagement, but will also help to learn about how the teacher-coach relationship might have impacted engagement.	– When teachers are disengaged, do you know what keeps them from being fully engaged? 　　○ Do any other reasons come to mind? Tell me about a session or coaching meeting in which you knew that the teacher was really interested. – What made her interested in the session? – What encouraged her to participate? Now tell me about a session or coaching meeting in which you knew that the teacher was really uninterested. – What made her uninterested in the session? – What made it difficult for her to participate? *Relationship with the teachers* What is it like working with teachers as an instructional coach? Have you ever been a mentor or supervisor—formal or informal—to another teacher? – If so, how did this compare to the instructional coaching relationship? From your experience with instructional coaching, what kinds of practices should get implemented into coaching programs to make them go (more) smoothly?

Part 6: Engagement—Uptake of promoted practices	
Topics & Annotation	Guiding questions
I want to know about the uptake of practices promoted in the instructional coaching. Specifically, to what extent did teachers integrate suggested new practices and resources, who helped them to do so, and what elements of the instructional coaching relationship promoted the implementation of novel practices.	*After/between sessions* Are teachers able to review and/or use any of the resources that are offered in or after coaching sessions, or meetings between sessions? Why or why not? – Do any other reasons come to mind? *Relationships & uptake* To what extent do teachers try out new practices as a result of coaching?

	Can you identify a novel practice that you have seen implemented in a classroom as a result of coaching? – What encouraged implementation of this practice? – How did implementation of the practice go? Are there times when teachers want to implement new practices suggested in coaching but don't? – What were some of the barriers to implementation? o Do any other reasons come to mind? Tell me about how you see other people (in or outside of the school) influencing teacher use of the resources and strategies.

Part 7: Wrap up	
Topics & Annotation	Guiding questions
Interviewer will conclude the interview and ask for additional comments and/or questions.	That's all I wanted to ask you about today. Is there anything you would like to add that we haven't talked about? Thank you very much for your time.

Demographic Survey

Name: _____   _____
                              (first)   (last)

1. **Please list your current position**:
   _____

2. **Including this year, how many years have you been in your current position?**
   _____

3. **Including this year, how many years have you been working with children professionally?** _____

4. **What is the highest level of education you have completed?**

   ❑ Less than high school diploma

   ❑ GED

   ❑ High school diploma

   ❑ Some undergraduate (no degree)
      Please specify:

   _____

   ❑ Associate's degree

   ❑ Bachelor's degree

   ❑ Master's degree

   ❑ Doctorate degree

   ❑ Some graduate (no degree)
      Please specify:

   _____

   ❑ Other:

   _____

5. **Do you hold a degree in early childhood education?**

   ❑ Yes   ❑ No   ❑ Currently working on a degree in early childhood education

   Do you hold a degree in a field related to early childhood education (for example, elementary education, special education, human development, sociology, or psychology)?

   ❑ Yes   ❑ No   ❑ Currently working on a degree in a related field

   Do you have a teaching license? If so, what is it?
   _____

6. Which category best describes your race?

- ☐ American Indian or Alaska Native
- ☐ Black or African American
- ☐ Native Hawaiian, Pacific Islander
- ☐ Multi-Race Please Specify: _____
- ☐ Asian
- ☐ Hispanic, Latino/a, or Spanish
- ☐ White
- ☐ Other: _____

What is your primary language?

☐ English   ☐ Spanish   ☐ Other: _____

What languages do you speak fluently? (Check all that apply.)

☐ English   ☐ Spanish   ☐ Other: _____

What is your place of birth? _____