UNDERSTANDING AND PROMOTING EFFECTIVE TEACHER-CHILD INTERACTIONS IN PRESCHOOL: BRIDGING RESEARCH, PRACTICE, AND POLICY

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APPROVAL OF THE DISSERTATION

This dissertation, ("Understanding and Promoting Effective Teacher-Child Interactions in Preschool: Bridging Research, Practice, and Policy"), has been approved by the Graduate Faculty of the Curry School of Education and Human Development in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Expanding opportunities for young children to attend preschool programs has been a priority for policymakers in recent years. Preschool programs are intended to provide children, particularly those from low-income families, with foundational knowledge, skills, and behaviors that will set them up for success in kindergarten and beyond (Phillips et al., 2017). Indeed, recent evaluations of large-scale programs often find evidence for these intended benefits (Phillips et al., 2017). Children who attend high-quality programs show bumps to their foundational social and academic skills prior to formal school entry (Barnett et al., 2018; Weiland & Yoshikawa, 2013), as well as to medium- and long-term educational outcomes, including reduced special education placement and grade retention and increased high school graduation (McCoy et al., 2017). While these findings are promising, not all evaluations have found such positive benefits (Lipsey, Farran, & Durkin, 2018), indicating that there is still much to be learned about the specific quality conditions necessary to yield positive outcomes for children and, perhaps more daunting, how to achieve those conditions at scale (Weiland, 2016).

Children's exposure to adults who provide consistent, responsive, and intellectually-stimulating learning experiences is a key ingredient of effective preschool programs (Hamre, 2014). The daily interactions between teachers and children are the most proximal social processes through which preschool programs enhance children's learning and development (Bronfenbrenner & Morris, 2006). Teacher-child interactions, or process quality (Farran, 2017; Pianta, Downer, & Hamre, 2016), are consistently linked to children's positive social, emotional, and academic outcomes, more so than structural features of the classroom such as teacher-child ratios or the provision of certain

educational materials such as books and toys (Burchinal, 2017). Given that effective teacher-child interactions are a key ingredient of effective preschool programs, ensuring that all teachers provide these types of interactions, regardless of children's socioeconomic background or prior skill levels, is critical (Rhodes & Huston, 2012). Realizing this goal requires building a deep understanding of factors linked to high-quality interactions and using that knowledge to enhance quality through practice and policy interventions.

Understanding and Promoting Effective Teacher-Child Interactions: Bridging Research, Practice, and Policy

For research to be useful for improving educational outcomes, it must be relevant for and used by practitioners and policymakers (National Research Council, 2012). The shortcoming of research in this regard is increasingly recognized as a challenge worth addressing. For example, a joint subcommittee from the Institute of Education Sciences (IES) and the National Science Foundation (NSF) issued a report that describes a "pipeline of evidence," noting that research takes many forms, and no one form is sufficient for the task of bringing science to bear on educational outcomes (IES and NSF, 2013). This pipeline begins with basic research that produces foundational knowledge that enhances our understanding of a given construct or the relations between constructs (i.e., research). Basic research informs applied research which centers on designing and testing the effectiveness of interventions to improve specific behaviors and outcomes (i.e., practice). Applied research then informs which interventions and strategies should be disseminated broadly, leading to scale-up research that evaluates their implementation and efficacy in real-world contexts (i.e., policy). Research at each of these levels plays a

unique role in the cycle of producing and using evidence to advance educational outcomes. The three papers in this dissertation illustrate this research, practice, policy continuum around understanding and promoting effective teacher-child interactions in preschool classrooms.

Starting with basic research on teacher-child interactions. A robust theoretical and empirical research base indicates that the quality of teacher-child interactions is one of the most important classroom factors for shaping children's learning and development (Brock & Curby, 2014; Hamre, Hatfield, Pianta, & Jamil, 2014; Howes et al., 2008; Yoshikawa et al., 2013). Effective teacher-child interactions in preschool classrooms are responsive to children's social and academic needs, engage children to think deeply about age-appropriate concepts, use advanced language, and are delivered in a warm and respectful tone (Hamre, 2014). Children who are exposed to such high-quality teacher-child interactions show more favorable learning gains, with some evidence suggesting that interaction quality must reach a minimum bar for children to reap the benefits (Burchinal, Vandergrift, Pianta, & Mashburn, 2010).

Given this robust knowledge base, a logical next step is to understand the relations between the quality of teacher-child interactions and various contextual factors. Much research has pursued this line of inquiry, particularly the contribution of teacher qualifications, including formal education and years of experience, to interaction quality. What we have learned from these studies is that teacher qualifications are generally weak proxies of high-quality classroom interactions. In one seminal study that used seven large datasets, neither teachers' highest level of education nor majoring in early childhood was consistently related to classroom process quality or children's academic outcomes (Early

et al., 2007). A more recent study found similar results, with the exception that teachers with a BA degree showed higher global classroom quality and teacher-child interactions compared to teachers with a high school diploma or GED (Lin & Magnuson, 2018). Among preschool teachers, years of experience is likewise inconsistently linked to the quality of teacher-child interactions (Connor, Son, Hindman, & Morrison, 2005; Pianta, Whittaker, Vitiello, Ansari, & Ruzek, 2018). Although the group of children comprising the classroom is a central characteristic of the environment, surprisingly little research has examined child factors – or their intersection with teacher qualifications – in relation to the quality of teacher-child interactions.

The first paper in my dissertation (Examining the role of preschool classrooms' behavioral composition as a predictor of the quality of teacher-child interactions) is a basic research study that aimed to understand how child and teacher characteristics jointly contribute to the quality of teacher-child interactions in the classroom. In this study, we examined the links between classroom behavioral composition (i.e., child disruptive behaviors aggregated to the classroom level) and the quality of teachers' emotional, organizational, and instructional interactions. Furthermore, we asked whether teachers' education, specifically degree attainment and area of study, and years of experience enhance teachers' ability to provide high-quality teacher-child interactions when teaching in classrooms with high levels of disruptive behaviors. Findings indicated that when teachers perceived extreme levels of disruptive behaviors in the classroom, they showed declines in the quality of their classroom organization and instructional support throughout the year. Holding a bachelor's degree emerged as a potential protective factor for teachers' emotional support but more years of experience appeared

to exacerbate the challenges of teaching in behaviorally challenging classrooms, although both interactions were marginally significant. When thinking about basic research informing applied work, this study underscores the need to design and test interventions that support teachers to handle disruptive behaviors, to ensure that they are able to maintain high-quality learning environments for children.

Building from basic research to conduct applied research on enhancing teachers' practice. Prevention and implementation science involve the application of basic research toward the design and evaluation of interventions to prevent or promote targeted behaviors. While basic research describes a phenomena or problem, applied research is concerned with testing theories of change – both understanding whether an intervention was effective in impacting change and how and for whom such change occurred. Interventions in early childhood have been shown to improve teacher-child interactions and reduce children's disruptive behaviors (Hemmeter, Snyder, Fox, & Algina, 2016; Sutherland et al., 2018; Webster-Stratton, Reid, & Stoolmiller, 2008; Williford et al., 2017), however, the field is still unpacking the underlying processes of change. We cannot expect successful scale-up of interventions deemed effective in tightly controlled randomized control trials to broader applications without understanding these underlying processes and necessary conditions of implementation (Hulleman & Cordray, 2009; Layzer, 2013).

Teacher consultation is a common component of interventions designed to improve teachers' practice and children's development (Mattera, Lloyd, Fishman, & Bangser, 2013; Reinke, Stormont, Herman, & Newcomer, 2014; Snyder, Hemmeter, & Fox, 2015). Consultation typically involves regularly occurring meetings between a

consultant and a teacher to support the teacher's implementation of a set of evidence-based practices. Implementation research is often centered on understanding the links between fidelity to evidence-based practices and a set of outcomes, thus the role of teacher consultation for contributing to implementation and outcomes is not well understood (Pas, Bradshaw, & Cash, 2014).

The second paper of my dissertation (Implementing *Banking Time* with teachers and preschoolers displaying disruptive behaviors: Links between consultant-teacher alliance, implementation fidelity, and dyadic teacher-child interactions) is an applied research study that investigated the role of two dimensions of the consultant-teacher alliance (the quality of the relationship between the consultant and teacher and teachers' investment in the consultation) for shaping the quality of dyadic teacher-child interactions. We examined the extent to which these dimensions of consultant-teacher alliance operated directly to influence dyadic interactions and indirectly through teachers' fidelity of implementation. Findings indicated that when consultants perceived having a close relationship with teachers and that teachers were invested in the consultation, teachers were observed to interact more positively with children. Contrary to our hypothesis, there was no evidence to suggest that this process operated indirectly via implementation fidelity. These findings indicated that the affective nature of teacher consultation, specifically relationship quality and investment, may be an important process by which consultation operates to support teachers' practice. This study is one example of applied research unpacking implementation of an evidence-based intervention to inform efforts to successfully bring such interventions to scale.

Translating basic and applied research into policy interventions at scale. The culmination of evidence from basic and applied research indicates that policies that intervene only upon structural quality, such as teacher qualifications, are unlikely to move the needle on improving practice, but interventions that directly target teaching practices can successfully improve process quality. Implementation science provides insight into how successful interventions can be most effectively scaled up to optimize their impact. Furthermore, partnerships between researchers and practitioners are becoming a popular mechanism for translating basic and applied research into policy interventions at scale (Coburn & Penuel, 2016; Conaway, Keesler, & Schwartz, 2015).

Professional development (PD) is increasingly recognized as a policy lever for equipping preschool teachers to provide high-quality experiences that will ultimately impact children's early learning (Connors, 2016; Connors, 2019; Knapp, 2003). Recent meta-analyses of PD interventions for early childhood educators have shown positive effects on teacher-child interactions and, to a lesser extent, children's outcomes (Egert, Fukkinnk, & Eckhardt, 2018; Markussen-Brown et al., 2017; Werner, Linting, Vermeer, & Van IJzendoorn, 2016). However, these research-based models do not represent the typical PD experiences of most preschool teachers (Cox, Hollingsworth, & Buysse, 2015), and research does not offer clear guidance on how leaders can improve the quality of PD at scale. Without such guidance, state and school district leaders are left with inadequate options for using research to inform PD selections for preschool teachers (Hamre & Hatfield, 2012).

The third paper of my dissertation (Implementing a PD Consultation process in a state preschool program: Describing the process and findings from a research practice

partnership) addressed this research to practice gap for providing preschool teachers with high-quality PD to improve the quality of teacher-child interactions. This paper described a PD measurement and feedback process implemented in Virginia's state preschool program. First, basic and applied research on effective PD was translated into a PD Rubric, which was used to systematically assess the quality of PD across 121 school divisions (Virginia's term for district, used hereafter). Next, school division leaders were supported to apply knowledge of their PD strengths and weaknesses, identified via the rubric, toward the selection and delivery of PD that research suggests is most likely to improve teacher-child interactions. Findings from this study generated a descriptive picture of "business as usual" PD. The greatest area of need across the state was providing PD that intentionally builds teachers' skills in the classroom. Furthermore, the study provided insight into a statewide implementation process in which research was translated for broad application to support school division leaders to implement key elements of effective PD for preschool teachers.

Significance

This dissertation contributes to the early childhood field by addressing pressing questions at each level of the research, practice, and policy continuum, to ultimately promote effective teacher-child interactions in preschool programs. In particular, study 1 illustrates basic research to understand factors related to teacher-child interactions in preschool classrooms, study 2 offers an example of applied research examining the implementation of one intervention to improve the quality of teacher-child interactions, and study 3 translates principles from basic and applied research into a process to provide

preschool teachers with high-quality PD aimed at enhancing teacher-child interactions at scale.

A critical challenge for the early childhood field is understanding which components of preschool programs are essential for achieving short- and long-term outcomes for children (Foundation for Child Development, 2020). The quality of teacher-child interactions is consistently identified as one of the most critical classroom features for promoting preschool children's school readiness, yet much work remains to improve the quality of interactions at scale. Only by engaging in the process of conducting rigorous and relevant research and bridging accumulated knowledge to practice and policies can we expect science to make meaningful contributions to advancements in early childhood education.

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Examining the role of preschool classrooms' behavioral composition as a predictor of the quality of teacher-child interactions

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Abstract

Research Findings: This study examined the relation between classroom behavioral composition and teacher-child interactions in preschool classrooms and the potential for teachers' experience, education level, and area of study to buffer against the challenges of teaching in classrooms with high levels of disruptive behaviors. Classroom behavioral composition was operationalized in two ways (classroom mean and classroom proportion of children at or above 90th percentile) using teacher reports of children's disruptive behaviors. Results indicated that the proportion of children at or above the 90th percentile was linked to a decline in the quality of teacher-child interactions in classroom organization and instructional support across the year. Marginally significant interaction effects suggested that holding a bachelor's degree may be a protective factor for teachers' emotional support quality at the beginning of the year, but more years of teaching experience seemed to worsen the negative effect of challenging classroom behavioral composition on the quality of emotional interactions over the course of the school year. *Practice or Policy:* The quality of preschool teachers' practice showed declines across the year when teachers perceived very disruptive behaviors in the classroom. The results of this study have implications for preservice training, teacher professional development, and quality rating and improvement systems focused on teacher-child interactions.

Keywords: Classroom Behavioral Composition, Disruptive Behaviors, Teacher-child Interactions, Preschool, Teacher qualifications

The extent to which children's experiences in preschool classrooms benefit their learning and development hinges in large part on the quality of the interactions in the classroom (Hamre, 2014; Mashburn et al., 2008). Teacher-child interactions that are warm and responsive to children's needs promote positive development across a range of domains including language, pre-academic skills, and social skills (Burchinal et al., 2008; Curby et al., 2009; Roorda, Koomen, Spilt, & Oort, 2011). In contrast, teacher-child interactions that are punitive or insensitive to children's needs put children at risk for maladaptive outcomes (Hamre & Pianta, 2001; Reinke, Herman, & Newcomer, 2016).

As the leader of the classroom, the teacher is primarily responsible for shaping classroom interactions, yet the teacher is only one part of these back-and-forth exchanges. Characteristics of children themselves also contribute to the classroom environment. However, most research examining factors that may influence the quality of classroom interactions has focused on characteristics of the teacher such as mental health (Jennings, 2015; Roberts, LoCasale-Crouch, Hamre, & DeCoster, 2016; Sandilos et al., 2015) and professional qualifications such as level of education and experience (Connor, Son, Hindman, & Morrison, 2005; Early et al., 2006, 2007; Lin & Magnuson, 2018). Much less research has focused on how compositional characteristics of the children in the classroom may play a role (Friedman-Krauss, Raver, Morris, & Jones, 2014), or how these may intersect with teachers' qualifications to support positive classroom interactions (Ansari & Pianta, 2018). This study aimed to understand the factors that promote positive teacher-child interactions in preschool classrooms by addressing the way in which children and adults together create classroom environments. In particular, teachers' perceptions of children's disruptive behaviors in the classroom and teachers'

professional qualifications, including their experience in the classroom, education level, and area of study, are considered.

An Ecological Perspective on Teacher-Child Interactions

The bioecological model of human development conceptualizes individuals as nested within their direct and indirect environments and emphasizes the role of proximal processes, or the ongoing interactions between individuals and their environments, in shaping human development (Bronfenbrenner & Morris, 2006). The classroom is a key environment in which children spend a significant amount of their time and, through the daily interactions with their peers and teacher, shapes children's learning and developmental outcomes. These interactions are reciprocal, or bidirectional, in nature, such that children not only receive input from their teacher, but also produce output that, in turn, informs the teacher's reaction to children. The current study is informed by the bioecological model, and in particular the dual role of children and teachers, as a basis for creating classroom environments characterized by high-quality teacher-child interactions.

Teacher-Child Interaction Quality

Significant investments are being made across the country to expand access to preschool driven by promising evidence of short- (Barnett et al., 2018; Weiland & Yoshikawa, 2013) and longer-term impacts for children (McCoy et al., 2017; Phillips, Gormley, & Anderson, 2016). As scale-up efforts continue, a key aim of researchers, practitioners, and policymakers is to ensure that the programs serving children are of high quality. While many features of preschool classrooms are important for children's experiences, the quality of teacher-child interactions is arguably the most central (Hamre, 2014). High-quality interactions across three domains of classroom processes (emotional,

organizational, and instructional) consistently show positive benefits for children's learning. Provision of warm, emotionally-supportive interactions supports children's social competence (Brock & Curby, 2014; Mashburn et al., 2008). Children who experience well-managed classrooms that set clear expectations for children's behavior show better self-regulation and fewer behavior problems (Broekhuizen, Mokrova, Burchinal, Garrett-Peters, & The Family Life Project Key Investigators, 2016; Hamre, Hatfield, Pianta, & Jamil, 2014; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). And interactions that scaffold children's higher-order thinking skills support academic achievement and language development (Carr, Mokrova, Vernon-Feagans, & Burchinal, 2019; Howes et al., 2008; Johnson, Markowitz, Hill, & Phillips, 2016; Mashburn et al., 2008).

Given the importance of teacher-child interactions, it is important to consider factors that may support (or inhibit) children's experiences of high-quality interactions over the course of the year. The overall quality of teacher-child interactions in preschool classrooms is typically moderate to low depending on the type of interaction (Justice, Mashburn, Hamre, & Pianta, 2008; LoCasale-Crouch et al., 2007), but significant variability in quality exists across teachers (Early et al., 2005; Hamre, 2014). Time of year may influence the quality of teacher-child interactions, but since there is limited evidence documenting the stability or change in interaction quality within teachers across a school year, it is difficult to hypothesize whether it would support or inhibit teachers' provision of high-quality interactions. On the one hand, interaction quality could improve over time as teachers get to know the children in their classrooms, set expectations, and delve into curricula that provide engaging and cognitively stimulating instructional

activities. However, time could also detract from high-quality interactions if teachers cannot build upon successes in the classroom but rather develop negative cycles of interactions that become difficult to break.

Reflecting both the importance of teacher-child interactions for ensuring high-quality preschool programs and the drive to hold preschool programs accountable for providing such quality, the CLASS tool is becoming more commonly used in state-wide quality rating and improvement systems (QRIS) (Vitiello, Bassok, Hamre, Player, & Williford, 2018). The CLASS tool is a framework for conceptualizing, observing, and measuring teacher-child interactions (Pianta, La Paro, & Hamre, 2008). It captures 10 dimensions of interaction quality, which are organized into three overarching domains: emotional support, classroom organization, and instructional support. Higher ratings of these content-general, classroom-wide interactions indicate higher quality classroom environments, and numerous studies indicate positive associations between higher CLASS scores and children's learning outcomes (e.g., Burchinal, Vernon-Feagans, Vitiello, Greenberg, & The Family Life Project Key Investigators, 2014; Mashburn et al., 2008).

In light of the evidence indicating that a sizeable proportion of preschool programs are of poor quality (Justice et al., 2008; LoCasale-Crouch et al., 2007) and the additional QRIS policy relevance for program improvement, understanding the factors that influence the quality of teacher-child interactions is paramount. The focus of this study is on one salient feature of preschool classrooms – the presence of disruptive behaviors.

Disruptive Behaviors in Preschool Classrooms

Managing children's disruptive behaviors is a stressful part of early childhood educators' jobs (Kaiser, Rogers, & Kasper, 1993; Quesenberry, Hemmeter, Ostrosky, & Hamann, 2014). Teachers report that the stress related to behavior management is one of the most disliked aspects of their job (Kontos & Stremmel, 1988), as well as low self-confidence in their ability to manage disruptive behaviors (Li Grining et al., 2010). Teachers of low-income children are more likely to experience disruptive behaviors in the classroom, as low socioeconomic status is a risk factor for developing behavior problems (Qi & Kaiser, 2003). With few supports related to disruptive behaviors (Wells, 2017) or limited uptake of such opportunities among preschool teachers, one outlet for handling misbehaviors has been suspension or expulsion from preschool programs (Zinsser, Zulauf, Das, & Silver, 2017). The national expulsion rate for preschoolers due to behavioral concerns is estimated to be nearly 7 children per 1,000 enrolled, a rate that is over three times as high as the national rate in K-12 settings (Gilliam, 2005).

Even if children who display disruptive behaviors remain in the classroom, they are not as likely to benefit from the learning environment to the same degree as students without behavioral concerns. Teachers issue more commands to children whom they perceive as demonstrating greater disruptive behaviors compared to those they perceive as demonstrating fewer problem behaviors (Dobbs & Arnold, 2009). And children who display disruptive behaviors are less likely to develop positive relationships with their teachers (Birch & Ladd, 1998; Doumen et al., 2008; Roorda, Verschueren, Vancraeyveldt, Craeyevelt, & Colpin, 2014) despite the positive buffering effects that such relationships can offer (Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008; Hamre & Pianta, 2005). Some research suggests that children's behaviors drive this

association, such that heightened disruptive behavior lead to more conflictual teacher-child relationships (Mejia & Hoglund, 2016).

The negative effects of disruptive behaviors extend beyond teacher-child relationships. The peer effects literature shows that peers' disruptive behaviors can undermine children's social-emotional development and academic outcomes. More exposure to peers' disruptive behaviors can lead to higher levels of aggressive behavior, particularly for children already exhibiting elevated levels of challenging behaviors (Hanish, Martin, Fabes, Leonard, & Herzog, 2005; Kellam, Ling, Merisca, Hendricks Brown, & Ialongo, 1998). Additionally, exposure to more severe problem behaviors in preschool classrooms (i.e., proportion of children in classroom who scored above the sample 75th percentile) is linked to greater internalizing behaviors in kindergarten (Yudron, Jones, & Raver, 2014). Interestingly, in terms of academic outcomes, studies that looked at the average or mean-level disruptive behavior in the classroom did not find significant associations with children's reading and math outcomes (Bulotsky-Shearer, Dominguez, & Bell, 2012; Georges, Brooks-Gunn, & Malone, 2012; Neidell & Waldfogel, 2010). However, disruptive behavior at the 75th and 90th percentiles led to decreases in kindergarten math scores (Neidell & Waldfogel, 2010). These discrepant findings suggest that the classroom mean of disruptive behaviors may be capturing a different quality of the classroom environment than the extent to which disruptive behaviors are more severe (e.g. falling at the 75th or 90th percentile), a point that is discussed in more detail in the following section.

The extent to which the presence of disruptive behaviors influences global teacher-child interactions in a classroom is an under-researched topic yet important to

understand in order to create environments that best support children's learning and development. The prosocial classroom model (Jennings & Greenberg, 2009) provides a useful framework for conceptualizing the role of behavioral challenges in the classroom for teachers' ability to engage in effective interactions with children. This model posits that teachers' ability to effectively manage children's behaviors, develop positive relationships with children, and ultimately provide a classroom experience supportive of children's learning is greatly influenced by teachers' own social-emotional competencies. Teacher stress can undermine these competencies, introducing a "burnout cascade" in which children's behaviors and teachers' responses to them continue to worsen in a repeated cycle over time. Given that teacher perceptions of disruptive behaviors are related to higher levels of teacher stress (Friedman-Krauss, Raver, Neuspiel, & Kinsel, 2014), classroom-level behavior problems may undermine the quality of global teacher-child interactions if teachers' stress prevents them from engaging in positive, responsive, and cognitively-stimulating interactions with all children in the classroom.

The only study to our knowledge that has explored the relation between classroom-level behavior problems and teacher-child interactions in preschool (Friedman-Krauss, Raver, Morris, et al., 2014) examined the relations between fall classroom-level behavior problems and the emotional climate of the classroom in the spring (controlling for fall) and tested whether this relation was mediated by teacher stress. Classroom-level behavior problems were operationalized as the classroom average of children's externalizing behaviors as reported by teachers, classroom emotional climate was assessed using the emotional support domain of the CLASS observational measure (Pianta et al., 2008), and teacher stress was self-reported. Results suggested that

classroom-level behavior problems significantly predicted higher job stress among teachers in the spring. Job stress significantly predicted spring classroom emotional climate, but this relation was characterized by an inverse-U shape. Specifically, low levels of stress and high levels of stress predicted poorer classroom emotional climates, while moderate levels of stress predicted more positive classroom emotional climates. Contrary to expectations, higher levels of classroom-level behavior problems significantly predicted higher classroom emotional climate in the spring, and teacher job stress was not found to mediate the relation between classroom-level behavioral problems and classroom emotional climate. The authors suggest that the unexpected findings may be due to a lack of variation in emotional climate across classrooms (with most classrooms scoring in mid-to-high range), the fact that only variance in spring classroom emotional climate not accounted for by fall emotional climate was being predicted, or classroom assignment processes in which higher-performing teachers were assigned children with greater behavioral challenges. The goal of the present study is to build upon the work of Friedman-Krauss, Raver, Morris, et al. (2014) to explore the relation between classroom behavioral composition and the quality of teacher-child interactions across three domains (emotional, organizational, and instructional), as well as teachers' professional qualifications that may moderate these associations.

Conceptualizing Classroom Behavioral Composition

Classroom behavioral composition is broadly defined as the compilation of behavioral characteristics of children comprising a classroom. It can be operationalized in multiple ways, according to particular properties of a classroom's distribution (Yudron et al., 2014). The classroom mean is the most commonly used approach for operationalizing

behavior problems at the classroom level and reflects the average level of behavior problems. Intuitively, it makes sense that the classroom mean is an important feature of the classroom environment to consider in the context of compositional studies, however, it is also important to recognize that the mean only provides one piece of information about the classroom environment. While relatively straightforward to calculate and interpret, classroom mean scores alone do not account for other properties of a classroom's distribution of scores, an omission that could lead one to draw misinformed conclusions about a specific research question related to classroom composition (Glewwe, 1997; Yudron et al., 2014). For example, the mean provides useful information about a classroom, as classrooms with higher means are likely more difficult to manage, but the mean may be driven by a few students with extreme disruptive behaviors or a majority of students with moderate-to-high disruptive behaviors. These two potential classroom environments present different challenges for teachers' classroom management skills. A teacher of a classroom with more students in the moderate-to-high range may be able to generally carry out daily tasks with some interruptions, while a teacher of a classroom with a few students displaying extreme challenges may be more hampered in her ability to execute instructional activities as planned due to time and attention being constantly devoted to more severe management issues. While these compositional metrics of a particular classroom are related to each other, each represents a distinct aspect of the environment that may contribute to teachers' and children's experiences in the classroom.

Moderating Role of Teacher Qualifications

Our primary interest in teachers' classroom experience, education level, and area

of study is to explore whether these professional qualifications matter for teachers' ability to handle behaviorally challenging classrooms. Although teachers' experience, education levels, and area of study are inconsistently linked to the quality of teacher-child interactions (Early et al., 2007; Lin & Magnuson, 2018; Pianta et al., 2005), these associations are not well-understood. Yet, teachers' qualifications continue to be a common policy lever for improving the quality of preschool programs (Friedman-Krauss et al., 2019). Therefore, it is important to better understand the role of these qualifications and in particular whether they may be important factors when considering the effect of teaching in more challenging environments on teacher-child interactions.

Most of the current literature reports on average associations between these qualifications and the quality of teacher-child interactions, but only looking at average associations could mask the potential benefits these qualifications may confer when faced with a difficult classroom context. Indeed, Ansari and Pianta (2018) found this to be the case for years of experience and education levels. In their study on the effects of classroom age diversity on teacher-child interactions, more years of experience and education buffered preschool teachers against the challenges of teaching in mix-aged classrooms. Only among teachers with fewer years of education did classroom age diversity predict worse instructional support, and only among teachers with fewer years of experience did classroom age diversity predict worse instructional and emotional support. We suspect that a similar rationale could apply to teachers' ability to handle more behaviorally challenging classrooms. Therefore, we will explore the moderating role of teachers' years of experience, bachelor's degree attainment, and area of study in the relation between classroom behavioral composition and teacher-child interactions.

To summarize, it is well-established that the quality of teacher-child interactions is important for promoting children's positive academic and social outcomes, yet disruptive behaviors may undermine the quality of teacher-child interactions. Research focused on the effects of disruptive behaviors in the classroom has mostly focused on children's social-emotional and academic outcomes, as well as dyadic teacher-child relationships. Much less work has examined the role of classroom-level disruptive behaviors on classroom-wide teacher-child interactions. Furthermore, while teacher experience, education, and area of study are generally not strong predictors of classroom quality, their contribution may be more evident when examining teaching contexts that present particular challenges to teachers (e.g., behaviorally challenging classrooms).

Present Study

The goal of this study is to advance our understanding of the relation between classroom behavioral composition and teacher-child interactions and the potential for teachers' qualifications to buffer against the challenges of teaching in classrooms with high levels of disruptive behaviors. The following research questions are addressed: (1) To what extent do different classroom behavioral composition factors (e.g., mean, proportion of children at or above the 90th percentile) predict teacher-child interactions at the beginning of the year and change in teacher-child interactions over the school year? Three types of teacher-child interactions (e.g., emotional, managerial, and instructional) will be considered, adding to the unique contribution of this paper. (2) Are teachers with more years of experience, a bachelor's degree, or early childhood major better able to provide high-quality teacher-child interactions amidst more behaviorally challenging classroom environments?

Regarding the first research question, we expect that initial teacher-child interactions and change in interactions over time will be worse in classrooms with higher mean levels of disruptive behavior and higher proportions of children at or above the 90th percentile, but we expect the 90th percentile threshold to be a stronger predictor than the classroom mean because this metric plausibly represents a classroom environment that is more likely to hamper teachers' ability to provide emotionally warm, productive, and academically-oriented interactions. Regarding the second research question, we expect that having more years of experience, bachelor's degree attainment, and majoring in early childhood will buffer against lower-quality teacher-child interactions in all domains, particularly in the case of preventing diminished quality in teacher-child interactions over the course of the year. Compared to instructional interactions, we suspect that teachers' emotional and organizational interactions may be more susceptible to the negative effects of challenging classroom behavioral composition, due to the strong conceptual alignment between these types of interactions and children's disruptive behaviors, and therefore have more to gain from the positive buffering effects that teachers' qualifications may offer under challenging behavioral contexts. However, differences across domains are exploratory.

Method

Participants

The current study used data that was collected as part of a randomized control trial (RCT) of the Banking Time intervention, a teacher-child, dyadic intervention aimed at improving preschool children's disruptive behaviors (see Williford et al., 2017 for a detailed description of the intervention and results). The larger RCT sample included 183

teachers, 173 classrooms, and 2,427 children. Due to various reasons, ten lead teachers turned-over during the course of the study and all were subsequently replaced by a different lead teacher. Thus, ten classrooms were linked to two lead teachers in the data. For the purposes of the present study, one teacher from each of these classrooms was dropped so that each classroom was associated with only one lead teacher. In all cases, we retained the teacher who completed the baseline ratings of children's disruptive behaviors (described in more detail below). An additional 13 classrooms and teachers were dropped from the original RCT sample due to non-participation in any study activity. The current study includes classrooms from three conditions tested in the impact study, as the intervention is not related to the current study's research questions and is unlikely to interact with the classroom processes being investigated in the present study. There were no significant differences between the intervention conditions on baseline program, teacher, or child demographic variables (see Williford et al., 2017 for more detailed information).

The final sample for the current study consists of a total of 2,427 children spread across 160 teachers and 90 preschool centers. Teachers were racially diverse, with 53% identifying as White, 41% identifying as Black/African American, and the remaining identifying as either multiracial (3%), Latino (1%), or Native American, Asian, or other (all less than 1%). Teachers were majority female (97%) and were on average 41 years old with 12 years of teaching experience. Sixty-seven percent of teachers held at least a bachelor's degree and 40% majored in early childhood. Children were also racially diverse, with 40% identifying as Black, 38% as White, 10% as Latino, 9% as multiracial, and a small percentage as Native American, Asian, or other. Children came from a broad

range of economic backgrounds but the majority were from low-income families. Children were 48% female and 4-years-old on average. Classrooms had a mix of funding sources, with 26% being federally-funded, 19% state-funded, and 55% privately-funded. The average class size was 15.17 children and ranged from 5 to 25. The average number of classrooms per center was 2.33 and ranged from 1 to 7.

Procedures

Preschool centers of various types (e.g., Head Start, public PreK, and privately funded) were recruited across three sites in two Mid-Atlantic states to participate in the Banking Time RCT. After the center directors approved of the study, lead teachers were invited to participate. Once teachers consented to participate, they completed a personal and classroom demographic survey. Parental consent was requested for all children in the classroom, with majority of parents (76%) consenting for their child participate in the study. Parents completed a short demographic survey. Six weeks into the school year, teachers rated all consented children in their classroom on two disruptive behavior rating scales, Attention-Deficit/Hyperactivity Disorder Rating Scale-IV (ADHDRS-IV; DuPaul, Power, Anastopoulos, & Reid, 1998) and Oppositional Defiant Disorder Rating Scale (ODDRS; Hommersen, Murray, Ohan, & Johnston, 2006). In the larger Banking Time RCT, only the two boys and one girl with the highest disruptive behavior ratings received the intervention (n = 470 children), however, the current study uses the behavior ratings from all children (n = 2,427) regardless of whether they were selected to receive the intervention.

Data collection. Data for this study were collected at two points during the year: baseline (October) and end of year (May). Teacher and child demographic data were

collected at baseline. Trained data collectors blind to intervention condition conducted classroom observations using the CLASS (Pianta et al., 2008) at baseline and end of year. At each time point, teachers were observed for approximately five observation cycles (*M* = 4.88, *SD* = 1.78). Each cycle consisted of data collectors observing the teacher for 15 minutes and coding for 10 minutes. Before conducting classroom observations, data collectors attended a 2-day CLASS training and achieved acceptable reliability. To demonstrate reliability, the coders independently coded five video clips and scored within one point of a master code on 80% of the dimensions.

Measures

Classroom behavioral composition. Classroom behavioral composition was operationalized using children's scores from the ADHDRS-IV and ODDRS rating scales. These behavior rating scales are used in clinical research with preschool-aged children and have been shown to be valid and reliable (McGoey, DuPaul, Haley, & Shelton, 2007). The ADHDRS-IV has 18 items, of which 9 assess inattention and 9 assess hyperactivity and/or impulsivity. Sample items for inattention include "has difficulty organizing tasks and activities" and "does not seem to listen when spoken to directly." Sample items for hyperactivity and/or impulsivity include "fidgets with hands or feet or squirms in seat" and "has difficulty awaiting turn." The ODDRS has 8 items, including "argues with adults" and "is touchy or easily annoyed by others." Both rating scales are reported on a 4-point Likert scale: never/rarely (0), sometimes (1), often (2), and very often (3). We used a summed score across the 26 items (α = .96). Within the sample, scores ranged from 0 - 78 (*M* = 14.3, *SD* = 15.0), with higher scores reflecting more disruptive behaviors.

The classroom mean level of disruptive behavior was the first way in which we operationalized behavioral composition. To calculate the classroom mean, we averaged all children's disruptive behavior scores within a classroom. Classroom mean scores were variable across the sample, with a range of 1.13 – 37.6 (M = 14.6, SD = 7.3). The proportion of children in a classroom whose disruptive behavior score is at or above the 90th percentile was the second way we operationalized classroom behavioral composition. We chose this method because we were interested in capturing the extent to which classrooms contained children with clinically significant behavior problems and based on prior research demonstrating divergent findings when using the classroom mean versus proportion of children meeting a higher threshold (Neidell & Waldfogel, 2010; Yudron et al., 2014). In our sample, the proportion of children in classrooms at or above the 90th percentile ranged from 0 to 0.70 (M = 0.11, SD = 0.12).

Teacher-child interaction quality. The quality of teacher-child interactions was measured from live observations using the CLASS (Pianta et al., 2008). The CLASS tool captures classroom quality along 10 dimensions that are organized into one of three domains: Emotional Support, Classroom Organization, and Instructional Support. Classroom quality is measured on a 7-point Likert scale (1 = low to 7 = high). At each time point (e.g., baseline and end of year), trained data collectors observed classrooms for approximately five data collection cycles. Scores from these cycles were averaged together to create three domain scores at each time point. Across 20% of observations, two data collectors rated the same cycle to determine interrater reliability. Intraclass correlations (ICCs) were .82 for Emotional Support, .76 for Classroom Organization, and

.73 for Instructional Support. Multiple studies have demonstrated reliability and validity of the CLASS measure (e.g., Hamre et al., 2013, Mashburn et al., 2008).

Teacher experience and education. The teacher survey conducted at the beginning of the year asked teachers to report on how many years they had taught and their highest degree earned. We created a dichotomous indicator for whether the teacher had at least a bachelor's degree (1 = yes, 0 = no).

Covariates. A set of teacher- and classroom-level covariates hypothesized to relate to classroom behavioral composition and teacher-child interaction quality were included to limit the likelihood of obtaining biased associations. In addition to teachers' experience and education mentioned above which are used as moderators, teacher covariates include age and beliefs about teaching young children. Beliefs about teaching young children was assessed using the modernity scale (Schaefer & Edgerton, 1985) on the baseline teacher survey (α =.79). This scale captures whether teachers hold more traditional, authoritarian views (e.g., teacher-centric) versus more modern or progressive views (e.g., child-centric) related to teacher-child interactions. This variable was included as a covariate in order to control for teacher beliefs which may relate to both teachers' ratings of disruptive behavior and the quality of teacher-child interactions. Classroom covariates include percent male, percent non-White, percent children age 3, average income-to-needs ratio, class size, intervention status, and cohort (e.g., site and year). Demographic variables were collected via teacher and parent surveys, and child-level data were aggregated to the classroom level. Intervention status and cohort were assigned by the research team. Table 1 presents descriptive statistics for all variables in this study.

Analytic Strategy

First, bivariate correlations were examined among the two classroom behavioral composition predictor variables, CLASS outcome variables (beginning and end of year), teachers' qualifications (education levels, years of experience, and area of study), and control variables. Results indicated that the classroom mean of disruptive behavior and the proportion of children at or above the 90th percentile were highly correlated (r = .83, p < 0.001). Multicollinearity concerns prevented us from including both predictors in the same model, however, we were still interested in examining differential associations since they conceptually represent distinct aspects of the classroom environment. Table 2 presents bivariate correlations for the key study variables.

To address the current study's research questions, linear regression models were run in the Stata software package version 14.2. Eight models were examined for each CLASS domain in the fall and spring controlling for fall (i.e., change over time). Models 1 and 2 considered the main effects of classroom behavioral composition (measured as classroom mean and proportion of children at or above the 90th percentile) on teacher-child interactions. Model 3 included the interaction of classroom mean with years of teaching experience, Model 4 included the interaction of classroom mean with an indicator for bachelor's degree, and Model 5 included the interaction of classroom mean with an indicator for early childhood major. Models 6, 7, and 8 followed the same pattern but substituted the proportion of children at or above the 90th percentile for the classroom mean. All child-level covariates were aggregated to the classroom level prior to analyses. Standard errors were adjusted to account for clustering of classrooms within preschool centers. Missing data ranged from 0-20.6% across the study variables (see Table 1 for the percent of missing data for each variable). Multiple imputation using the Blimp software

(Enders, Keller, & Levy, 2017; Keller & Enders, 2018) was used to handle missing data. Results were estimated across twenty imputed datasets. Interaction terms were specified in the imputation phase to preserve any potential interaction effects that may exist in the data.

Results

Here we present results for associations between classroom behavioral composition and the quality of teacher-child interactions at the start of the year and change over the course of the year. The top half of Table 3 displays results for initial teacher-child interactions, while the bottom half displays results for change in teacher-child interactions over time. Following the results for the main effects of classroom behavioral composition, we present results for the moderation analyses, to address whether teacher qualifications (e.g., years of experience, bachelor's degree, and early childhood major) are important factors for understanding the relation between classroom behavioral composition and the quality of teacher-child interactions. Standardized beta coefficients are presented, which can be interpreted as effect sizes.

Classroom Behavioral Composition Predicting Teacher-Child Interactions at the Start of the Year

We found no statistically significant relation between classroom mean or proportion of children at or above the 90th percentile and teachers' initial scores in Emotional Support, Classroom Organization, or Instructional Support.

Classroom Behavioral Composition Predicting Change in Teacher-Child Interactions Over Time

In this section, we present results for the associations between classroom

behavioral composition and spring CLASS scores, controlling for fall. This set of outcomes can be thought of as variance in teacher-child interactions at the end of the year that is explained by classroom behavioral composition while taking into account the quality of teacher-child interactions at the beginning of the year. In other words, this outcome captures the extent to which behavioral composition is associated with change in teacher-child interactions from the beginning to the end of the year. Paired t-tests indicated that on average teachers' Emotional Support ($t = 0.72$, $p = .47$) and Classroom Organization ($t = 0.19$, $p = .85$) did not change from fall to spring, but Instructional Support decreased over this period of time ($t = 3.93$, $p < .001$). We found that the proportion of children at or above the 90th percentile was significantly and negatively associated with change in Classroom Organization ($\beta = -0.15$, $SE = .07$, $p = .04$) and Instructional Support ($\beta = -0.19$, $SE = .07$, $p = .01$) over the course of the year. As the proportion of children with extreme behavioral challenges in a classroom increased, teachers showed declines in the quality of Classroom Organization and more steep declines in Instructional Support over the year. There was also a trending negative association between the proportion of children at or above the 90th percentile and change in Emotional Support ($\beta = -0.17$, $SE = .09$, $p = .05$).

Teacher Qualifications as Moderators of Links Between Classroom Behavioral Composition and Teacher-Child Interactions

Regarding our second research question whether teachers' years of experience, bachelor's degree, or early childhood major matter for teachers' ability to provide high-quality teacher-child interactions amidst more behaviorally challenging classroom environments, we found some *marginally* significant interactions with differing patterns

at the beginning and end of the year. At the beginning of the year, we found a trending interaction between bachelor's degree and classroom mean predicting Emotional Support ($\beta = .27$, $SE = .14$, $p = .05$). A graph of the interaction (Figure 1) suggests that when teachers held a bachelor's degree, they provided roughly the same amount of Emotional Support regardless of the classroom mean of disruptive behaviors. However, among teachers without a bachelor's degree, Emotional Support varied depending on the classroom behavioral composition. In classrooms with low levels of disruptive behavior, teachers provided a great deal of Emotional Support, but in classrooms with higher levels of disruptive behaviors, teachers provided less Emotional Support.

We found different patterns for change in the quality of Emotional Support across the school year. When looking at change in Emotional Support, we found *marginally* significant moderation of classroom mean ($\beta = -.12$, $SE = .07$, $p = .09$; Figure 2) and classroom proportion at or above the 90th percentile ($\beta = -.10$, $SE = .06$, $p = .07$) by teachers' years of experience, but the direction of the effect was opposite that for holding a bachelor's degree. Teachers with high levels of experience showed greater declines in Emotional Support across the year in classrooms with a high mean or high proportion of children with very disruptive behaviors compared to less experienced teachers in similarly challenging classrooms. We present this trending moderation effect for classroom mean in Figure 2, however the pattern of results was the same for the proportion at or above the 90th percentile. We found no evidence that majoring in early childhood moderated the association between classroom behavioral composition and the quality of teacher-child interactions.

Discussion

Guided by the importance of teacher-child interaction quality for young children's positive learning and development (Hamre, 2014), reports of preschool teachers' stress related to children's disruptive behaviors in the classroom (Quesenberry et al., 2014), and the increasingly common use of classroom process measures in statewide QRIS (Vitiello et al., 2018), we explored the role of classroom behavioral composition on teacher-child interactions and whether teachers' experience, holding a bachelor's degree, or majoring in early childhood may act as a protective factor for teaching in more behaviorally challenging classrooms. Classroom behavioral composition was operationalized in two ways – first, as the classroom mean level of disruptive behavior, and second, as the proportion of children in the classroom at or above the 90th percentile of disruptive behaviors – using teacher report of children's externalizing behaviors. Additionally, we were interested in determining the extent to which these factors influenced the quality of teacher-child interactions at the beginning of the year and change over the course of the school year.

The first research question examined whether classroom behavioral composition is related to teacher-child interactions at the beginning of the year and change over the course of the year. Neither classroom mean nor classroom proportion at or above the 90th percentile for disruptive behaviors was related to teacher-child interactions at the beginning of the school year. However, the proportion of children at or above the 90th percentile for disruptive behaviors was significantly related to change in the quality of teacher-child interactions over the course of the year. Specifically, teachers who perceived higher classroom proportions of children with extreme disruptive behaviors showed declines in the quality of their organizational and instructional interactions across

the year. The effect size was -.15 for Classroom Organization and -.19 for Instructional Support. Although these effect sizes are small, they are above and beyond fall teacher-child interaction quality. To compare the magnitudes of these associations to those of the lagged fall scores (not presented in Table 3), the effect corresponds to a little less than half of the effect of fall Classroom Organization scores (*ES* = .33) and a little less than three-quarters of the effect of fall Instructional Support scores (ES = .28). Given that intervention work has shown that the quality of teacher-child interactions is not easily improved when delivering professional development at scale, particularly with regard to Instructional Support (Early, Maxwell, Ponder, & Pan, 2017), these declines in quality across the school year are meaningful. The association between classroom proportion at or above the 90th percentile for disruptive behaviors and change in teachers' Emotional Support was marginally significant but in the expected direction.

Developmental theory assumes bidirectionality between children and teachers, however, the influence of teachers on children is more commonly examined. These results, although not causal, indicate that the opposite direction is true as well in that children's disruptive behaviors can negatively influence teacher practice over time, a finding that is in line with reports from teachers that children's disruptive behaviors often cause stress and impact their classroom practice (Quesenberry et al., 2014). Additionally, it is important to note that since these declines in quality are at the classroom level, a few very disruptive children may be contributing to a poorer quality preschool experience for all children in the classroom.

While we expected both the classroom mean and classroom proportion at or above the 90th percentile to matter for the quality of classroom interactions, we

hypothesized that the 90th percentile threshold would be the more salient feature, and these findings align to that aspect of our hypotheses. For preschool teachers, the presence of children with more severe disruptive behaviors may create circumstances for which it is harder to maintain or improve upon high-quality interactions over time, compared to the presence of a group of children displaying moderate disruptive behaviors. It is possible that moderately disruptive behaviors can be redirected more easily, even when a larger number of students is involved, than that of more severe behaviors among only a few children. Clinical research identifying severity of disruptive behavior as a risk factor for continued behavior problems in early childhood supports this notion (Shaw, Gilliom, & Giovannelli, 2000).

These findings have implications for education practice and policy. Early childhood teachers have reported a desire to receive more training around how to manage disruptive behaviors in the classroom (Granja, Smith, Nguyen, & Grifa, 2018), and these findings suggest that filling this gap in teacher professional development is warranted to help ensure high-quality teacher-child interactions for all children. From a policy perspective, the CLASS tool is increasingly being used in state-wide QRIS evaluation systems to determine the quality of classroom environments. In the present study, teachers who reported more children in the classroom who were very active, impulsive, inattentive, and oppositional showed declines in the quality of their practice over time, so it is important to consider the proportion of children in a classroom who display severe disruptive behaviors when interpreting teachers' CLASS scores and making decisions based on those scores.

The second research question this study explored was whether having more years

of teaching experience, a bachelor's degree, or early childhood major helped teachers provide high-quality teacher-child interactions amidst more behaviorally challenging classroom environments. We found *marginal* evidence for both bachelor's degree and years of teaching experience, though the patterns were in the opposite directions and differed depending on whether the outcome was initial interaction quality or change in quality over time. Specifically, in the domain of Emotional Support, we found a trend result showing that that holding a bachelor's degree was associated with teachers being observed to have a more positive classroom climate at the beginning of the year despite perceiving greater disruptive behaviors among children. We also found a trend effect that showed that more years of teaching experience was linked to increasing the negative association between level of disruptive behaviors at the classroom level and the quality of emotional interactions over the course of the school year. Majoring in early childhood neither helped nor hindered teachers' ability to productively handle challenging classroom environments. We acknowledge that these are only trend level associations and, while interesting, more research is needed to determine if these results replicate before describing the potential implications of these results.

Limitations and Future Research

Several limitations to this study are important to mention. First, the measurement of classroom behavioral composition posed a challenge. Similar to previous studies related to classroom behavioral composition (Friedman-Krauss et al., 2014; Yudron et al., 2014), we relied on teachers' reports of individual children's behaviors to create the classroom composition variables. To better capture the potential influence of children's disruptive behaviors on the quality of teacher-child interactions, validating these scores

with other measures such as observations or direct assessments will be an important area for future research. Additionally, in this study, high collinearity between classroom mean and proportion at or above the 90th percentile for disruptive behaviors prevented these compositional factors from being analyzed together in the same model. Future research should work towards developing novel ways to measure classroom composition that allow researchers to tease apart various features of a classroom without sacrificing conceptual clarity. Second, the findings are correlational and thus we are unable to detect causal effects of classroom behavioral composition on the quality of teacher-child interactions. Third, the three CLASS domains were highly correlated in this sample, so the main effect of proportion at or above the 90th percentile on change in quality across all domains may be driven by considerable shared variance in the outcomes rather than unique associations with the three domains. Fourth, our interaction effects were trending toward significance and should therefore be interpreted cautiously. Future research should continue to pursue these questions to determine if the effects replicate in other samples.

Conclusion

Given that teacher-child interactions are one of the most significant features of early childhood classrooms (Hamre, 2014), as well as the increasingly widespread assessment of interactions in classrooms (Vitiello et al., 2018), understanding the contribution of both children and teachers is important for identifying points of intervention. The current study is unique in that it examined classroom behavioral composition using two metrics – the classroom mean and the proportion of children at or above the 90th percentile for disruptive behaviors – and its role on emotional,

organizational, and instructional teacher-child interactions at the beginning of the year and change over time, as well as whether teachers' years of experience, education levels, or area of study may be an asset for teachers who are tasked with teaching behaviorally challenging classrooms. Findings highlight that teachers' perceptions of extreme disruptive behaviors (e.g., those reaching clinically significant levels) were linked to a decline in the quality of teacher-child interactions over time and that this metric was more consequential than the average level of disruptiveness in a classroom. Additionally, holding a bachelor's degree seemed to serve as a resource for teachers' ability to provide warm, emotionally responsive interactions at the beginning of the year, however, more teaching experience seemed to undermine teachers' ability to engage in emotionally warm and supportive interactions throughout the school year. Given the prevalence with which preschool teachers report that handling disruptive behaviors is an area of challenge, it is important to support teachers in this area through PD in order to prevent declines in the quality of teacher-child interactions.

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Table 1. Descriptive Statistics for Key Study Variables ($N_{classrooms}$ = 160)

	Mean	Standard Deviation	Range	% Missing
Classroom Behavioral Composition Predictors				
Classroom mean	14.58	7.32	1.13 – 37.60	0%
Classroom proportion 90th percentile	0.11	0.12	0 – 0.70	0%
Teacher Moderators				
Years of teaching experience	12.31	9.23	0 – 43.00	5.00%
Bachelor's degree or higher [a]	0.67	0.47	0 – 1.00	2.50%
Early childhood major [a]	0.40	0.49	0 – 1.00	3.75%
Outcomes				
Fall emotional support	5.12	0.76	2.90 – 6.50	4.38%
Spring emotional support	5.13	0.69	3.25 – 6.71	20.63%
Fall classroom organization	4.80	0.74	2.58 – 6.44	4.38%
Spring classroom organization	4.86	0.80	2.00 – 6.39	20.63%
Fall instructional support	2.22	0.64	1.03 – 5.21	4.38%
Spring instructional support	1.99	0.66	1.00 – 4.72	20.63%
Classroom and Teacher Covariates				
Class size	15.17	3.58	5.00 – 25.00	2.50%
Classroom income-to-needs	1.93	1.25	0.25 – 4.87	0%
% of boys in classroom	0.52	0.14	0.11 – 0.92	4.38%
% children age 3 in classroom	0.32	0.41	0 – 1.00	8.13%
% of children non-White in classroom	0.61	0.34	0 – 1.00	0%
Teacher age in years	40.88	11.67	21.00 – 67.00	3.13%
Teacher beliefs about children	2.36	0.60	1.19 – 3.88	3.13%

Notes.

[a] Indicates proportion of sample with a value of 1 (= yes).

Table 2. Bivariate Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Classroom mean	-																	
2. Classroom proportion 90th percentile	0.83***	-																
3. Years of experience	0.08	0.03	-															
4. Bachelor's degree	-0.01	0.04	-0.10	-														
5. Early childhood major	-0.09	-0.05	-0.01	-0.25**	-													
6. Emotional support baseline	-0.06	-0.02	0.13	-0.04	-0.07	-												
7. Emotional support EOY	-0.13	-0.16	0.05	0.06	0.11	0.52***	-											
8. Classroom organization baseline	-0.07	-0.08	0.06	0.01	-0.01	0.80***	0.48***	-										
9. Classroom organization EOY	-0.12	-0.17	0.00	0.18	0.12	0.47***	0.88***	0.47***	-									
10. Classroom instructional support baseline	-0.03	-0.08	0.01	0.06	-0.11	0.58***	0.29**	0.52***	0.22*	-								
11. Classroom instructional support EOY	-0.14	-0.20*	0.07	0.01	-0.08	0.27**	0.62***	0.21*	0.57***	0.33**	-							
12. Classroom size	-0.18*	-0.17*	0.04	0.13	0.05	-0.01	-0.06	-0.05	-0.03	0.04	-0.02	-						
13. Classroom income-to-needs	-0.08	-0.06	-0.06	-0.20*	-0.09	0.15	0.09	0.14	0.02	0.11	0.10	-0.22**	-					
14. Classroom % male	-0.05	0.03	0.04	-0.02	0.09	-0.14	-0.05	-0.12	-0.03	-0.19*	-0.05	0.11	-0.03	-				
15. Classroom % age 3	0.13	0.06	-0.05	-0.38***	0.05	0.08	-0.08	0.07	-0.18	-0.01	-0.09	-0.15	0.23**	0.09	-			
16. Classroom % non-White	0.08	0.02	0.07	0.18*	0.06	-0.25**	-0.20*	-0.25**	-0.14	-0.18*	-0.18*	0.13	-0.84***	0.00	-0.13	-		
17. Teacher age	0.02	-0.02	0.51***	-0.08	0.01	0.04	0.07	-0.01	0.08	0.02	0.25**	0.13	-0.08	0.09	-0.02	0.02	-	
18. Teacher beliefs about children	0.09	0.04	-0.08	-0.17*	-0.02	-0.43***	-0.33**	-0.31**	-0.36***	-0.26**	-0.23*	-0.06	-0.09	0.10	0.15	0.17*	-0.18*	-

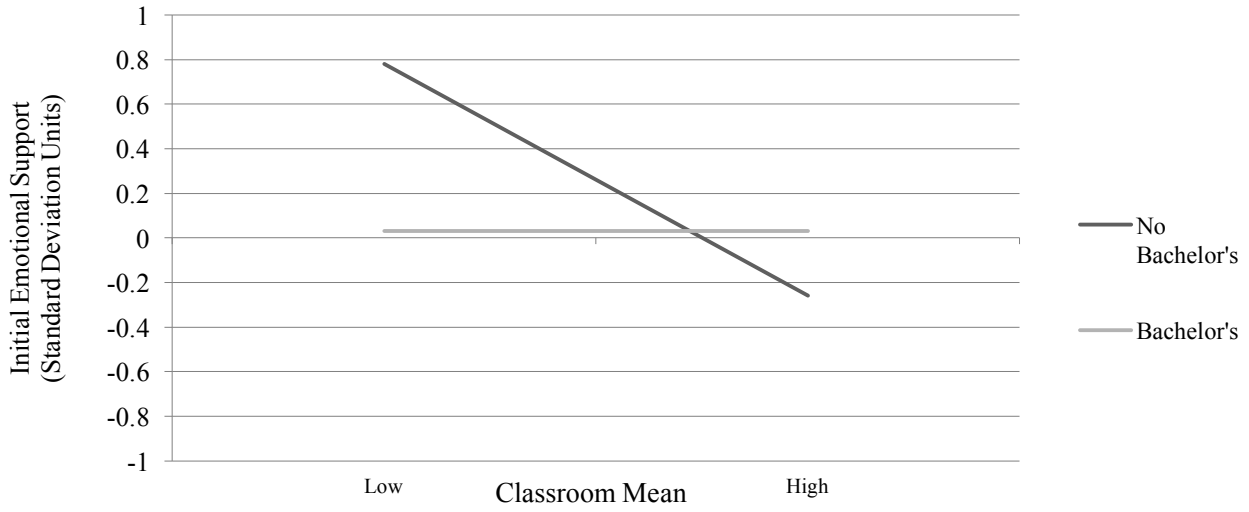
Notes.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. Associations between classroom behavioral composition and the quality of teacher-child interactions

	CLASS Domain		
	Emotional Support *β (SE)*	Classroom Organization *β (SE)*	Instructional Support *β (SE)*
Classroom composition and beginning of year quality			
Main effects models			
Classroom mean	-0.08 (.06)	-0.10 (.08)	-0.02 (.07)
Classroom proportion at or > 90th percentile	-0.06 (.06)	-0.12 (.08)	-0.07 (.07)
Interaction Models			
Classroom mean x experience	-0.06 (.06)	0.01 (.06)	-0.05 (.07)
Classroom mean x bachelor's degree	0.27† (.14)	0.14 (.14)	0.05 (.16)
Classroom mean x early childhood major	0.01 (.15)	0.00 (.16)	-0.11 (.16)
Classroom proportion at or > 90^{th} percentile x experience	-0.06 (.07)	-0.03 (.08)	-0.04 (.07)
Classroom proportion at or > 90^{th} percentile x bachelor's degree	0.18 (.16)	0.15 (.14)	-0.00 (.15)
Classroom proportion at or > 90^{th} percentile x early childhood major	-0.03 (.15)	-0.16 (.16)	-0.23 (.14)
Classroom composition and change in quality over year			
Main effects models			
Classroom mean	-0.10 (.09)	-0.05 (.08)	-0.13 (.08)
Classroom proportion at or > 90th percentile	-0.17† (.09)	-0.15* (.07)	-0.19* (.07)
Interaction Models			
Classroom mean x experience	-0.12† (.07)	-0.07 (.06)	0.00 (.07)
Classroom mean x bachelor's degree	0.02 (.17)	0.01 (.18)	-0.15 (.16)
Classroom mean x early childhood major	-0.05 (.18)	0.12 (.17)	0.23 (.15)
Classroom proportion at or > 90^{th} percentile x experience	-0.10† (.06)	-0.03 (.06)	0.03 (.05)
Classroom proportion at or > 90^{th} percentile x bachelor's degree	-0.04 (.20)	-0.03 (.21)	-0.10 (.16)
Classroom proportion at or > 90^{th} percentile x early childhood major	0.08 (.17)	0.20 (.17)	0.13 (.17)

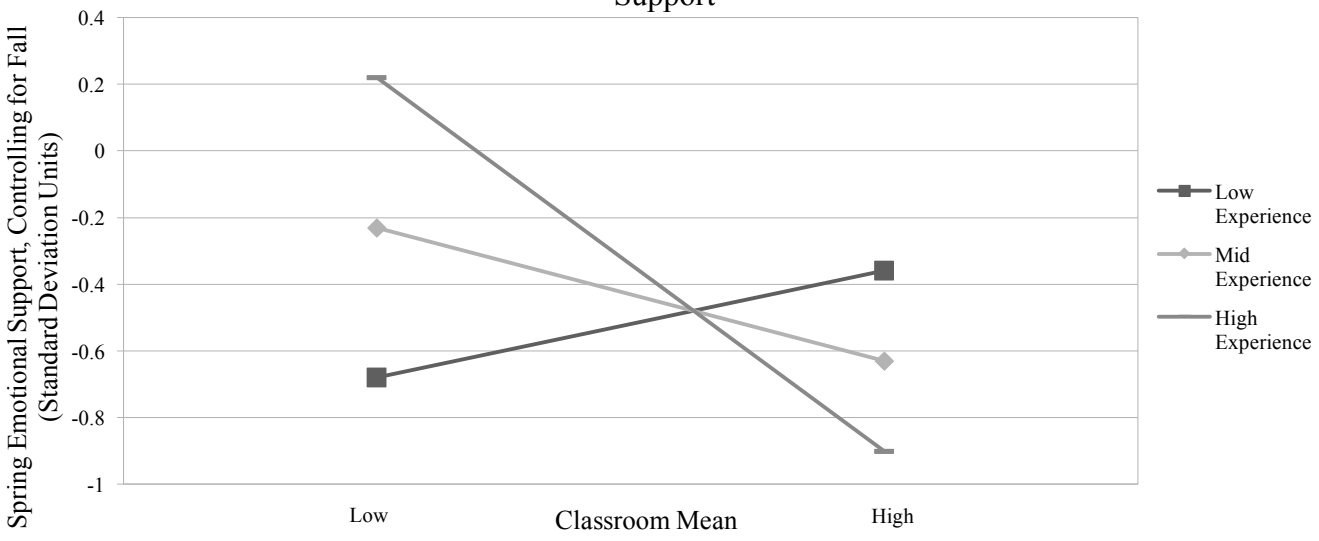
Notes.
All main effects and interaction models were examined separately.
Standardized coefficients are presented and serve as measures of effect sizes.
All models control for percent classroom male, percent classroom non-white, percent classroom age 3, average classroom income-to-needs ratio, class size, teacher beliefs about children, teacher age, intervention status, and cohort.
Standard errors were adjusted to account for clustering of classrooms within preschool centers.
* $p < .05$. † $p < .10$.

Figure 1: Moderating Effect of Bachelor's Degree on Initial Emotional Support



Note: The interaction is marginally significant (p = .05)

Figure 2: Moderating Effect of Years of Experience on Change in Emotional Support



Note: The interaction is marginally significant (p = .09)

Implementing *Banking Time* with teachers and preschoolers displaying disruptive behaviors: Links between consultant-teacher alliance, implementation fidelity, and dyadic teacher-child interactions

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Abstract

Teacher consultation is commonly used to ensure that classroom-based interventions are implemented with fidelity to achieve targeted outcomes. Using implementation data from the *Banking Time* intervention (N =151 children), we examined the links between two dimensions of consultant-teacher alliance (i.e., the quality of the consultant-teacher relationship and teachers' investment in consultation) and the quality of dyadic teacher-child interactions. We also investigated whether links between consultant-teacher alliance and dyadic teacher-child interaction quality operated indirectly via teachers' fidelity of implementation. Findings indicated that when consultants perceived having a closer relationship with teachers and that teachers were invested in the consultation, teachers were observed to interact more positively with children. We did not find evidence for an indirect association between consultant-teacher alliance and dyadic teacher-child interactions via implementation fidelity. Results have implications for school-based interventions that employ teacher consultation to support teachers.

Keywords: Implementation Fidelity, Teacher Consultation, Consultant-Teacher Alliance, Working Relationship, Teacher Investment, Teacher-Child Interactions, Preschool

Teacher consultation is a common component of classroom-based intervention models, including those that focus on improving children's social-emotional and behavioral outcomes (Cappella et al., 2016; Domitrovich, Gest, Gill, Jones, & Sandord DeRousie, 2009; Mattera, Lloyd, Fishman, & Bangser, 2013; Raver et al., 2009; Reinke, Stormont, Herman, & Newcomer, 2014; Snyder, Hemmeter, & Fox, 2015; Williford et al., 2017). As teachers are primarily responsible for implementing these interventions, the role of the consultant is to support teachers to implement the intervention's core components as intended (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Pas, Bradshaw, & Cash, 2014; Reinke et al., 2014). Supporting teachers' successful implementation of interventions' core components is important, given the clear links between implementation quality and positive intervention outcomes (Durlak & DuPre, 2008). Although consultation is a key strategy to promote teachers' skill development and favorable intervention outcomes (Stormont, Reinke, Newcomer, Marchese, & Lewis, 2015), the specific processes by which consultation exerts its influence are not well-understood (Pas et al., 2014), limiting our capacity to design effective consultation supports for teachers implementing classroom-based interventions. Addressing this gap, and responding to calls for unpacking consultation processes to inform the design, delivery, and impacts of social and behavioral interventions (Cappella, Reinke, & Hoagwood, 2011; Powell & Diamond, 2013; Sheridan, Edwards, Marvin, & Knoche, 2009), in this study we investigate the consultant-teacher alliance as one specific consultation process.

Recent work has pointed to the alliance between the consultant and teacher as a key feature of the consultation process (Johnson, Pas, & Bradshaw, 2016; Wehby,

Maggin, Partin, & Robertson, 2012). Following Johnson and colleagues (2016), the consultant-teacher alliance can be organized conceptually into four dimensions – working relationship, coaching process, investment, and benefits of coaching – with each potentially reported from the perspective of the teacher and the consultant. A fifth dimension, barriers to coaching, was also reported, however, this dimension only pertains to the coach or consultant perspective. The current study utilizes the framework from Johnson et al. to explore two dimensions of the consultant-teacher alliance: quality of the working relationship and teachers' investment in consultation. Working relationship encompasses the degree of connection, enjoyment, and partnership present in the relationship between the consultant and teacher. The second dimension, teachers' investment in consultation, reflects the degree to which consultants perceive that teachers are actively involved in the consultation sessions and are open to engaging in new strategies introduced by the consultant.

In this study, we sought to understand the links between these two dimensions of the consultant-teacher alliance (i.e., quality of the working relationship and teachers' investment in consultation) and dyadic teacher-child interactions, as well as the extent to which these dimensions of alliance indirectly contribute to dyadic teacher-child interactions through teachers' fidelity of implementation. To answer these questions, we leverage implementation data from the *Banking Time* intervention, a relationship-focused intervention focused on improving dyadic interactions among teachers and children perceived to display elevated levels of disruptive behaviors (Williford et al., 2017).

Implementation of Interventions with Teacher Consultation

Implementation is broadly defined as a description of intervention delivery in a given setting with attention to how the actual delivery differs from what was prescribed by the intervention developers (Durlak & DuPre, 2008). Implementation can pertain to two distinct systems: the core programmatic activities or components of an intervention and the support system (Domitrovich et al., 2008). The support system intends to facilitate effective implementation of the intervention's core components by providing the consultation, training, assistance, and problem-solving necessary for the implementer to execute with fidelity the core components (Domitrovich et al., 2008). For instance, teacher consultation (i.e., support system) is theorized to promote teachers' fidelity of implementation to the programmatic activities (i.e., core components) which then leads to improvements in the outcomes targeted by the intervention (Dunst, Trivette, & Raab, 2013). In addition to this indirect pathway, teacher consultation may operate directly to promote outcomes (Dunst et al., 2013), depending on the specific features of consultation being investigated and their conceptual alignment to intervention outcomes.

To date, more attention has been given to understanding implementation of the intervention itself compared to the support system (Powell & Diamond, 2013; Stormont et al., 2015), despite the fairly ubiquitous presence of support systems across school-based intervention models (Denton & Hasbrouck, 2009). To our knowledge, an empirical examination of how variation in specific dimensions of teacher consultation contributes both directly and indirectly to intervention outcomes has not been conducted. The current study tests the relations between one consultation process theorized to play a key role in the success of classroom-based interventions (i.e., consultant-teacher alliance), teachers'

fidelity to implementation to the core components of *Banking Time*, and outcomes targeted by the intervention (i.e., dyadic teacher-child interactions).

Direct Links Between Consultation Alliance and Dyadic Teacher-Child Interactions

Given that teacher consultation is inherently a relational process, the working relationship between a consultant and teacher may directly influence intervention outcomes that are likewise relational or emotionally-salient in nature, such as interacting with children more sensitively and responsively (Johnson et al., 2016; Powell & Diamond, 2013). For instance, a consultant may validate a teacher's feelings of frustration or stress related to handling disruptive behaviors or support teachers to regulate their own emotions (Raver, Blair, & Li-Grining, 2012), leading to more positive dyadic teacher-child interactions (Buettner, Jeon, Hur, & Garcia, 2016). By providing teachers with external resources, consultants may also contribute to teachers' overall perceptions of a supportive work environment (Cappella et al., 2016). Early childhood teachers who perceive positive work conditions, including positive relationships with supervisors and coworkers, report lower levels of depression, stress, and emotional exhaustion (Jeon, Buettner, & Grant, 2018), which facilitate effective teacher-child interactions.

The second dimension of consultant-teacher alliance, teachers' investment, is key to the success of the consultation process. It would be insufficient for consultants to be the only party actively engaged in the consultation; teachers must also be open to the goals and practices of the intervention, try new strategies, and reflect with their consultant (Johnson et al., 2016). Indeed, teachers' engagement in the NCRECE professional development intervention predicted change in teachers' instructional

interactions for the coaching condition but not for the coursework condition, suggesting that teachers' engagement in coaching- or consultation-based supports may be especially important (LoCasale-Crouch et al., 2016). Consultants may cultivate teachers' engagement by providing a different perspective or source of motivation for teachers that helps them shift their ways of interacting with children (Lee, Frey, Herman, & Reinke, 2014). This may be especially relevant in the case of improving dyadic interactions with children teachers perceive to display elevated levels of disruptive behaviors, since teachers tend to develop negative representation models of these children that can both undermine interaction quality and be difficult for teachers to alter (Spilt, Koomen, Thijs, & van der Leij, 2012).

Indirect Links Between Consultation Alliance and Dyadic Teacher-Child Interactions Through Fidelity of Implementation

The consultant-teacher alliance may contribute to intervention outcomes indirectly through promoting stronger fidelity to the intervention's core components (Dunst et al., 2013). Fidelity is widely acknowledged to be a critical factor for promoting successful intervention outcomes (Durlak & DuPre, 2008). Among school-based interventions for preschoolers, fidelity is linked to positive child and teacher outcomes (Domitrovich, Gest, Jones, Gill, & Sanford DeRousie, 2010; Marti, Melvin, Noble, & Duch, 2018; Sutherland, Conroy, McLeod, Algina, & Wu, 2018), including prior work finding that fidelity to *Banking Time* practices contributed to positive dyadic teacher-child interactions (Alamos, Williford, & LoCasale-Crouch, 2018; LoCasale-Crouch, Williford, Whittaker, DeCoster, & Alamos, 2018).

The links between consultant-teacher alliance and fidelity, however, have been investigated far less, despite the emphasis on creating collaborative partnerships in consultation (Chu, 2014) and the wide use of consultation in school-based interventions to support teachers to implement interventions with high fidelity (Artman-Meeker, Fettig, Barton, Penney, & Zeng, 2015; Powell & Diamond, 2013). Research shows that when teachers perceived a positive working relationship with their coach, they implemented intervention activities more frequently compared to teachers who perceive a less positive relationship with their coach, however there was no difference in implementation quality (Johnson, Pas, Bradshaw, & Ialongo, 2018), thus providing mixed-evidence. In another study, working relationship buffered against the negative influence of teacher burnout on consultant-reported fidelity (Wehby et al., 2012), underscoring that the consultant-teacher relationship plays a protective role in supporting teachers' intervention fidelity. Similarly, teachers who were rated by trainers as being engaged in interventions' training workshops (Reinke, Herman, Stormont, Newcomer, & David, 2013; Wanless, Rimm-Kaufman, Abry, Larsen, & Patton, 2015) and by consultants as being open to consultation (Domitrovich et al., 2009) implemented interventions with greater fidelity compared to teachers who were rated as being less engaged. Although theory and some empirical work supports these two pathways (consultation alliance to fidelity and fidelity to outcomes), to our knowledge, the extent to which consultation alliance operates indirectly to influence intervention outcomes via fidelity has not been examined.

Banking Time **as an Intervention for Improving Dyadic Teacher-Child Interactions**

Banking Time (Pianta & Hamre, 2001) is a dyadic, attachment-focused intervention to improve the quality of interactions and relationships between the teacher

and a child. The intervention aims to disrupt negative cycles of interactions by supporting the teacher-child dyad to interact in new ways and in a different setting, apart from the typical classroom environment, which often involves demands and stress (Pianta, 1999). By establishing new cycles of interaction in which the teacher engages in specific practices (e.g., observe the child's play, narrate aloud the children's actions, allow the child to lead the session), each individual is more likely to perceive the other differently (i.e., more positively), which is theorized to shift internal working models and improve the teacher-child relationship and children's behavior (Pianta, 1999).

Banking Time involves short (10-15 minutes), regularly-occurring (2-3 times/week for a period of seven weeks), one-on-one sessions in which a teacher and child spend time together and interact in specified, positive ways. A randomized control trial (RCT) of the *Banking Time* intervention employed three conditions: *Banking Time*, *Child Time*, and business-as-usual (Williford et al., 2017). In both the *Banking Time* and *Child Time* conditions, teachers participated in the short, regularly-occurring, one-on-one sessions with a child and were supported by a consultant. However, only in the *Banking Time* condition were teachers instructed and supported to use specific practices designed to enhance the relational interactions between teachers and children. Teachers in the *Child Time* condition spent the same amount of time with an individual child but were not instructed or supported on how to spend the time or interact with the child. The third condition was business-as-usual and no treatment was administered.

Results from the impact study indicated that children in the *Banking Time* and *Child Time* conditions displayed fewer disruptive behaviors as reported by their teacher and parents, respectively, compared to children in the business-as-usual condition, and

teachers in the *Banking Time* condition were observed to show fewer positive and negative interactions with children compared to business-as-usual teachers (Williford et al., 2017). Furthermore, children in the *Banking Time* condition showed significantly greater declines in their cortisol levels, a measure of the stress response system, compared to children in the business-as-usual condition (Hatfield & Williford, 2017).

Present Study

The present study leverages implementation data from the *Banking Time* trial to explore two dimensions of consultant-teacher alliance – the quality of the consultant-teacher relationship and teachers' investment in consultation– and how they shape teacher and child outcomes directly and indirectly through fidelity of implementation. This study fills a gap in the literature in two ways. First, we focus on the consultation process, which has received relatively little attention within implementation science compared to efforts to understand implementation of intervention core components (Stormont et al., 2015). Unpacking the consultation process contributes to our understanding of how consultation operates as an implementation support in school-based interventions (Nadeem, Gleacher, & Beidas, 2013). Second, we focus on understanding two dimensions of the consultant-teacher alliance (Johnson et al., 2016), which theory and practice suggest is foundational to the success of consultation yet is only an emerging line of inquiry in the school-based consultation literature. We view the current study's sample (i.e., teachers and children perceived to display elevated levels of disruptive behaviors) as a strength for examining consultant-teacher alliance; the consultant-teacher alliance may be an especially important aspect of consultation when the content and outcomes of the intervention are affective in nature, as with *Banking Time*.

Two research questions are addressed: (1) To what extent do consultant-teacher relationship quality and teachers' investment in consultation directly influence the quality of dyadic teacher-child interactions? (2) Are these associations mediated by teachers' fidelity to *Banking Time* practices? We expect the quality of the consultant-teacher relationship and teachers' investment in consultation to positively relate to dyadic teacher-child interactions. Furthermore, we anticipate that this relation will be mediated, at least in part, by teachers' fidelity of implementation to *Banking Time* practices.

Method

Participants

Participants for the current study were drawn from a larger impact study of the *Banking Time* intervention (Williford et al., 2017). Only participants randomly assigned to the *Banking Time* condition were retained in this study's sample (i.e., the *Child Time* and business-as-usual conditions were excluded from the current sample; see more information in the "Procedures" section). There were no significant differences between the intervention conditions on baseline program, teacher, or child demographic variables (see Williford et al., 2017 for more detailed information).

The final sample for the current study consists of 151 children and 56 teachers. Nine children and three teachers who were in the original *Banking Time* impact study were excluded from the current study's sample due to missing data for the consultant identifier, which was used a fixed effect (described further in "Analytic Strategy"). Classrooms had a mix of funding sources, with 25% being federally-funded, 23% state-funded, and 52% privately-funded. Children were 4-years-old on average and 67% were male. Most children were either Black/African American (48%) or White (37%), with the

remainder being Latino (7%), multiracial (6%), or Asian, Native American, or other race (all less than 1%). Children came from a broad range of economic backgrounds but the majority were from low-income families. The vast majority of teachers were female (94%), they were 39-years-old on average, had an average of 11 years of experience, 72% held at least a bachelor's degree, and 39% majored in early childhood. Teachers' racial composition was 50% identifying as White, 41% identifying as Black/African American, 4% Latino, with the remaining 5% identifying Native American, Asian, or multiracial.

Procedures

Recruitment of programs and teachers. Recruitment for the larger *Banking Time* RCT occurred in three urban or semi-urban geographical sites within two Mid-Atlantic states in the U.S. Directors from preschool centers of various types (e.g., Head Start, state-funded PreK, and privately-funded) were asked permission to invite teachers to participate in the study. After teachers consented to participate, they provided personal information and classroom demographic information on a baseline survey. Parental consent was then requested for all children in the classroom. If parents consented for their child to participate in the study (76% consent rate), they completed a short demographic survey.

Child selection. Six weeks into the school year, teachers rated all consented children in their classroom on two disruptive behavior rating scales, Attention-Deficit/Hyperactivity Disorder Rating Scale-IV (ADHDRS-IV; DuPaul, Power, Anastopoulos, & Reid, 1998) and Oppositional Defiant Disorder Rating Scale (ODDRS; Hommersen, Murray, Ohan, & Johnston, 2006). Items from both measures were summed

and the two boys and one girl with the highest disruptive behavior ratings participated in the intervention study ($N = 470$ children).

Randomization procedures. Classrooms were randomized into one of three treatment conditions – *Banking Time*, *Child Time*, or business-as-usual – such that all children in a classroom were assigned to the same intervention condition. The three participating children in the *Banking Time* and *Child Time* conditions were then randomly assigned to one of three seven-week intervention windows. During this seven-week window, teachers implemented *Banking Time* or *Child Time* only with the child assigned to that intervention window. Although children in the business-as-usual condition did not receive treatment, they were also assigned a seven-week window for assessment purposes.

Intervention description. As previously mentioned, the *Banking Time* intervention efficacy trial included three treatment conditions (*Banking Time*, *Child Time*, and business-as-usual), but only participants from the *Banking Time* condition are included in the current study's sample. In the *Banking Time* condition, teachers met one-on-one with a child perceived to display disruptive behaviors for 10-15 minutes, two to three times per week, in the school setting. Teachers worked with one child at a time, for the duration of seven weeks, before repeating the process with a second and, finally, third child. The sessions were intended to facilitate a context in which the child and teacher could interact in positive ways and engage in activities of interest to the child. As such, the teacher was instructed to allow the child to lead the play (e.g., pretend play with figurines, arts and crafts, blocks) and refrain from actively teaching skills or engaging in activities that promoted the teacher's role (e.g., reading books). Teachers were also

instructed to implement specific practices theorized to promote the quality of teacher-child interactions. These practices included observing the child's behaviors, narrating the child's actions, labeling the child's emotions, and promoting positive relational themes to the child (e.g., "I can be a helper."). To ensure that the child led the session, teacher-directed behaviors were discouraged, including questioning, making direct comments or issuing indirect commands, teaching skills, and praising children. In the *Child Time* condition, teachers followed the same meeting schedule described above (e.g., one-on-one sessions for 10-15 minutes, 2-3 times/week, for seven consecutive weeks, and then rotating to the second and third participating child), but were not given any instructions or restraints on how to spend time with the child. In the business-as-usual condition, teachers and children were assessed but did not receive any treatment.

Teacher consultation. Teachers in the *Banking Time* and *Child Time* conditions worked with a consultant to promote implementation of the intervention as intended. Consultants were assigned to either the *Banking Time* (n = 4) or *Child Time* (n = 3) condition. Consultants met in-person every other week and had a phone call on the alternate weeks. In the *Banking Time* condition, consultants reviewed video footage of *Banking Time* sessions filmed by the teacher to address areas where teachers' implementation (e.g., how teachers were spending the time) could be improved and answer any questions or concerns raised by the teacher. In the *Child Time* condition, consultants worked with teachers to problem-solve how to find time to meet individually with a child, but did not provide any guidance on what teachers should do during or how teachers and child should interact during that time. Teachers in the business-as-usual condition did not meet with a consultant. Consultants had a Master's degree in education

or psychology and had experience working in early childhood settings. Consultants participated in a week-long training before meeting with teachers and continued to receive group or individual supervision each week with a supervisor who had extensive early childhood experience and prior training in *Banking Time*.

Data collection. Data for this study were primarily collected at four time points throughout the year: at the beginning of the year in October, at which point no treatment had been introduced (baseline), and following each of the three, seven-week intervention windows which corresponded to January (post-Window 1), March (post-Window 2), and May (post-Window 3), depending on the intervention window to which the child was randomly assigned. Teacher and child demographic data were collected at baseline through teacher and family surveys. Variables related to consultation alliance and child and teacher outcome data were collected at post-window. One outcome measure (e.g., the inCLASS, see "Measures" section) was also collected at pre-window, so that changes from pre- to post-window could be measured. Teachers' fidelity to *Banking Time* practices were collected each week throughout a child's seven-week intervention window.

Field-based data collectors participated in a two-day training on the live observation measure (i.e., individualized Classroom Assessment Scoring System; inCLASS) and at this time also learned how to administer the video-taped observation measure (i.e., Teacher-Child Structured Play Task; TC-SPT); see more information in "Measures" section). At the conclusion of the training, coders had to demonstrate reliability by coding five video clips independently and score within one point of a master code on 80% of the dimensions in order to conduct live classroom observations. Children

were observed using the inCLASS for approximately eight 15-minute cycles (M = 8.40, SD = 1.54). Two separate groups of coders, undergraduate research assistants who were not involved in any aspect of data collection, coded videotapes of the TC-SPT and *Banking Time* sessions. One group of coders was assigned to code interactive behaviors for teacher-child dyads from the TC-SPT. A separate group of coders was assigned to code teachers' fidelity to *Banking Time* practices from videos submitted of the intervention sessions. Coders were trained by senior researchers on the respective coding scheme and attended weekly calibration meetings to ensure adequate coding reliability.

Measures

Teacher and child characteristics. In the fall, parents or guardians and teachers completed a survey that provided child/family and teacher demographic characteristics, respectively. Variables used in the current study include child age, child income-to-needs ratio, teacher age, teacher ethnicity, and teacher bachelor's degree indicator.

Consultant-teacher alliance. Two dimensions of the consultant-teacher alliance were assessed using surveys completed by consultants at post-window. The first alliance dimension was the quality of the consultant-teacher relationship. Consultants completed a survey in which they rated 9 items such as "I feel comfortable sharing my ideas/thoughts with this teacher" and "The teacher and I are partners in this process" on a 5-point Likert scale (1 = definitely disagree, 2 = slightly disagree, 3 = neutral, 4 = slightly agree, and 5 = definitely agree). Cronbach's alpha was .91, indicating strong internal consistency. The second dimension of consultant-teacher alliance was teachers' investment in the consultation sessions. For this dimension, consultants rated 13 items such as "This teacher reports back on success of earlier attempts to implement new strategies and

approaches" and "The teacher asks questions related to improving his/her implementation of Banking Time/Child Time" on the same 5-point Likert scale as above. Cronbach's alpha was .94.

Children's observed interactions in the classroom. The Individualized Classroom Assessment Scoring System (inCLASS; Downer, Booren, Hamre, Pianta, & Williford, 2011) measures an individual child's observed interactions with teachers, peers, and tasks in the preschool setting. The inCLASS is comprised of ten dimensions: (1) positive engagement with teacher, (2) communication with teacher, (3) conflict with teacher, (4) sociability with peers, (5) conflict with peers, (6) assertiveness with peers, (7) communication with peers, (8) engagement with tasks, (9) reliance with tasks, and (10) behavior control. The dimensions positive engagement with teacher (i.e., child's attunement to the teacher, proximity seeking, and shared positive affect) and communication with teacher (i.e., child initiates communication with the teacher, sustains conversations and uses speech for varied purposes) were averaged to create the domain score Positive Engagement with Teacher, which was used in this study. Scores are rated on a 7-point Likert scale with higher scores reflecting more positive engagement with the teacher. Intraclass correlations (ICCs) were calculated for 20% of observations to determine the inter-rater reliability of two data collectors who independently observed and rated the same child. The ICC for the Positive Engagement with Teacher domain was .80. The inCLASS has shown construct and criterion validity (Downer, Booren, Lima, Luckner, & Pianta, 2010) and predictive validity with regard to growth in children's school readiness skills (Williford, Whittaker, Vitiello, & Downer, 2013).

Teacher-child dyad observed interaction quality. The quality of interactions between teacher-child dyads was assessed using the Teacher-Child Structured Play Task (TC-SPT; Whittaker, Williford, Carter, Vitiello, & Hatfield, 2018) at post-window. In this play task, the teacher and child participated in two activities that were consistent across all dyads. The teacher and child first played together with toys for seven minutes (i.e., free play portion) and then had three minutes to clean up the toys (i.e., clean up portion). The quality of interactive behaviors was measured for teachers and children separately. Coders who were blind to the intervention condition and did not work as field-based data collectors coded either teacher interactive behaviors or child interactive behaviors, within either the free play or clean up portion of the task (i.e., videos were split among four separate coding teams). This study uses teacher and child interactive behaviors from the clean-up portion only. All behaviors were rated on a 5-point Likert scale with higher scores reflecting more positive behaviors.

Within the clean-up portion of the structured play task, two composites were formed for teacher interactive behaviors, and two composites were formed for child interactive behaviors. For teachers, the composites were Positive Teacher Interactions with Child (sensitive and responsive presence, positive affect, teacher confidence, teacher encourages stimulating environment, teacher support for child autonomy, and affective mutuality) and Negative Teacher Interactions with Child (teacher directiveness and teacher negativity). For children, the composites were Child Active Engagement (child enthusiasm, child reliance on the teacher for help [reverse scored], child persistence, compliance, child's negative emotions [reverse scored], and behavior control) and Child Positive Interactions with Teacher (child experience, child affection toward teacher, child

negativity toward teacher [reverse scored], avoidance of the teacher [reverse scored], and affective mutuality/felt security). In this study, two composites are used: Positive Teacher Interactions with Child (α = .90) and Child Positive Interactions with Teacher (α = .72). Twenty percent of videos were double-coded for teacher interactive behaviors, and all videos were double-coded for child interactive behaviors. Interrater reliability was good for both composites used in this study, as measured by intraclass correlations (Positive Teacher Interactions with Child = .80; Child Positive Interactions with Teacher = .85). The composites show evidence of construct and criterion validity (Whittaker et al., 2018).

Fidelity of implementation. Teachers' fidelity to *Banking Time* practices was coded from videotapes of *Banking Time* sessions submitted each week during each child's seven-week intervention window. From the total number of videos submitted (ideally 7), up to four videos per child were randomly selected for double coding. This study uses a composite fidelity score (α = .74). The specific teacher practices included in this composite are the quality with which teachers observed and narrated the child's actions (1 = very poor to 5 = very good), the frequency with which teachers imitated the child (1 = none/never to 5 = frequently/often), the extent to which the teacher let the child lead the session (1 = strongly disagree to 5 = strongly agree), and the extent to which the teacher refrained from using controlling language (1 = none/never to 5 = frequently/often [reverse scored]). In the case that four or fewer videos were submitted for a child (N = 49), all videos were coded. On average, 3.75 videos per child were coded (SD = .64). The ICC across all fidelity scores was .84.

Consultation dosage. Consultants recorded the number of sessions, face-to-face and via phone, they had with a teacher. This information was collected separately for each child (i.e., for each seven-week intervention window).

Analytic Strategy

Bivariate correlations indicated that the two dimensions of consultant-teacher alliance were highly correlated ($r = .87$, $p < 0.001$), however, we decided to examine their associations to outcomes separately since previous work has distinguished them as conceptually distinct dimensions of alliance. We ran two mediation models for each of our three outcomes. Model 1 considered the direct link between consultant-teacher relationship quality and the indirect link via fidelity of implementation on dyadic teacher-child interactions, while model 2 examined these links for teachers' investment in the consultation sessions.

All models included a set of covariates and fixed effects to account for factors that could be confounded with our variables of interest and result in biased associations. To isolate the unique contributions of the consultant-teacher alliance and fidelity of implementation to dyadic teacher-child interactions, we controlled for the total number of consultation sessions (in-person and phone) held between a consultant and a teacher. We controlled for the total number of consultation sessions since dosage may influence consultants' perceptions of their relationship with a teacher and/or their perceptions of teachers' investment in consultation, as well as teachers' fidelity of implementation and the quality of dyadic teacher-child interactions. A set of child and teacher demographic covariates were also included to account for individual characteristics that may influence the associations examined in this study. Specifically, we controlled for child age, child

income-to-needs ratio, teacher age, teacher ethnicity, and whether the teacher held at least a bachelor's degree. We controlled for the pre-window score, collected at the beginning of the child's intervention window, of one outcome (i.e., child's positive engagement with the teacher in the classroom), which allows us to predict change in this outcome. Pre-scores for the other two outcomes were not measured and thus could not be included. Finally, we included as fixed effects the child's selected intervention window and a dummy variable for consultant. By including consultant fixed effects, we indirectly controlled for site, since consultants worked within only one site.

Analyses were run in Mplus version 8.4. To obtain a non-biased estimate of the indirect effect, we computed bootstrap standard errors with 2,000 draws (Muthén, Muthén, & Asparouhov, 2016). Bootstrap standard errors correct for the non-normality of the indirect effect which is a product term. Additionally, standard errors were adjusted for the dependence of the data (i.e., children nested within teachers) by specifying the TYPE = COMPLEX estimation. Missing data ranged from 0-25% across key study variables (see Table 1 for the percent of missing data for each variable). Multiple imputation using the Blimp software (Enders, Keller, & Levy, 2017; Keller & Enders, 2018) was used to handle missing data. Results were estimated across twenty imputed datasets. We present standardized betas, which are presented as a measure of the associations' effect sizes.

Results

Descriptive Results

Table 1 presents means and standard deviations for key variables in this study. Consultants rated the quality of their working relationships with teachers very highly (M = 4.35, SD = .81). Consultants' ratings of teachers' investment in the consultation were

on average slightly lower than perceived relationship quality, but still indicated agreement that teachers were invested in the consultation (M = 3.87, SD = .92). Bivariate correlations among the two dimensions of consultant-teacher alliance, fidelity of implementation, dyadic teacher-child interactions, and covariates are presented in Table 2. As previously mentioned, the two dimensions of consultation alliance were highly correlated (r = .87, p < .001). The quality of the consultant-teacher relationship and teachers' investment in consultation were moderately correlated with fidelity of implementation (r = .25, p < .01; r = .38, p < .001, respectively). Fidelity of implementation was also moderately correlated with children's positive interactions (r = .31, p < .001), but all other relations between fidelity and dyadic interactions were small. Teachers' investment in consultation showed stronger relations to dyadic interactions than relationship quality.

Direct Links Between Consultation Alliance and Dyadic Teacher-Child Interactions

As shown in Table 3, we found that when consultants reported a stronger consultant-teacher working relationship, teachers were observed to interact more positively with the child in the context of a structured play task (β = .25, SE = .11, p = .03). Similarly, when consultants perceived higher levels of teachers' investment in the consultation, teachers were observed to interact more positively with the child in the context of a structured play task (β = .37, SE = .12, p = .002). At the trend level, we found that when consultants perceived higher levels of teachers' investment in the consultation, children were observed to interact more positively with the teacher during a structured play task (β = .23, SE = .14, p = .10). We did not find any significant direct

associations between either dimension of consultant-teacher alliance and children's observed positive engagement with the teacher in the classroom.

Indirect Links Between Consultation Alliance and Dyadic Teacher-Child Interactions Through Fidelity of Implementation

We did not find any evidence supporting the hypothesized mediation model that consultant-teacher alliance influenced dyadic teacher-child interactions via teachers' fidelity of implementation. Furthermore, the association between consultant-teacher alliance and teachers' fidelity of implementation was non-significant in all models.

Discussion

Despite its primary purpose of enhancing implementation quality, teacher consultation remains an under-studied aspect of implementation of classroom-based interventions. Addressing this gap, this study examined the direct and indirect contributions of teacher consultation to intervention outcomes. Using implementation data from *Banking Time*, an intervention previously shown to improve the quality of dyadic teacher-child interactions (Williford et al., 2017), we examined the relation between two dimensions of the consultant-teacher alliance, specifically the quality of the consultant-teacher relationship and teachers' investment in the consultation sessions, and the quality of dyadic teacher-child interactions. We tested both the direct links between consultant-teacher alliance and teacher-child interactions and the indirect links via fidelity of implementation. Our findings indicated that the quality of the consultant-teacher relationship and teachers' investment in consultation were directly associated with teachers' one-on-one positive interactions with children. Neither dimension of consultant-teacher alliance contributed to dyadic teacher-child interactions indirectly

through fidelity of implementation. These findings and related implications are discussed in more detail below.

Direct Links Between Consultant-Teacher Alliance and Dyadic Teacher-Child Interactions

We found that both dimensions of consultant-teacher alliance directly contributed to teachers' interactions with children during a standardized task in which teachers and children cleaned up a set of toys, providing some confirmation for our first hypothesis. When consultants perceived having a closer relationship with teachers and that teachers were invested in the consultation, teachers were observed to be more sensitive and response to children's needs and promote their engagement in the clean-up task. We found marginal evidence that teachers' investment in consultation influenced children's interactions with their teacher during the clean-up task and no evidence that either dimension of alliance was related to children's observed positive engagement with the teacher during the typical classroom setting.

Teachers' positive interactions with children during the structured play task is the most proximal outcome of the intervention, as it is hypothesized that changes in teachers' interactive behaviors will then lead to changes in children's interactive behaviors. It is possible that we only saw statistically significant direct effects on teacher behaviors because insufficient time had elapsed for the benefits to translate to children's interactive behaviors (Han & Weiss, 2005), since all outcomes were measured at the end of the child's seven-week intervention window. Still, the signal that teachers' investment in consultation may be important for child-centered outcomes suggests that future work is

warranted to further understand how consultant-teacher alliance relates to not only teachers but children as well.

These findings also suggest that taking a relational perspective to teacher consultation may support the ultimate goals of the intervention and therefore should not be overlooked by intervention developers. While this concept is not new (Chu, 2014), and is likely implied among consultation models, it has thus far not been a primary focus in implementation research of school-based interventions. For instance, of 49 studies on early childhood coaching, only 6 (12.2%) explicitly reported that building a positive and collaborative partnership was an intentional part of the coaching model (Artman-Meeker et al., 2015). This may be partly due to a greater desire to describe and investigate the effectiveness of specific coaching behaviors, such as conducting observations, providing feedback, and action planning with teachers (Reinke et al., 2014). Although we were not able to test this hypothesis in the current study, the consultant-teacher alliance may be especially important for interventions that cover topics known to elicit feelings of stress or anxiety from teachers (e.g., handling disruptive behaviors), as the consultant can help to de-escalate teachers' stress and motivate teachers to reflect on their own actions and how they impact children. Future work should continue to unpack various features of consultation and examine whether certain features are more or less relevant depending on the goals of the consultation and intervention.

Indirect Links Between Consultation Alliance and Dyadic Teacher-Child Interactions Through Fidelity of Implementation

We found no evidence for our second hypothesis that the consultant-teacher alliance operates indirectly via teachers' fidelity of implementation to promote dyadic

teacher-child interactions. This finding is unexpected given that the primary role of teacher consultation, and support systems more broadly, is to support teachers' implementation of evidence-based practices (Domitrovich et al., 2008), and the substantial research linking stronger implementation to better outcomes (Alamos et al., 2018; Domitrovich et al., 2010; Marti et al., 2018; Sutherland et al., 2018). Prior work found that more positive teacher perceptions of the working relationship with a coach predicted greater implementation dosage but not quality (Johnson et al., 2018). This somewhat aligns with our own findings from the present study, which found no significant associations between either dimension of consultant-teacher alliance and implementation fidelity, which is similar to Johnson et al.'s (2018) description of implementation quality. It is possible that having a good relationship with a consultant could stir teachers to be compliant with their requests (i.e., implement with desired frequency), but does not contribute as strongly to the way in which teachers implement intervention activities. Furthermore, if a consultant perceives a strong relationship with a teacher, they may be less inclined to suggest areas for improvement, so as to not undermine the quality of the relationship. The null association between teacher investment in consultation and fidelity of implementation is inconsistent with previous work (Domitrovich et al., 2009). One difference, and potential explanation, is that Domitrovich et al. (2009) used coach ratings of teachers' fidelity, which the authors described as coaches' overall impressions of teachers' demonstrated skills in implementing strategies targeted by the intervention, while in the current study we used observed fidelity to *Banking Time* practices rated by independent coders. Using coach ratings of teachers' fidelity has the potential of introducing bias as coaches may over-rate

teachers' fidelity since it is a reflection of their own coaching skills. Given that this study is one of the first to examine a mediated pathway from consultant-teacher alliance to intervention outcomes via fidelity, our null indirect effects should be interpreted cautiously until more work on this topic has been conducted.

Limitations and Future Directions

This study has several limitations to note. First, the direct and indirect associations between consultant-teacher alliance and dyadic teacher-child interactions are correlational and cannot be interpreted from a causal lens. Furthermore, we were not able to establish time precedence across the variables of interest. All outcome measures were collected at the end of each child's intervention window. Consultant-teacher alliance was also reported at the end of each intervention window, but consultants reported retrospectively, considering their relationship quality and teachers' investment over the past seven weeks. Fidelity was an aggregate of teachers' implementation across the seven-week window. Future work should design teacher consultation studies with an eye toward timing, to better understand the underlying mechanisms. Second, we used consultants' reports of the quality of the working relationship with teachers. Teachers' perspectives may be more appropriate, given that the extent to which teachers feel supported by their consultant is more likely to influence their implementation and interaction quality. However, in our data, teachers overwhelming rated their relationship quality as high, leading to insufficient variability for statistical modeling. Measures that better capture nuances in perceptions of relationship quality, including interviews with teachers, would help to further unpack teacher consultation processes. Finally, in this study we were only able to examine two dimensions of the consultant-teacher alliance

(i.e., working relationship quality and teachers' investment in consultation). Investigating other dimensions conceptualized by Johnson et al. (2016) is an area of needed research. Future work could also examine the interplay between consultant-teacher alliance and different types of interventions. For example, *Banking Time* is a relational intervention aimed at improving the quality of dyadic teacher-child interactions, however, many classroom-based interventions focusing on children's social-emotional and behavioral outcomes are designed to be delivered to the entire classroom (e.g., Mattera et al., 2013). More research is needed to understand how teacher consultation processes operate across various approaches to intervention.

Conclusion

Prevention and implementation scientists have called for the field to develop a deeper understanding of the "what" and "how" behind teacher consultation to better support teachers' implementation of evidence-based practices to ultimately promote children's learning and development (Pas et al., 2014; Powell & Diamond, 2013). As such, this study explored teacher consultation in the context of *Banking Time*, a dyadic intervention designed to improve the quality of interactions between the teacher and a child perceived to display elevated levels of disruptive behaviors. Our findings highlight the importance of the consultant-teacher alliance for directly promoting intervention outcomes, although, unexpectedly, this association did not operate through improved fidelity of implementation. These findings contribute to our understanding of teacher consultation, yet much work remains to be done. Given the prevalence of teacher consultation in school-based interventions, it is necessary to fully attend to not only the intervention itself, but also the role of the support system for promoting successful

outcomes.

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Table 1. Descriptive Statistics for Key Study Variables

	N = 56 teachers *N* = 151 children		
	Mean (SD)	Range	% Missing
Consultant-teacher alliance predictors			
Quality of consultant-teacher relationship	4.35 (.81)	1.56 – 5.00	25%
Teacher investment in consultation	3.87 (.92)	1.46 – 5.00	25%
Implementation mediator			
Fidelity to Banking Time practices	3.71 (.51)	2.56 – 4.72	15%
Outcomes at post-window			
Teacher positive interactions with child in play task	3.27 (.87)	1.67 – 5.00	17%
Child positive interactions with teacher in play task	3.58 (.69)	1.70 – 5.00	19%
Child positive engagement with teacher in classroom	2.30 (.66)	1.06 – 4.19	14%
Outcomes at pre-window [a]			
Child positive engagement with teacher in classroom	2.29 (.64)	1.13 – 4.50	7%
Covariates			
Total number of consultation sessions	6.23 (1.95)	1 – 10	7%
Child age in months	48.70 (6.72)	34 – 66	0%
Child income-to-needs ratio	1.74 (1.45)	.22 – 5.27	7%
Teacher age	39.43 (11.46)	21 – 67	4%
Teacher ethnicity [b]	.50 (.50)	0 – 1	4%
Teacher bachelor's degree [c]	.72 (.45)	0 – 1	4%

Notes.
[a] Child's positive engagement with the teacher was the only outcome assessed at pre-window.
[b] Indicates proportion of teachers in sample who report their ethnicity as non-White.
[c] Indicates proportion of teachers in sample who hold at least a bachelor's degree.

Table 2. Bivariate Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Quality of consultant-teacher relationship	-												
2. Teacher investment in consultation	.87***	-											
3. Fidelity to Banking Time practices	.25**	.38***	-										
4. Teacher positive interactions with child in play task (post)	.24*	.36***	.16	-									
5. Child positive interactions with teacher in play task (post)	.16	.28**	.31***	.59***	-								
6. Child positive engagement with teacher in classroom (post)	.07	.09	.14	.26**	.29**	-							
7. Child positive engagement with teacher in classroom (pre)	.12	.17	.14	.38***	.35***	.42***	-						
8. Total number of consultation sessions	.22*	.23*	.15	-.12	-.05	.09	.05	-					
9. Child age	.02	.10	.02	-.05	-.05	-.02	.02	-.05	-				
10. Child income-to-needs ratio	.08	.09	.21*	.09	.24**	.02	.22*	.18*	-.18*	-			
11. Teacher age	-.18	-.22*	-.46***	.11	-.11	-.11	-.06	-.09	.06	-.11	-		
12. Teacher ethnicity	-.37***	-.38***	-.31***	-.10	-.03	-.24**	-.28***	-.24**	-.23**	-.13	.14	-	
13. Teacher bachelor's degree	-.05	-.02	.07	.16	.08	-.04	-.04	.03	.32***	-.04	.03	-.04	-

Notes.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. Mediation models for consultant-teacher alliance predicting dyadic teacher-child interactions through fidelity of implementation

Outcome	Consultant-teacher alliance predictor	Alliance on fidelity	Fidelity on outcome	Alliance on outcome	Indirect effect
		Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)
Teacher positive interactions in play task					
	Relationship quality	.06	.14	.25*	.01
		(.14)	(.14)	(.11)	(.03)
	Teacher investment in consultation	.18	.08	.37**	.01
		(.13)	(.14)	(.12)	(.03)
Child positive interactions in play task					
	Relationship quality	.06	.23†	.14	.01
		(.14)	(.13)	(.12)	(.04)
	Teacher investment in consultation	.18	.20	.23†	.04
		(.13)	(.14)	(.14)	(.04)
Child positive engagement with teacher in classroom					
	Relationship quality	.06	.05	.00	.00
		(.14)	(.11)	(.10)	(.02)
	Teacher investment in consultation	.18	.05	-.01	.01
		(.13)	(.11)	(.10)	(.02)

Notes.
Standardized coefficients are presented.
Consultant-teacher alliance predictors were run in separate models.
All models control for child characteristics (age, income-to-needs ratio, selected intervention window), teacher characteristics (age, ethnicity, bachelor's degree indicator), total number of consultation sessions, and consultant fixed effects. Pre-score was included for the outcome positive engagement with teacher.
Standard errors were adjusted to account for clustering of children within teachers. Standard errors were also bootstrapped with 2,000 draws.
** $p < .01$, * $p < .05$, † $p < .10$.

Implementing a PD Consultation Process in a State Preschool Program: Describing the Process and Findings from a Research Practice Partnership

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Abstract

This study describes the implementation process and findings of a PD Consultation process designed to enhance the quality of professional development (PD) offered to preschool teachers working in Virginia's state-funded preschool program as part of a larger research practice partnership centered on quality improvement. Implementation of the PD Consultation process, including the development of a PD Rubric and Questionnaire, is described. The PD Rubric was used to understand the baseline quality of PD offered to preschool teachers across 121 school divisions and to guide individualized PD consultation calls between division leaders and consultants. After describing the statewide implementation of the PD Consultation process, data related to the quality of PD across divisions and division leaders' satisfaction with this process are presented. Findings indicated that the area of PD with the greatest room for improvement was providing PD that supports teachers to refine their teaching skills, as opposed to providing teachers only with new knowledge or general discussion. Division leaders found the PD Consultation process to be valuable, particularly talking with their consultant. Findings from this study provide insight into how to bridge research and practice around supporting the delivery of effective PD for preschool teachers at scale.

Keywords: Preschool; Professional development; Research practice partnership; Descriptive analysis; Statewide implementation

High-quality early childhood education (ECE) has great potential for promoting young children's school readiness skills, particularly for children from low-income backgrounds (Barnett et al., 2018; Yoshikawa, Weiland, & Brooks-Gunn, 2016). Thirty-three percent of all four-year-olds in the country attended a state-funded prekindergarten program in 2017-2018, an increase of about 19% since 2002 (Friedman-Krauss et al., 2019). Increased investments in preschool will only translate to gains in children's school readiness if the aspects of teaching that matter most for children's learning are implemented with sufficient levels of quality (Burchinal, 2017). Process quality, or the daily interactions between teachers and children and provision of learning opportunities, is most strongly linked to gains in children's learning (Burchinal, 2017; Burchinal, Vandergrift, Pianta, & Mashburn, 2010; Hamre, 2014; Keys et al., 2013; Mashburn et al., 2008; Pianta, Downer, & Hamre, 2016), yet national assessments of process quality indicate that teachers are missing opportunities to engage with children in activities that encourage their conceptual understanding, analytical reasoning, or complex language use (Cabell, DeCoster, LoCasale-Crouch, Hamre, & Pianta, 2013; Chien et al., 2010; LaParo et al., 2009; Pianta et al., 2016). These types of cognitively stimulating interactions are necessary for promoting children's key domains of school readiness, including their academic and language skills (Johnson, Markowitz, Hill, & Phillips, 2016; Mashburn et al., 2008; Weiland, 2016).

Professional development (PD) can be a key lever for supporting teachers' provision of high-quality teaching (Institute of Medicine & National Research Council, 2015). However, a gap exists between the type of PD that has been shown to benefit teachers' practice and that which is most commonly delivered in preschool programs

(Hamre, Partee, & Mulcahy, 2017; Winton, Snyder, & Goffin, 2016). Researchers often test intensive, pre-packaged PD models that tend to rely on resources external to preschool programs. Although much research has documented the benefits of these PD models (Brunsek et al., 2020; Egert, Fukkink, & Eckhardt, 2018; Fukkink & Lont, 2007; Markussen-Brown et al., 2017; Werner, Linting, Vermeer, & Van IJzendoorn, 2016), the available but limited data on PD at-scale suggest that they are not typical of most teachers' PD experiences. "Business-as-usual" PD for preschool teachers involves intermittent workshops or trainings that deliver general content related to children's learning and development (Buysse, Hollingsworth, & West, 2011; Cox, Hollingsworth, & Buysse, 2015; Harding et al., 2019; Schachter, Gerde, & Hatton-Bowers, 2019), without any evidence that this type of PD benefits teachers or children (Weiland, McCormick, Mattera, Maier, & Morris, 2018). Coaching is becoming more widely used, but the majority of state-funded preschool teachers do not have access to sustained opportunities to be observed and receive feedback on their practice (Tout, Metz, & Bartley, 2013). Furthermore, the existing data on PD at scale are not actionable for state or school district leaders because they are neither embedded in a continuous improvement framework nor individualized to specific programs or districts. In the U.S. education system, school districts are the "unit of implementation" (Horner, Sugai, & Fixsen, 2017) for scaling-up evidence-based practices, as they have authority over what happens in schools and classrooms. This is true for PD in school-based preschool programs, yet we know very little about how districts within a state approach and implement PD for preschool teachers in a business-as-usual context (Weiland, 2016).

This study describes the implementation process and findings of a PD Consultation process that was situated within a larger research practice partnership (RPP) in Virginia. Our research team worked collaboratively with partners at the Virginia Department of Education (VDOE) to design a PD measurement and feedback process which sought to systematically assess the quality of current PD offerings across school divisions (Virginia's term for district, used hereafter) participating in the Virginia Preschool Initiative (VPI) and then support division leaders to apply this knowledge toward the provision of more effective PD for preschool teachers. The study adds to our understanding of what typical PD looks like at scale and how the field might begin to narrow the research to practice gap by supporting division leaders to design and deliver the types of PD experiences that research indicates are most likely to improve teachers' practice.

A Research Practice Partnership in Virginia

VPI is Virginia's state-funded preschool program that serves roughly 18,000 at-risk four-year-olds. In the 2019-2020 school year, the only PD requirement was that divisions must provide 15 hours of PD to preschool lead and assistant teachers, which is somewhat less stringent than other states that require individualized PD plans and coaching (Freidman-Krauss et al., 2019). However, over the past few years, Virginia has made a deliberate effort to improve the quality of its preschool programs. We briefly provide some background context related to the state's increasing focus on quality and the origins of the RPP between researchers at the University of Virginia's (UVA) Center for Advanced Study of Teaching and Learning (CASTL) and early childhood leaders at the VDOE.

In December 2017, the Joint Legislative Audit and Review Commission (JLARC) released a report to the Governor and General Assembly of Virginia titled *Improving Virginia's Early Childhood Development Programs* (JLARC, 2017). The report cited 2014 data collected via the state's kindergarten readiness assessment, which found that one-third of children in Virginia entered kindergarten lacking school readiness skills in at least one domain across literacy, math, social skills, and self-regulation (Williford, Downer, & Hamre, 2014). Regarding VPI, the report found that clear expectations and support for ensuring a high-quality preschool program were lacking, primarily because implementation of the program was largely up to localities, and provided recommendations around program quality improvement. In 2018, UVA CASTL and VDOE began partnering to conduct this work, with *A Plan to Ensure High-Quality Instruction in All Virginia Preschool Initiative Classrooms* serving as a blueprint (VDOE, 2018).

The plan describes three levers for improving preschool quality: using an evidence-based curriculum, assessing teacher-child interaction quality, and providing teachers with individualized PD. The current study is situated within the third lever – providing teachers with individualized PD. At the time of the RPP, the only requirement from the state was that divisions must offer lead and assistant teachers 15 hours of PD per year, but the form and focus of PD was decided by each division. Divisions provided the state with a brief overview of their PD plan, but detailed information was not collected and the provision of PD and its quality was not well-understood statewide. VDOE communicated to UVA CASTL their desire to obtain more detailed information about PD quality in VPI via a rubric and for UVA CASTL consultants to provide technical

assistance that was data-driven, or individualized to divisions' PD needs. In response to VDOE's request, during the 2019-2020 school year, we worked closely with VDOE to design and implement a PD Consultation process that was centered on assessing the quality of PD offered to preschool teachers in each VPI division and then using that information to guide individualized consultation sessions between VPI division leaders and UVA CASTL consultants. The goals of the individualized consultation sessions were to provide VPI division leaders with feedback specific to their division's PD strengths and areas with room for growth and to work with leaders to plan and support their next steps to improve the quality of their PD. The PD Consultation process was grounded in the literature on effective elements of PD, discussed next.

Elements of Effective PD

Recent reviews of PD in early childhood support the conclusion that PD is most likely to improve teachers' practice and children's learning and development when certain elements are present (Darling-Hammond, Hyler, & Gardner, 2017; Desimone, 2009; Hamre et al., 2017; Winton et al., 2016; Zaslow, Tout, Halle, Whittaker, & Lavelle, 2010). These elements include using data to guide PD delivery (e.g., content and dosage) and evaluate its effectiveness, focusing on a manageable number of specific objectives, targeting PD to teachers' classroom practice, and providing personalized feedback, all within a coherent system that aligns PD with other programmatic activities and is accessible for lead and assistant teachers across different program types.

Administrators and school leaders need information on which to base their decisions regarding teachers' PD (Derrick-Mills, 2015; Mead & Mitchel, 2016), including which teacher practices to target and with what intensity, how to tailor PD so it

meets teachers' individualized needs, and how to determine whether the PD enhances teachers' practice and children's learning. Child assessments and observations of classroom practice can reveal information that is useful for answering these questions (Farran, Meador, Christopher, Nesbitt, & Bilbrey, 2017; Hamre et al., 2017). For example, data can indicate what types of practices are most challenging for a teacher and the point at which the teacher displays consistent improvements to these practices (Farran et al., 2017; Darling-Hammond et al., 2017; Weiland et al., 2018). While it is clear that one-time workshops are not sufficiently intense for changing teachers' practice, the amount of PD that is sufficient is less clear and depends on factors such as the teachers' prior knowledge and skills and the complexity of the PD objective (Gerde, Duke, Moses, Spybrook, & Shedd, 2014; Zaslow et al., 2010). Using data to inform the content and intensity of teachers' PD also helps narrow its focus, which is another element of effective PD.

Effective PD targets a manageable number of clearly articulated objectives that aim to improve teacher practices (Winton et al., 2016; Zaslow et al., 2010). The ultimate goal is that teachers engage in effective interactions and instructional across all content and curricular domains, but teachers cannot be expected to improve in all areas at once (Downer, Jamil, Maier, & Pianta, 2012). Restricting objectives to a small number, based on most pressing needs identified in data, allows teachers to dedicate the necessary time and space to gain new knowledge and transfer that knowledge into observable behavior change. PD objectives should not only be reasonable in scope, they should also articulate the specific knowledge and skills to be gained from PD (e.g., Barton, Fuller, & Schnitz, 2016). When the goals of PD are clearly articulated through precise objectives, versus a

more ambiguous focus on general improvement, teachers have a better understanding of the desired outcome and are therefore more likely to change their practice (Hamre et al., 2017; McLeod, Hardy, & Grifenhagen, 2019).

Teachers need PD formats that allow them to link new conceptual knowledge to concrete skills and behaviors enacted in the classroom (Darling-Hammond et al., 2017; Desimone, 2009; Schachter et al., 2019). Role-playing specific behaviors, reviewing videos that exemplify a concept or skill, and analyzing or reflecting on a practice with a coach are all ways in which PD can change teachers' practice (Early, Maxwell, Ponder, & Pan, 2017). These activities are in contrast to more typical PD activities, such as workshops or trainings, in which teachers play a more passive role in receiving information, with limited opportunities for application to the classroom setting (Cox et al., 2015). Observing teachers and providing them with feedback that is specific to their own classroom practice is a particularly effective strategy for improving teaching and learning outcomes (Brunsek et al., 2020; Desimone & Pak, 2017; Egert et al., 2018; Pianta et al., 2017; Reinke, Stormont, Herman, & Newcomer, 2014; Weiland et al., 2018).

Effective PD is coherent, meaning that it is aligned to and supports a program's "instructional model," or the overall approach to teaching and learning, including curriculum, child assessments, and vision for quality teaching (LiBettti & Mead, 2019). This intentional alignment ensures that PD does not operate apart from a program's core educational activities (e.g., curriculum implementation, child assessment), but rather purposefully incorporates these activities so teachers have a clear understanding of a program's goals and how their PD supports them to reach those goals (Hamre et al.,

2017). Coherent PD does not happen by chance; it relies on skilled leaders to articulate a vision and intentionally plan PD that fits the program's instructional model (Whalen, Horsley, Parkinson, & Pacchiano, 2016).

Finally, in order for PD to provide teachers with the knowledge and skills to enhance their practice, teachers must be able to access it. Reflecting the importance of providing PD to all teachers, in 2016 the National Institute for Early Education Research (NIEER) updated their PD quality benchmark from 15 hours of in-serve PD for lead teachers only to 15 hours of PD per year, individualized PD plans, and classroom-embedded support for all lead and assistant teachers (Friedman-Krauss et al., 2019). However, only 9 states met this requirement in 2017-2018 (Friedman-Krauss et al., 2019). It is not uncommon for states to require in-service PD for only lead teachers or to include assistant teachers in some but not all of the PD offerings. Furthermore, research suggests that collaboration among early childhood educators across sectors (e.g., Head Start, state-funded preschool) can provide teachers with social capital and new resources that benefit their practice (Mowrey & King, 2019). Yet, assistant teachers are less likely to collaborate with colleagues than lead teachers (Mowrey & King, 2019). Thus, ensuring that lead and assistant teachers engage in all aspects of PD and have opportunities to collaborate with colleagues across sectors is an important element of effective PD.

Present Study

The extent to which division leaders consider the above elements when planning and delivering PD to preschool teachers is unknown, due to the limited data on PD at scale (Tout et al., 2013). This gap in our knowledge of current practice is problematic because school divisions may be expending valuable resources (i.e., time and money) on

PD that lacks evidence of impact (Winton et al., 2016). Furthermore, the field does not have examples of how to narrow the research to practice gap at scale, since most intervention work is centered on testing specific PD models that target a particular content area (i.e., language and literacy outcomes) in relatively small populations. The goal of the current study was to address both of these gaps by learning from the implementation of a PD Consultation process delivered in Virginia's state-funded preschool program in the 2019-2020 school year.

Drawing from a larger RPP targeting preschool quality improvement, this study describes the implementation of a continuous improvement process toward more effective PD provision for preschool teachers and provides a picture of typical PD offerings across the state. We address three research questions that provide insight into the PD Consultation process: (1) What did implementation of the PD Consultation process look like across VPI divisions? (2) What information about PD in VPI was provided to the state as a result of this process? (3) How useful did VPI leaders find the PD Consultation process? To answer these questions, we draw from implementation data, coding data, survey results, and overall reflections on conducing this work over the past year.

Method

Sample

The sample for this study includes the 122 school divisions in Virginia participating in VPI, the state-funded preschool program. Divisions were required by VDOE to participate in the PD Consultation process with researchers at UVA CASTL. Divisions vary widely in their total population of children under age 5, the proportion of

children under age 5 living in poverty, and the size of their VPI program (i.e., number of classrooms and schools/centers that house VPI). For example, divisions ranged from anywhere between one classroom in one school/center to 80 classrooms and 48 schools/centers. Additionally, the proportion of children under five who live in poverty varies substantially, ranging from less than 10% to over 60%, with the highest poverty rates concentrated in southern and southwestern areas of the state. Appendix A summarizes this descriptive information for all VPI divisions.

Procedures

Responding to the goals of our partners at VDOE, researchers at UVA CASTL worked with VDOE to develop a PD Consultation process to assess the quality of VPI divisions' PD across the state and to generate data to inform individualized consultations sessions between division leaders and UVA CASTL consultants. The PD Consultation process consisted of three steps, as shown in Figure 1: (1) VPI leaders reported their division's current PD practices by answering questions on a form (i.e., PD Questionnaire, see Appendix B), (2) UVA CASTL consultants rated the quality of PD, as described in the Questionnaire, using a rubric (i.e., PD Rubric, see Appendix C), and (3) consultants shared with divisions their score, notable strengths, and areas for improvement for each element on the PD Rubric before verbally discussing the feedback and planning next steps for improvement over videoconference. The PD Rubric was intended to operationalize PD quality for the purposes of generating baseline data on each division and providing a concise framework in which UVA CASTL consultants could situate their technical assistance and consultation work with divisions. At the end of the PD Consultation process, VPI leaders completed a feedback survey that asked them to report

on the usefulness of the consultation, the likelihood that they would make changes to their PD as a result of the consultation, and their satisfaction with specific aspects of the consultation, including the PD Rubric, PD Questionnaire, their consultant's written feedback, and the videoconference with their consultant.

The first author led efforts to develop the PD Rubric and PD Questionnaire, in close collaboration with UVA CASTL researchers and VDOE leaders. The PD Rubric, described in more detail in the "Measures" section, assesses the quality of six PD elements that research indicates are key ingredients for successful PD. These six elements are data-driven; specific, articulated objectives; practice-focused; feedback and analysis loops; coherence; and access for all teachers. To develop the rubric, the first author reviewed the literature base on effective PD and drafted descriptions of the PD elements across four levels of quality (Not Yet, Emerging, Effective, and Exemplary). First, descriptions of each PD element were drafted for the Exemplary level, to operationalize the "gold standard," followed by the three preceding levels of quality. The development process was informed by the literature as much as possible, but professional judgment was required to translate research for a practice-based tool. For example, some judgment was needed to ensure that expectations for divisions were reasonable to achieve and that the four levels of quality were conceptually distinct from one another. Once the first draft was complete, an iterative process was used to refine the PD Rubric such that drafts of the rubric were shared with a core group of researchers at UVA CASTL who have expertise in early childhood PD and our partners at VDOE. After approximately four rounds of feedback and revisions, an initial version of the PD Rubric was finalized. The lead author then developed the PD Questionnaire, a 6-page form including a combination

of open-response questions and structured tables designed to be filled-in, to obtain information from VPI divisions regarding their PD plans. The questionnaire contained one or two questions related to each of the six elements on the PD Rubric. For example, the PD Questionnaire asked divisions to report on their plans for using data (e.g., which specific data sources they consult and any data tracking tools they have in place to facilitate effective data use), the objectives they anticipate covering in PD throughout the year, and a general breakdown of the amount of time spent across common PD activities, including workshops, professional learning communities, and observation and feedback loops.

Data collection. In early fall 2019, UVA CASTL and VDOE hosted a webinar for VPI leaders to explain how the PD consultation process would unfold in the 2019-2020 school year. During this webinar, the first author and UVA CASTL consultants introduced the PD Questionnaire and Rubric. We provided brief explanations of the six PD elements as well as the type of information we aimed to collect via the Questionnaire. The PD Rubric was provided to divisions at end of the webinar so the scoring criteria were very transparent. We did not provide an example of a completed PD Questionnaire, because we did not want to influence divisions' responses to the questions. In addition to the PD Questionnaire, divisions were encouraged to submit supplemental information about their PD plans, such as sample PD materials, observation checklists, and protocols, but this was not required. The 122 divisions were split into four, rolling groups with consultants completing the PD assessment and feedback consultation work over a 5-month period. The deadline to submit the PD Questionnaire for the four groups was mid-October, late-November, early-January, and early-February, respectively.

Measuring the quality PD elements. After UVA CASTL received a division's PD Questionnaire, the questionnaire was independently coded by two coders. One of these coders was the division's consultant; the second was a coder who did not interface with division leaders. Each second coder was randomly assigned to code roughly half of the PD Questionnaires, such that both double-coders consensus coded across the five consultants. The two coders independently rated the PD Questionnaire using the PD Rubric and codebook and then held a 30-45-minute meeting during which the two coders shared their independent codes and reached agreement on consensus codes. Once consensus codes were reached, the three sets of codes (i.e., the consultant's codes, the double-coder's codes, and the consensus codes) along with select information about divisions' PD plans were inputted into Qualtrics, including which data sources were being used, broad areas of focus for PD objectives (e.g., curriculum implementation), percent of PD that was passive versus practice-focused, and total number of feedback loops.

Once coders began coding divisions' PD Questionnaires, the lead author created a codebook that outlined more detailed coding guidance than was possible to include in the PD Rubric. A primary purpose of the codebook was to illustrate the level of clarity that was necessary in a division's response to score a particular item as having been met. For example, the codebook provided examples of divisions' responses that would be coded affirmative (e.g., the division is using data to tailor the focus of teachers' PD) or negative (e.g., either the division is not using data to tailor the focus of teachers' PD or the response provided insufficient detail to mark as affirmative). Similarly, the codebook provided examples of PD objectives that were precisely articulated and examples of

objectives that were too vague to be counted as such. The codebook also provided general coding guidelines. For example, coders were allowed to consider responses across the entire PD Questionnaire to code a particular PD element, rather than being constrained to a division's response to the one or two questions that were specific to each PD element. As another example, if the division listed the number of hours per week they engaged in a particular PD activity, coders calculated the overall time spent in that activity by multiplying by 36 weeks in the year. The codebook was continually updated throughout the coding process, especially at the beginning when the coding team was making many coding decisions. All consultants and second coders met regularly (typically every week) to discuss coding challenges and to review additions that had recently been made to the codebook.

Measures

Quality of divisions' PD. The PD Rubric was designed to assess the quality of VPI divisions' PD. The rubric assesses six elements of PD quality using a four-point Likert-type scale (Not Yet, Emerging, Effective, and Exemplary), with higher scores reflecting better quality PD. The first element – data driven – is comprised of two indicators: data use, which reflects divisions' use of data to inform and/or evaluate PD, and data-related resources, which reflects the extent to which divisions have mechanisms (i.e., meeting structures, tools) in place that facilitate continual data collection and analysis across the school year. The second element – specific, articulated objectives – assesses both the quantity and precision of the PD objectives. The third element – practice-focused – assesses the proportion of PD that provides teachers with opportunities to build skills (i.e., practice-focused) as opposed to PD in which teachers learn new

knowledge or discuss practice generally (i.e., passive PD). The fourth element – feedback and analysis loops – assesses the number of times teachers have the opportunity to implement a new practice, receive feedback on their practice, and analyze their practice with a colleague. The fifth element – coherence – assesses the degree to which PD incorporates a focus on curricula, child assessments, and information obtained from teacher observations, to promote a clear and focused vision for PD that is aligned with key programmatic activities. The sixth element – access for all teachers – assesses the extent to which lead teachers and instructional aides across different program types (e.g., VPI, Head Start, Early Childhood Special Education) receive the same PD experiences. While the focus of CASTL's consultations primarily pertain to enhancing PD in VPI, the state is moving toward a more unified governance structure for early childhood and therefore VDOE wanted to learn how accessible PD is to teachers who are not funded by VPI but may work in VPI settings or with VPI teachers.

Inter-rater reliability was assessed through weighted Kappas for all eight PD quality items (e.g., data-use; data-related resources; data-driven; specific, articulated objectives; practice-focused; feedback and analysis loops; coherence; and access). The weighted Kappa considers degree of agreement, as opposed to absolute agreement, when calculating reliability from an ordinal scale (Cohen, 1968). As the PD Rubric assesses quality on a 4-point ordinal scale, the weighted Kappa is the appropriate reliability statistic. Weighted Kappa coefficients are reported in the Results section of this article.

Division-reported feedback on consultation process. Upon completing all steps in the PD Consultation process, division leaders completed a short feedback survey that asked them to report their perceptions of the clarity of the PD Rubric and Questionnaire

and the utility in engaging in the PD Consultation process. Example items include "My team will change our division's PD practices as a result of the PD consultation process," "The PD Questionnaire was easy to complete," and "My consultant's written feedback on the PD Feedback and Planning form was helpful." Responses were provided on a five-point Likert scale (1 = completely disagree to 5 = completely agree). If a respondent selected either "disagree" or "completely disagree" on one of the Likert-scale items, they were shown a follow-up, open-ended question that asked what they would change to improve the particular consultation aspect with which they reported being dissatisfied. All respondents were also asked two open-ended responses: "What was most helpful about the PD Consultation process?" and "What suggestions would you give to improve the PD Consultation process?".

UVA CASTL consultation notes. Consultants recorded qualitative notes via a Google form following all videoconferences with division leaders. The specific topics reported in this study include the average length of the call, the roles of the division leaders participating in the call, the extent to which there was any resistance from division leaders regarding the consultation, and major themes or feedback communicated by the division leaders.

Results

The goals of the PD Consultation process between state leaders at VDOE and UVA CASTL were to (1) systematically assess the quality of current PD offerings in VPI and (2) use that knowledge to provide individualized consultation sessions in which UVA CASTL consultants supported VPI leaders to make plans to improve one or more aspects

of their division's PD. Below we provide a summary of findings, organized around our three research questions that aim to provide insight into this goal.

What Did Implementation of the PD Consultation Process Look Like Across VPI Divisions?

The PD Consultation process was a learning experience for both for VPI leaders and UVA CASTL researchers and consultants. We describe implementation of the process using data captured from our coding procedures and from UVA CASTL consultants' notes. We also draw from our team's firsthand reflections of the implementation successes and challenges. Over the course of the 2019-2020 school year, UVA CASTL received and coded 121 (99% of divisions) PD Questionnaires and, using scores generated from the PD Rubric, provided individualized feedback to VPI leaders over videoconference regarding their division's PD strengths and areas with room for improvement. One division did not complete the PD Consultation process due to staffing challenges.

Using the PD Rubric as an anchor for consultation worked well as a statewide process because it was broad enough to apply to all divisions yet provided specificity around key elements of PD that have the strongest evidence for improving teachers' practice. For example, some divisions implemented specific models like the ExCELL program which focuses on children's language and literacy development, other divisions used STREAMin^3, a comprehensive curriculum and PD model, while others had less structured PD models in place. Because the PD Rubric assessed features of PD, rather than pertain only to coaching or a particular PD model, we could apply the rubric to a diverse set of PD plans and gather useful information that gives an overarching picture of

PD statewide. However, we learned that divisions did not use data in the stepwise progression that we had anticipated and outlined in the original version of the PD Rubric, which resulted in an early change to the rubric to make it feasible to score the types of responses divisions provided. The PD Rubric assessed four ways in which data should be used to inform PD offerings: (1) to plan the broad focus area(s) of PD, (2) to determine the appropriate amount of ongoing PD, (3) to tailor the focus of PD to meet teachers' needs, and (4) to track intended outcomes. During the development phase of the PD Rubric, we hypothesized that these four purposes for using data progressed from simpler to more complex. Therefore, in the original version of the PD Rubric, the four levels of quality reflected this stepwise progression. Divisions' responses on the PD Questionnaire did not confirm this hypothesis, however. In the revised PD Rubric, the four levels of quality are distinguished by the total number of ways a division is using data to inform PD offerings, with using data in more ways reflecting higher quality, but there is not a requirement that certain purposes precede others, with one exception. We did maintain that using data to plan the broad area(s) of focus was a foundational and necessary prerequisite to the three other purposes, which was reflected in the revised scoring of the data-driven element.

A second reflection was that divisions approached the PD Consultation process with varying levels of capacity and understanding of the PD elements. Consultants noted that some VPI leaders said the PD Questionnaire was challenging to complete, because they either did not understand the PD elements, did not have sufficient time to devote to filling it out, or could not easily describe their PD in the way we were asking. For example, some VPI leaders from larger school divisions that had many disparate

schools/centers implementing VPI, each with their own PD, found it difficult to provide a high-level description of PD to capture the typical experience of a teacher in the division. Coding the PD Questionnaires was challenging for these reasons, in addition to the open-ended nature of the questions and our decision to withhold from divisions examples of completed questionnaires. An issue we encountered was that some divisions' responses on the PD Questionnaire were vague, in which case we decided that consultants' and second coders' scores should trend down. We also continually iterated on the codebook, adding more specific examples of responses and their corresponding score as they were encountered in the coding process. However, the coding challenges are evident in the coding reliability statistics.

Weighted Kappas were calculated using data from all divisions whose PD Questionnaires were double-coded (n = 108). Thirteen divisions were not included in reliability calculations due to their PD Questionnaires being among the first to be coded. After a series of initial coding changes were made, these 13 questionnaires were re-coded, either by one consultant or a consultant and a second coder working together, to reflect the final coding decisions. Weighted Kappas for each item were: data-use (.56), data-related resources (.66), data-driven (.62), specific, articulated objectives (.41), practice-focused (.75), feedback and analysis loops (.84), coherence (.51), and access (.76). Due to poor to moderate coding reliability, we used consensus scores that were agreed upon by the consultant and second coder in all consultation work with divisions and allowed for adjustment codes to be made if the consultant gained relevant information that would change a score during their videoconference with VPI leaders. Although we did not plan on using adjustment codes when conceptualizing the PD

Consultation process, it became clear early on that clarifying information was often shared on the videoconference between divisions and consultants and that we needed a process to reconcile discrepancies when an original score was not accurate based on new information gained during this call. Divisions were allowed to either re-submit their PD Questionnaire, in the case of more substantive edits, or the consultant could update the score for an element(s), if the change was straightforward. In 43% of divisions at least one PD element score was adjusted on or after the videoconference using this process. About 95% of adjustment codes resulted in an increased score, and the greatest number of adjustment codes were made for the practice-focused element.

Consultants met via videoconference with VPI leaders in the 121 divisions that turned in a completed PD Questionnaire. During the call, the consultant provided feedback to VPI leaders, including the division's PD Rubric scores, and together they chose one or two areas of need that the division would prioritize for improvement efforts. For divisions that struggled to complete the PD Questionnaire, the consultant spent time on the videoconference explaining the PD elements and making connections between the elements and the division's PD as described by VPI leaders on the call. As previously mentioned, to ensure the PD Rubric scores were valid, the consultant and division could elect to adjust consensus scores (i.e., scores agreed upon by consultant and second coder) if relevant information was obtained during the videoconference. Some divisions had two videoconferences with their consultant, particularly if the division made substantial revisions to their PD Questionnaire after the first videoconference.

The videoconferences lasted about seventy-five minutes on average and were attended by about two division leaders. The most common role of divisions leaders who

attended the videoconference was a VPI coordinator. These coordinators were often responsible for a variety of initiatives beyond VPI, including overseeing federal programs or early childhood special education services. Some coordinators were also school principals. In a few cases, assistant principals or assistant superintendents attended the videoconference, but this was less common. Consultants noted that the majority of division leaders were receptive to the consultation and feedback provided around their PD. In about 74% of videoconferences, consultants perceived no resistance from VPI leaders. In about 22% of videoconferences, consultants perceived mild resistance, more so at the beginning of the call. In about 4% of videoconferences, consultants perceived quite a bit of resistance. Common reasons for resistance included divisions being overwhelmed by many competing priorities and feeling like they had limited capacity to make improvements to PD. Seven divisions' resistance was specifically related to perceptions that one or more of their PD Rubric scores were not representative of their PD; in three of these divisions, consultants noted that they were able to resolve this through the adjustment code process. Data-driven and practice-focused were the PD elements most commonly chosen for improvement efforts, which aligned to statewide needs as assessed by the PD Rubric.

What Information About PD Was Provided to the State as a Result of this Process?

Data from the PD Rubric were provided to VDOE to paint an overarching picture of the quality of PD across VPI divisions. Table 1 displays means and standard deviations for each element of PD, using the final set of codes (i.e., consensus codes or adjustment codes, when applicable). The quality of PD as reported by division leaders and coded by a consultant and research team varied across the state. For each PD element, we observed

the full range of possible scores on the PD Rubric (1 = Not Yet, 2 = Emerging, 3 = Effective, and 4 = Exemplary). Figure 2 visually shows this distribution, providing the percent of divisions that fell into each of the four levels of quality described on the PD Rubric. Below we summarize our findings for each element of PD.

Data-driven. A data-driven approach to PD ensures that the content is relevant, amount is sufficient, and ultimately that the PD is effective. The data-driven element was reported overall as well as broken into its two indicators of data-use and data-related resources. Divisions scored higher on data-use (M = 2.80, SD = 1.10) than data-related resources (M = 2.17, SD = .92), with the combined data-driven element in between these two sub-scores (M = 2.30, SD = .88). Regarding divisions' use of data to plan and evaluate PD, 16% of divisions did not use data at all, only used data to plan the broad focus area of PD, or used data in ways *besides* planning the broad focus area of PD, falling into the Not Yet category. Twenty-two percent of divisions used data to plan the broad focus area of PD and for one additional purpose (e.g., determine the appropriate amount of ongoing PD, tailor the focus of PD to meet teachers' needs, or track PD's intended outcomes), scoring an Emerging on the PD Rubric. Twenty-six percent of divisions used data to plan the broad focus area of PD in addition to two of the other purposes or all three of the other purposes if only using one data source (e.g., curriculum fidelity data). To meet the Exemplary level, divisions had to use data from at least two distinct sources (e.g., curriculum fidelity data and child assessment data) in all four ways described on the PD Rubric. Thirty-six percent of divisions scored Exemplary for data-use. The vast majority of divisions (85%) reported using CLASS data on teacher-child interactions to plan and/or evaluate their PD offerings, with the next highest-reported data

source being the PALS Pre-K literary assessment (58% of divisions). Less than half of divisions (41%) reported using child assessment data besides PALS Pre-K.

The second indicator comprising the data-driven element was data-related resources. Data-related resources captured the extent to which divisions had access to and used various resources that facilitated VPI leaders to efficiently use data to make informed, data-driven decisions around PD. For this indicator, we scored the presence of three types of resources. The first, procedures for looking at data, was the most basic type of resource. Descriptions of monthly meetings in which data were reviewed or a specific person who was responsible for looking at data were considered procedures. The second resource was data tools, which included specific tracking mechanisms (e.g., Excel spreadsheet) or analysis tools that were used to identify trends or areas in need of PD. The third resource was a data system. A data system was the clear use of a data tool in a systematic, ongoing way over time. A division could not receive credit for the presence of a data system without having also met the data tool benchmark. Overall, we found that 26% of divisions had none of the three types of data resources (i.e., Not Yet) and that 40% of divisions reported the presence of either procedures for looking at data or a data tool but not both and had no data system in place (i.e., Emerging). A quarter of divisions (25%) reported having both procedures and a data tool or all three resources that only involved one data source (i.e., Effective). Only 9% of divisions had all three data resources that incorporated at least two data sources (i.e., Exemplary). When looking strictly at the presence of data tools, 68% of divisions reported using no data tools. The most commonly reported data tools were spreadsheets such as Excel (24% of divisions) or an online data management system (14% of divisions).

Specific, articulated objectives. Specific, articulated objectives clearly delineate what teachers should gain from PD. Objectives should be limited to a few key areas so teachers are repeatedly exposed to PD content and have sufficient time to develop new knowledge and skills. The majority of divisions (66%) scored emerging on this element, meaning that the objectives were either too vast in number and therefore unrealistic for a teacher to devote sufficient time and attention to or most of the objectives were too vague as to be able to concretely identify what the teacher would know and/or do differently as a result of the PD. As an example, "teachers will use the curriculum to teach children self-regulation skills" was considered imprecise, while "teachers will use formative assessments to inform instructional decisions for whole group and small group learning" was considered precise. A little over a quarter (27%) of divisions scored Effective on this element which required a maximum of 1-3 broad areas of focus with no more than five objectives each and that most of the objectives be precise. Only 3% of divisions scored Exemplary which added a further criterion that the division derived PD objectives from a framework that made clear for teachers and coaches or administrators the practices that constitute high-quality teaching and which teachers are expected to implement in that setting. A very small percentage of divisions (4%) scored Not Yet on this element, which was due to this category being quite a low bar (i.e., division had no PD objectives or the objectives were not related to early childhood teachers). PD objectives most frequently focused on improving teacher-child interactions (75% of divisions) and curriculum implementation (63% of divisions). Targeting content areas through PD was less frequently reported, with 36% of divisions focusing on social-emotional learning or self-regulation, 25% of divisions focusing on language and literacy instruction, and 14% of

divisions focusing on math instruction. Even fewer divisions reported delivering PD that helped teachers support children with disabilities (12% of divisions) or dual-language learners (4% of divisions).

Practice-focused. Practice-focused PD intentionally builds teachers' skills to improve their practice. According to our PD Rubric data, the practice-focused element showed the most room for growth. Teachers in 27% of divisions spend between 75-100% of their total PD time across the year in passive activities, including workshops and trainings in which they receive new knowledge, rather than activities in which they took a more active role such as analyzing videos of themselves or others teaching, reflecting on their own classroom practice, and receiving feedback on their practice (i.e., Not Yet). Teachers in 42% of divisions spent between 50-74% of their total PD time across the year in passive activities (i.e., Emerging). In 24% of divisions, teachers spent between 25-49% of their total PD time in passive activities (i.e., Effective). In only 7% of divisions did teachers spend less than 25% of their total PD in passive activities (i.e., Exemplary). Passive PD, or "one and done" workshops, are not as effective as PD activities that involve active and ongoing analysis, reflection, and practice of key teaching strategies.

Feedback and analysis loops. Feedback and analysis loops provide teachers with the opportunity to implement a new practice, receive feedback on their practice, and analyze their practice with a colleague. The feedback and analysis loops element was a relative strength on the PD Rubric. Most divisions reporting providing at least one feedback and analysis loop to teachers, but the number of feedback loops varied across divisions. For instance, 34% of divisions reported that teachers received feedback on and analyzed their practice 2-3 times/year (i.e., Emerging), 38% of divisions reported that

feedback and analysis loops occurred 4-8 times/year (i.e., Effective), and 24% of divisions reported that teachers received more than eight feedback and analysis loops across the year (i.e., Exemplary). Only a small percentage of divisions (4%) reported that teachers received none or only one feedback and analysis loop/year (i.e., Not Yet).

Coherence. Coherence is defined as an intentional approach to integrating curricula, child assessments, and classroom observation with the PD that teachers receive. Of the six elements of PD, coherence showed the greatest variability across divisions. In 34% of divisions, the PD was tied in some way to curricula, child assessments, and classroom observation and there was evidence of integration across at least two of these components (i.e., Exemplary). For example, to show evidence of integration across child assessments and curricula, a division may use formative assessment data to determine particular content areas that need additional support. Teachers then receive PD to improve their curriculum implementation around these areas of need identified by the assessment data. In 26% of divisions, PD was tied to two of the three components and those two components were integrated, or the PD was tied to all three components but there was not any evidence of integration across components (i.e., Effective). In 20% of divisions, two of the three components were tied to the PD offerings but there was not any evidence of integration across components (i.e., Emerging). Finally, in the remaining 20% of divisions, none or only one of the three components was tied to PD offerings (i.e., Not Yet).

Access. Access refers to the extent to which PD is provided to all full-time teachers across various types of preschool programming. Access was the highest-scoring element of the PD Rubric. The majority of divisions (55%) provided PD to all teachers

(lead and instructional aides) across all programming that was present at the site such as VPI, Head Start, Title 1, early childhood special education (i.e., Exemplary), and only 3% of divisions provided PD to only VPI funded-lead teachers while excluding instructional aides or other programming that was present (i.e., Not Yet). The remaining 42% of divisions fell in between, either excluding instructional aides (12% of divisions; Emerging) or excluding at least one program type that was present (30% of divisions; Effective).

Correlations among PD Rubric elements. We also examined how strongly the PD Rubric elements were related to each other, as shown in Table 2. Most elements were moderately correlated with each other, with a few notable exceptions. Access was not significantly correlated with any other PD Rubric element, and specific, articulated objectives was only significantly correlated with coherence but the magnitude was modest. Data-driven, practice-focused, feedback and analysis loops, and coherence were correlated with each other around r = .40-.50, indicating that the quality of these elements were moderately related, but that the elements represented distinct aspects of a division's PD.

How Useful Did VPI Leaders Find the PD Consultation Process?

A total of 125 VPI leaders from 109 divisions provided feedback on the PD Consultation process by completing a short feedback survey at the end of the process. Table 3 provides the results from this survey. The vast majority of VPI leaders found the PD Consultation process valuable. Ninety-four percent of leaders reported that they agreed or completely agreed that the PD Consultation process was valuable, while only 4% were neutral, and 2% disagreed that it was valuable. When asked about specific

components of the PD Consultation process, VPI leaders were very satisfied with the videoconference and written feedback provided by their consultant. Eighty-six percent of leaders either agreed or completely agreed that receiving written feedback on their PD plan was helpful, while 7% were neutral, and 2% disagreed that the written feedback was helpful. Similarly, 89% of leaders either agreed or completely agreed that talking to their consultant via videoconference was helpful, while 5% were neutral, and 1% disagreed that the videoconference was helpful. VPI leaders were less satisfied with the PD Rubric and PD Questionnaire. About 50% of VPI leaders said they agreed or completely agreed that the PD Questionnaire was easy to complete, about 22% were neutral, 26% disagreed, and 2% completely disagreed. When asked what would make the PD Questionnaire easier to complete, VPI leaders most commonly reported that they did not understand what information they were being asked to provide, they wanted to see a completed example, or that the PD Questionnaire was too long, detailed, and time-consuming to complete. About 73% of VPI leaders agreed or completely agreed that the PD Rubric was easy to understand, 16% were neutral, and 7% either disagreed or completely disagreed. Seventy-four percent of VPI leaders agreed or completely agreed that they would change their division's PD practices as a result of the PD Consultation process, 23% were neutral, and 2% disagreed that they would change their PD practices.

Respondents confirmed through an open-ended question that they found talking with their consultant to be the most helpful aspect of the PD Consultation process. Out of 125 responses collected, 68 VPI leaders mentioned the discussions with their consultant as being most helpful. Other responses mentioned that the format in which feedback was provided was very straightforward and actionable. In another open-ended question asking

VPI leaders for suggestions on how to improve the PD Consultation process, 74 VPI leaders either left the question blank or said they would not change anything about the process. Other responses included reducing the time required to engage in the process, condensing the PD Questionnaire or obtaining the same information in an interview format, and providing more support, especially to smaller divisions that typically have one person who fulfills many roles and responsibilities.

Discussion

This study described a year-long PD Consultation process implemented within the context of a larger RPP centered on improving classroom quality in VPI, Virginia's state-funded preschool program. The goals of the PD Consultation process were to generate baseline data that would allow VPI leaders and VDOE to better understand current PD practices across VPI and to deliver individualized technical assistance to support VPI leaders to use this information to improve upon their future PD programming, ultimately leading to enhanced teacher-child interactions. Here we offer some reflections on the work completed as part of the PD Consultation process, implications, limitations, and potential next steps. Our goal in sharing this process is to offer the field an innovative example of how we may begin to narrow the research to practice gap for understanding and improving preschool teachers' PD at scale.

The PD Consultation process was successful in meeting the goal of assessing the quality of "business-as-usual" PD and providing a framework and individualized support to VPI leaders to improve their division's PD offerings. Over the course of one year, we generated data on PD quality for 121 of the 122 school divisions participating in VPI and provided individualized consultation support to each division around improving their PD

offerings by addressing 1-2 of their greatest needs identified by the PD Rubric. We also reported to VDOE high-level trends in PD quality across VPI divisions.

The PD Consultation process was anchored in the PD Rubric, a tool developed specifically for this consultation work that describes six elements of PD across four levels of quality. The PD Rubric was used for dual purposes. First, the rubric was used as a data collection tool, to assess divisions' current PD practices. These baseline data revealed for each division the relative areas of strength and areas with room for growth. Consultants, working collaboratively with VPI leaders, then decided which areas of PD to target for improvements using information gleaned from the PD Rubric. This process of using data to inform decisions was intended to model for VPI leaders for how to use data to drive their own decisions around the content of teachers' PD. The second purpose of the PD Rubric was to provide a common lens for all involved in the consultation work to conceptualize what high-quality PD looks like. The rubric describes each PD element at four levels of quality (e.g., Not Yet, Emerging, Effective, Exemplary), allowing divisions to see where they fall on the rubric as well as to understand what steps they could take to move to the next level of quality. The goal was not that every division would end the year with Exemplary ratings on all six elements. The goal was that divisions would be able to take manageable steps forward to improve PD elements that were the greatest areas of need for that division.

A key lesson learned was that the PD Rubric specified a new way of thinking about PD for many VPI leaders. Some division leaders' confusion with the PD Rubric elements or difficulty completing the PD Questionnaire suggested that they were not accustomed to reflecting on their PD along these dimensions. The PD Rubric made

explicit important considerations that can be easy to overlook when planning and delivering PD, such as ensuring that the goal of the PD is precisely articulated and aligned to broader programmatic activities. To address these challenges, consultants spent time on some divisions' videoconferences building VPI leaders' understanding of the PD elements. We also designed a process for enabling adjustment codes to ensure that our scoring was a valid assessment of divisions' PD. In hindsight, we could have done more initially to train VPI leaders on the PD elements before they completed the PD Questionnaire, but at the time we were concerned that providing too much support would skew the responses that divisions provided. Consultants' notes and feedback data suggest that although this process may have challenged VPI leaders' conventional thinking around PD, overall, they were receptive to the consultation and found the process of reflecting on their PD using this framework to be valuable. We imagine that should UVA CASTL consultants and VPI leaders engage in a similar PD Consultation process moving forward, there would be a much stronger shared lens and foundation for understanding PD quality and approaching quality improvement efforts.

Beyond providing insight into implementation of the PD Consultation process, we also quantified what typical PD looks like across one state-funded preschool program, information that is currently lacking from the PD literature. One key finding was that VPI teachers commonly participated in passive PD, or PD that emphasizes knowledge acquisition rather than knowledge application. In over a quarter of divisions, teacher only spend between 0-24% of their time in PD activities with an explicit focus on improving practice. While teachers did, on average, receive multiple feedback and analysis loops throughout the year, this type of practice-focused PD did not represent the majority of

teachers' PD time. Another main finding was the lack of available data tools to help VPI leaders understand and use data to maximize the effectiveness of their PD offerings. These findings have implications for research, practice, and policy. First, state policymakers could direct more resources into the creation of sustainable resources that support division leaders to use data, so it is not left up to each division to re-create the wheel. Researchers and practitioners could work together to design user-friendly data tools and evaluate their feasibility and usefulness for informing decisions regarding the focus and amount of PD that is needed for specific teachers. VPI divisions already have sufficient data to inform PD (e.g., CLASS, Pre-K PALS, VKRP), but the data could be used more effectively to maximize the impact of PD. Additionally, division leaders should consider eliminating or reducing time in "one-and-done" workshops that are not individualized to teachers' needs or connected to their practice. Time that already exists (e.g., weekly professional learning communities) could be re-purposed to more intentionally support teachers to reflect on key practices that are relevant to their classroom (Cunningham, Etter, Platas, Wheeler, & Campbell, 2015). Divisions could also consider adopting a peer coaching model that would allow teachers to receive more frequent feedback and analysis loops without over-burdening an instructional coach (Johnson, Finlon, Kobak, & Izard, 2017; Zan & Donegan-Ritter, 2014).

The PD Consultation process relied on skilled consultants who worked with a set of VPI divisions throughout the 2019-2020 academic year. Indeed, VPI leaders reported that the most beneficial component of the PD Consultation process was speaking to their consultant. Consultants helped VPI leaders understand the PD Questionnaire and PD Rubric, explained their scores on the rubric, provided feedback on strengths and areas for

growth, listened to and brainstormed ideas for improvement, and connected VPI leaders with resources that would help them implement changes that would improve their PD offerings. We acknowledge the substantial resources that had to be allocated to implement the PD Consultation process as designed. Ultimately, we hope that the PD Consultation process builds VPI leaders' capacity to reflect on their PD using a research-based framework and to make informed decisions regarding how they are supporting teachers' practice. Looking ahead, one step that could empower VPI leaders and increase sustainability of the PD Consultation process is to have consultants work more intensively with a smaller number of divisions whose rubric data suggests that more direct support is needed. For example, instead of having consultants code all of the PD Questionnaires, some divisions may complete the questionnaire and score themselves on the PD Rubric in a self-assessment format. VPI leaders could complete this self-assessment at the beginning of the year and have a brief conversation with their consultant about their reflections and plans for improvement. This type of process would allow consultants to work more strategically with a smaller set of divisions who may not be quite ready to engage in PD improvement planning more independently.

The PD Consultation process had several limitations that could be strengthened moving forward. First, streamlining certain parts of the PD Questionnaire to cut down on the time it takes to complete and promote greater clarity in responses would be beneficial. For example, rather than employing a primarily open-ended response format, the question and answer format could be more structured (e.g., "check all that apply). Consultants could then use these responses to engage in semi-structured interviews with divisions to gather further information before assessing the division's strengths and areas with room

for growth. Second, as mentioned earlier, some larger school divisions that had many disparate schools/centers implementing VPI found the PD Questionnaire challenging to complete. In larger divisions, there could be variability in PD quality within a division, however, our process and tools were not designed to easily capture this variability. In these divisions, school or center leaders could complete the PD Questionnaire, as opposed to division leaders, which would provide more nuanced information to a division leader about variability in PD quality across schools within the division. Third, the PD Rubric could be refined to better capture variability in certain PD elements. For example, the rubric did not differentiate the quality of divisions' PD objectives very well. Well over half of divisions (66%) scored Emerging for specific, articulated objectives. In hindsight, the Not Yet level was a very low of a bar and hardly applied to any divisions (only 4%). Revising the criteria for specific, articulated objectives, particularly for the Not Yet and Emerging levels, would be worthwhile. Finally, given the already intensive nature of the PD Consultation process, we could not independently confirm the accuracy of divisions' responses to the PD Questionnaire, by reviewing specific documents as an example. The PD Consultation process was designed to serve as a quality improvement process, not as an accountability check, so we relied on divisions to be candid in describing their PD plans and emphasized the improvement orientation to the work. While we are confident in the steps we took to capture an accurate picture of PD quality, this approach does mean that the PD Rubric data are based on division-reported PD practices, which somewhat limits the objectivity of the data. Should this process be used more for accountability purposes, embedding validity checks into the process may be needed.

Conclusion

Although PD can be an effective lever for ensuring that preschool programs deliver the type of high-quality programming that is necessary for children to gain foundational knowledge and skills, the early childhood field lacks a clear understanding of the PD that most teachers are offered, how division leaders decide what PD to offer, and whether these are aligned to research-based recommendations. The purpose of this study was to describe how a RPP was used to develop a PD Consultation process with the goal of narrowing the research to practice gap by understanding and improving the quality of PD offered to preschool teachers in VPI, Virginia's state-funded preschool program. Using a newly developed consultation tool, the PD Rubric, our team provided individualized consultation services to VPI leaders in 121 school divisions and provided a picture of "business-as-usual" PD statewide. Findings from the PD Consultation process indicated that the quality of preschool teachers' PD is variable across the state and that division leaders need the most support around using data tools to inform their PD offerings and providing teachers with opportunities to reflect on and enhance their classroom practice. These findings can advance the field by providing an example of a consultation process that may be replicated in other settings or by spurring new developments in data tools and PD resources that help teachers hone their practice. By enhancing the quality of preschool teachers' PD, we will move closer to the goal of preparing all children who attend preschool for success in kindergarten and beyond.

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Table 1. Mean scores and standard deviations for PD Rubric elements (*n* = 121 divisions)

	Mean	Standard Deviation	Range
Data driven [a]	2.30	.88	1 – 4
Data use	2.80	1.10	1 – 4
Data-related resources	2.17	.92	1 – 4
Specific, articulated objectives	2.28	.58	1 – 4
Practice-focused	2.10	.88	1 – 4
Feedback and analysis loops	2.82	.85	1 – 4
Coherence	2.73	1.14	1 – 4
Access for all teachers	3.38	.80	1 – 4

Notes.
[a] The data driven element was comprised of two sub-indicators: data use and data-related resources

Table 2. Correlations among PD Rubric elements

	1	2	3	4	5	6	7	8
1. Data Use	-							
2. Data-Related Resources	.48***	-						
3. Data-Driven	.87***	.78***	-					
4. Objectives	.11	.11	.14	-				
5. Practice-Focused	.40***	.35***	.45***	.17	-			
6. Feedback and Analysis Loops	.40***	.43***	.45***	.09	.46***	-		
7. Coherence	.45***	.44***	.55***	.23*	.37***	.43***	-	
8. Access	.11	.11	.12	.00	.10	.18	.02	-

Notes.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. VPI leaders' feedback on PD Consultation process

	Mean	Standard Deviation	Range
The PD Consultation process was valuable	4.35	.64	2 – 5
My team will change our division's PD practices as a result of the PD Consultation process	3.91	.69	2 – 5
The PD Questionnaire was easy to complete	3.29	1.01	1 – 5
The PD Rubric (6 elements of effective PD) was easy to understand	3.85	.79	1 – 5
My consultant's written feedback (on the PD Feedback and Planning form) was helpful	4.27	.67	2 – 5
Talking to my consultant about the feedback was helpful	4.46	.67	2 – 5

Notes.
Results are based off 125 responses from 109 divisions. Some divisions submitted multiple responses completed by different people involved in the consultation process.
1 = completely disagree; 5 = completely agree

Figure 1. PD Consultation process

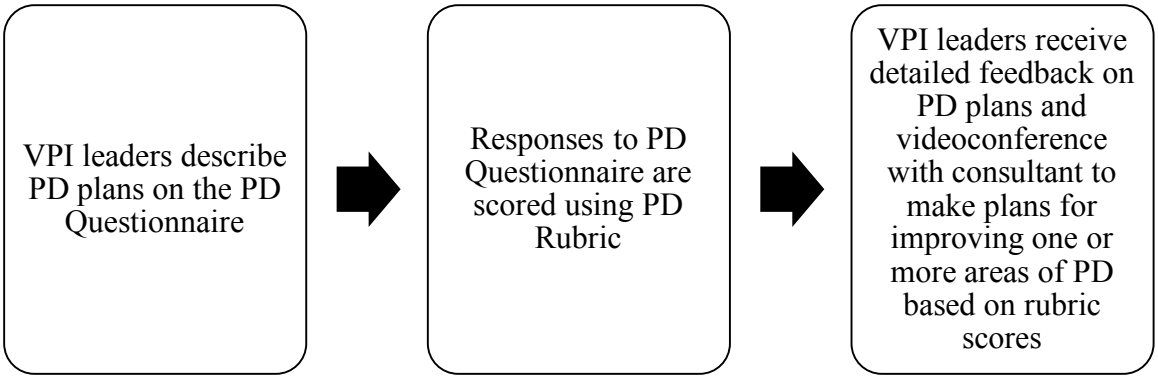
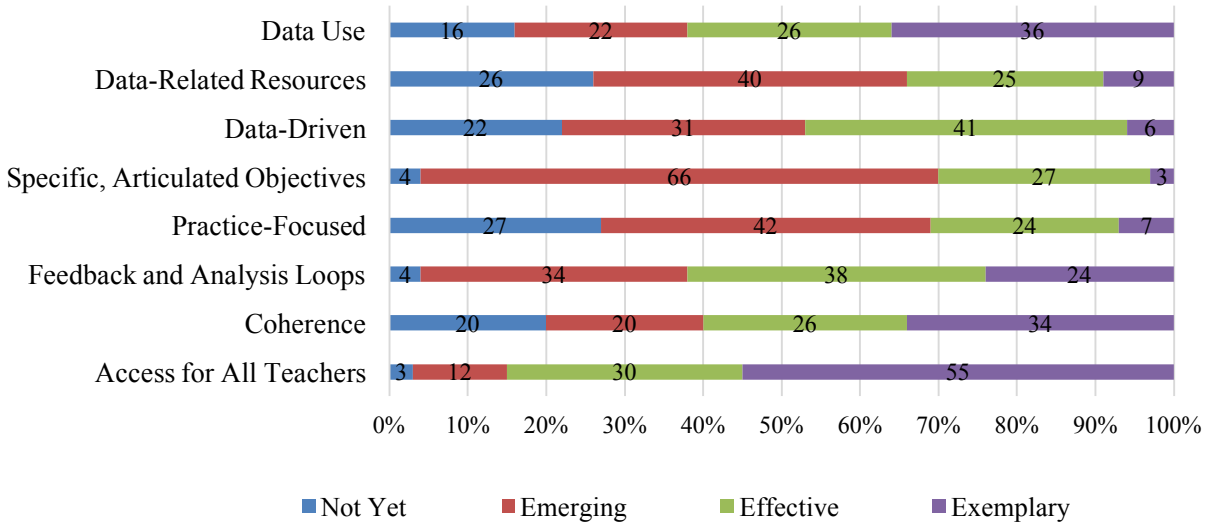


Figure 2: Percent of divisions in each level of quality



Appendix 1: Descriptive Information for VPI Divisions

Division	Total population of children under age 5 [b]	Percent of children under age 5 living in poverty [b]	Total number of VPI classrooms [c]	Total number of schools/ centers with VPI classrooms [c]
Accomack County	1,905	39.5	8	5
Albemarle County	5,691	17.4	11	7
Alexandria City	11,372	16.5	27	15
Alleghany County	679	27.4	3	2
Amelia County	744	19.5	2	1
Amherst County	1,706	23.0	5	3
Appomattox County	887	26.2	3	1
Arlington County	13,912	8.9	35	15
Augusta County	3,496	14.2	18	9
Bedford County	3,676	10.2	11	9
Botetourt County	1,411	19.8	2	2
Bristol City	869	51.1	7	4
Brunswick County	730	31.7	2	2
Buchanan County	905	46.7	7	4
Buckingham County	766	18.3	6	1
Buena Vista City	237	16.0	2	1
Campbell County	2,747	15.5	14	7
Caroline County	2,136	9.5	3	2
Carroll County	1,440	23.2	9	7
Charles City County	280	19.2	2	1
Charlotte County	715	31.5	4	3
Charlottesville City	2,574	20.6	11	6
Chesapeake City	15,066	16.9	20	7
Chesterfield County	20,218	9.5	7	7
Clarke County	670	18.4	3	1
Colonial Beach [c]	-	-	2	1
Colonial Heights City	1,228	19.9	4	3
Covington City	236	8.9	2	1
Culpeper County	3,291	9.6	7	6
Cumberland County	514	51.9	2	1
Danville City	2,472	33.0	13	2
Dickenson County	757	47.6	7	3
Dinwiddie County	1,470	20.6	2	2
Essex County	661	14.5	2	1
Fairfax City/County	75,927	8.6	63	48
Falls Church City	827	2.7	3	1
Fauquier County	4,036	10.2	5	5
Floyd County	733	14.2	4	3

Fluvanna County	1,163	1.2	3	1
Franklin City	491	19.1	4	1
Franklin County	2,675	30.4	14	12
Frederick County	5,124	7.8	3	3
Fredericksburg City	2,046	13.0	4	1
Galax City	257	28.4	2	1
Giles County	881	15.0	4	3
Gloucester County	1,951	12.8	4	4
Goochland County	835	3.2	2	2
Grayson County	669	46.3	1	1
Greene County	1,110	3.4	3	1
Greensville County	517	16.1	5	1
Halifax County	1,821	18.6	12	7
Hampton City	8,306	24.2	30	8
Hanover County	5,200	8.6	3	3
Harrisonburg City	2,830	21.1	18	7
Henrico County	20,123	17.5	53	26
Henry County	2,439	29.5	16	9
Highland County	89	34.8	1	1
Hopewell City	1,672	36.8	8	1
Isle of Wight County	1,865	14.7	5	4
King and Queen County	332	23.0	2	2
King George County	1,605	5.8	1	1
Lancaster County	439	17.8	3	1
Loudoun County	28,446	3.8	10	10
Louisa County	1,929	16.1	5	4
Lunenburg County	599	27.1	4	1
Lynchburg City	4,891	22.4	15	4
Madison County	538	9.8	2	1
Manassas City	3,498	13.8	10	5
Manassas Park City	935	9.3	4	1
Martinsville City	1,080	39.5	5	1
Mecklenburg County	1,429	21.2	10	4
Middlesex County	332	21.4	1	1
Montgomery County	4,364	15.8	11	8
Nelson County	628	7.1	2	2
Newport News City	13,162	19.5	70	4
Norfolk City	16,390	30.2	80	29
Northampton County	672	49.8	6	2
Northumberland County	357	22.7	2	1
Norton City	316	67.7	2	1
Nottoway County	820	24.8	4	2
Orange County	2,062	20.7	3	3
Page County	1,107	33.4	5	4
Patrick County	740	43.2	4	4

Petersburg City	2,301	35.2	14	1
Pittsylvania County	2,668	27.1	12	8
Poquoson City	509	13.4	1	1
Portsmouth City	7,137	31.1	27	3
Powhatan County	1,240	4.7	2	1
Prince Edward County	1,051	17.9	7	1
Prince George County	2,107	17.9	5	5
Prince William County	34,605	10.2	30	16
Pulaski County	1,548	24.8	9	5
Radford City	521	21.3	2	1
Richmond City	13,377	36.5	51	12
Richmond County	271	8.9	3	1
Roanoke City	6,904	32.5	27	14
Roanoke County	4,397	6.8	22	16
Rockbridge County	1,128	14.7	2	2
Rockingham County	4,400	15.0	18	15
Russell County	1,266	25.7	12	4
Salem City	1,471	9.7	2	2
Scott County	885	30.4	6	6
Shenandoah County	2,448	15.8	9	3
Smyth County	1,472	32.3	8	7
Southampton County	857	19.6	6	3
Spotsylvania County	8,216	13.4	11	9
Stafford County	9,236	4.9	5	2
Staunton City	1,441	13.8	3	1
Suffolk City	5,997	16.8	24	11
Surry County	287	22.3	2	1
Sussex County	483	26.4	3	1
Tazewell County	2,137	31.6	7	6
Virginia Beach City	28,846	11.6	39	23
Warren County	2,374	13.9	6	4
Washington County	2,300	30.7	7	7
Waynesboro City	1,406	23.0	5	1
Westmoreland County	902	11.2	4	2
Williamsburg-James City County	4,117	13.8	15	5
Winchester City	1,868	23.2	8	2
Wise County	2,013	34.4	14	5
Wythe County	1,325	27.2	7	6
York County	3,772	5.3	13	10

Notes.
[a] Source: U.S. Census Bureau, American Community Survey (2014-2018 5-year estimates)
[b] Source: VDOE reporting and UVA CASTL tracking, 2019-2020
[c] Colonial Beach population and poverty data are included in Westmoreland County

Appendix 2: Professional Development Questionnaire

The Virginia Department of Education (VDOE) and the Center for Advanced Study of Teaching and Learning (CASTL) at the University of Virginia are seeking to better understand and support the professional development (PD) that divisions provide to full-time preschool teachers and instructional aides. Please answer the questions below regarding your PD plans for the 2019-2020 school year.

Instructions:

- Think about and report on all of the PD that full-time teachers and instructional aides will engage in this year, including PD that may have already occurred and PD that may only be provided to some teachers.

- Gather documents that pertain to your division's PD. These may include a scope and sequence of PD for the year, sample materials (e.g., agendas, objectives, activities, coaching protocols), and data reports. You are encouraged to submit these materials to supplement your responses, but this is not required. VDOE and CASTL may request materials to get more detailed information or better understand a response.

- Use your division's PD documents to answer the following questions. You may reference the PD Rubric which will be used to evaluate responses. Please answer the questions honestly. This is a tool for continuous improvement; it is not meant to be punitive.

- Email your completed questionnaire and supplemental materials (if provided) to your division's CASTL PD consultant by your division's specified deadline.

What to expect for next steps:

- Once your PD Questionnaire has been submitted to CASTL, it will be checked for completion.

- A team at CASTL will review your responses and supplemental materials (if provided) and complete the rubric.

- CASTL will share the scored rubric with your division's leadership team during PD consultations. Through these consultations, CASTL will support your division to improve one or more areas of PD using the rubric as a framework.

Division Information:

Division name:

Name of person completing this questionnaire:
Role:
Email:

Date submitted to VDOE:

Are you submitting supplemental PD materials?

If yes, list all materials below:

1. Data-driven

Describe your plans for using data in each of the following ways. Indicate which data sources will be used in each area (data sources can be used for multiple purposes). Data could be from curriculum fidelity checklists, CLASS®, child assessments, and/or teacher practice assessments. If no plans are in place, write "none."

Data are used to:	Specific data: sources:	Describe plans:
Plan the broad focus area(s) of PD:		
Determine appropriate amount of ongoing PD:		
Tailor the focus and amount of PD to meet teachers' needs (individual or small group):		
Track intended outcomes for formative (e.g., re-evaluate and adapt PD as needed) and/or summative (determine effectiveness of PD) purposes:		

Describe any resources that you will have in place to facilitate data collection, analysis, and/or data-driven decision making around PD. Resources could be staffing (e.g. data analysts), staff trainings related to data use, or routines/expectations for using data to continuously drive improvement. If none exist, write "none."

Data-related resource:	Description of how resource will be used:

2. Specific, articulated objectives

List all of the broad areas of focus and the specific PD objectives within those areas of focus that you anticipate covering in PD next year. Broad areas of focus include the content area, and specific objectives provide more detail about what teachers will gain from the PD. If none exist, write "none."

Broad area of focus:	**Specific PD objectives: (can list multiple objectives under the broad area of focus)**

Describe how you derived the areas of focus and specific PD objectives (e.g., framework, rubric, etc.). This question is NOT about using data to plan the focus of PD. It is about whether there is a clear description of quality teaching that guides teachers' professional growth. If none exist, write "none."

3. Practice-focused

Below is a list of common activities that occur during PD. Provide a breakdown of the average number of hours teachers will spend in each activity and the total number of hours of PD in the 2019-2020 school year. If the activity does occur, write a brief note indicating what the activity is (e.g., Conscious Discipline workshop). If the activity does not occur, write "0 hours."

Common PD Activities:	**Number of hours in activity:**	**What is the Activity?**
Group workshop/training/seminar in which teachers listen to a presenter and answer/discuss questions to gain new knowledge:		
Coursework (in-person or online) in which teachers read relevant articles/texts and answer/discuss questions to gain new knowledge:		
Professional learning communities in which teachers analyze data and/or discuss practice generally (e.g., planning upcoming units):		
Professional learning communities in which teachers share about a practice they implemented and analyze that practice with the group (i.e., no role play, video review, or observation occurs):		
Professional learning communities in which teachers role play and/or review video of themselves or others teaching:		
Observation followed by feedback and analysis loops related to one's own practice (i.e., classroom observation, coaching):		
Other (describe):		
Total number of hours of PD:		

4. Feedback and analysis loops

List how many times on average teachers will be observed and receive feedback on and analyze their practice with a colleague during the 2019-2020 school year. A colleague could include an administrator/principal, instructional coach, or teacher. For each activity, describe who will conduct observations or meet with teachers to analyze practice as well as the expected time duration (e.g., principal will observe all lead teachers once for 30 minutes). If no observations or feedback and analysis loops will occur, write "0."

Placement on the rubric will be determined by the frequency with which teachers receive feedback on and analyze their practice with a colleague.

Activity:	**Average number of times next school year:**	**Who will be involved?**	**Expected time duration:**
Be observed by a colleague (e.g., either live observation or video review)**:**			
Receive feedback on and analyze their practice with a colleague (e.g., following an observation, a colleague reflects on a recently-implemented practice, brainstorms solutions to a problem, and/or plans improvements to practice with the teacher)**:**			

5. Coherence

In addition to PD, curricula, child assessments, and classroom observation contribute to high-quality teaching and learning. To be most effective, these components should be integrated/aligned with PD so that they work together rather than in isolation. Additionally, content that is un-related to these components should be removed from PD.

Describe the ways in which each component is intentionally integrated/aligned with your PD (i.e., how each component informs and supports your PD).

	Integration/Alignment with PD:
Curricula:	
Child Assessments:	
Classroom Observation:	

Describe the procedures you have in place for deciding what content is covered during PD. In other words, how will coherence be maintained and reinforced for teachers, so un-related or miscellaneous content, instructional tools, or materials do not compete for teachers' time and energy during PD? If none exist, write "none."

6. Access for all teachers

To what extent does the PD plan as described in the questions above apply to all full-time preschool teachers (lead and instructional aides) across various preschool programming (Title I, Head Start, SPED)? Check "Yes," "No," "Don't Know," or "Not Applicable." If some parts of the PD plan apply, but others do not, you may check "Yes" and "No" and briefly note which aspects do and do not apply for a particular group of teachers.

Does this plan apply to…	**Yes**	**No**	**Don't Know**	**Not Applicable**
VPI-funded lead teachers:				
VPI-funded instructional aides:				
Head Start and/or Title I-funded lead teachers:				
Head Start and/or Title I-funded instructional aides:				
SPED lead teachers:				
SPED instructional aides:				
Other (describe):				

7. Other

If you would like to provide any other information about your division's PD plans for the 2019-2010 school year, please provide it in the space below.

Appendix 3. PD Rubric

	Not Yet	Emerging	Effective	Exemplary
1. Data-driven  *A data-driven approach to PD ensures that the content is relevant, amount is sufficient, and ultimately that the PD is effective.*	• Data are not used at all or are only used to plan the broad focus area(s) of PD • No resources exist such that data collection, analysis, and data-driven decision-making are impossible	• Data are used to plan the broad focus area(s) of PD and **one** of the following: o determine appropriate amount of ongoing PD, tailor the focus of PD to meet teachers' needs, or track intended outcomes • Insufficient resources exist such that data collection, analysis, and data-driven decision-making are limited or inefficient	• Data are used to plan the broad focus area(s) of PD and **two** of the following (or all if from one data source): o determine appropriate amount of ongoing PD, tailor the focus of PD to meet teachers' needs, or track intended outcomes • Sufficient resources exist such that data collection, analysis, and data-driven decision-making are feasible and efficient	• Data from two distinct sources are used to plan the broad focus area(s) of PD and **all** of the following: o determine appropriate amount of ongoing PD tailor the focus of PD to meet teachers' needs, and track intended outcomes • Sophisticated resources exist such that data collection, analysis, and data-driven decision-making are systematic & highly efficient
2. Specific, articulated objectives  *Specific, articulated objectives clearly delineate what teachers should gain from PD. Objectives should be limited to a few key areas so teachers are repeatedly exposed to PD content and have sufficient time to develop new knowledge and skills.*	• PD objectives are absent or very vague • Alternatively, PD objectives are not related to early childhood	• PD objectives suggest some knowledge or skills to be gained but lack precision • Alternatively, PD objectives are precise but are too extensive and/or varied (e.g., 6-10 objectives in 1-2 or more areas) to sustain focus on a few key areas	• PD objectives delineate the precise knowledge and skills to be gained • PD objectives are a reasonable quantity and sufficiently connected (e.g., 3-5 objectives in 1-2 areas) to sustain focus on a few key areas	• PD objectives meet "effective" and are ALSO drawn from a framework that clearly defines expectations for quality teaching (e.g., rubric)
3. Practice-focused  *Practice-focused PD seeks to intentionally build teachers' skills in order to improve their practice. It can but does not have to include feedback and analysis loops.*	• Across all PD, teachers spend 75-100% of their time passively receiving information and/or generally discussing practice and 0-25% of their time intentionally building skills to improve practice	• Across all PD, teachers spend 50-75% of their time passively receiving information and/or generally discussing practice and 25-50% of their time intentionally building skills to improve practice	• Across all PD, teachers spend 25-50% of their time passively receiving information and/or generally discussing practice and 50-75% of their time intentionally building skills to improve practice	• Across all PD, teachers spend 0-25% of their time passively receiving information and/or generally discussing practice and 75-100% of their time intentionally building skills to improve practice

4. Feedback and analysis loops  *Feedback and analysis loops provide teachers with the opportunity to implement a new practice, receive feedback on their practice, and analyze their practice with a colleague.*	• Teachers never or rarely receive feedback on their practice and analyze their practice with a colleague	• Teachers infrequently receive feedback on their practice and analyze their practice with a colleague (e.g., 2-3 times/year)	• Teachers somewhat frequently receive feedback on and analyze their practice with a colleague (e.g., 6-8 times/year)	• Teachers frequently receive feedback on their practice and analyze their practice with a colleague (e.g., every two weeks)
5. Coherence  *Coherence is defined as an intentional approach to integrating curricula (what teachers teach), assessments (e.g., child outcomes), and classroom observation (e.g., CLASS® scores) with the PD that teachers receive as well as removing miscellaneous or un-related materials.*	• Curricula, assessments, and classroom observation are disjointed and not at all aligned/integrated with PD. There is no clear rationale that describes how each component informs and supports PD	• Curricula, assessments, and classroom observation are superficially aligned/integrated with PD. This is generally not intentional such that there are significant gaps in the rationale (i.e., illogical or incomplete) that describes how each component informs and supports PD	• Curricula, assessments, and classroom observation are somewhat intentionally aligned/integrated with PD. There are some gaps in the rationale (i.e., illogical or incomplete) that describes how each component informs and supports PD	• Curricula, assessments, and classroom observation are very intentionally aligned/integrated with PD. A logical and comprehensive rationale describes how each component informs and supports PD
6. Access for all teachers  *Access refers to the extent to which PD is provided to all full-time teachers across various types of preschool programming.*	• PD is provided only to VPI-funded lead teachers	• PD is provided to all lead teachers across most programming but not instructional aides	• PD is provided to all lead teachers across all programming but not instructional aides • Alternatively, PD is provided to all teachers (lead and instructional aides) across most programming	• PD is provided to all teachers (lead and instructional aides) across all programming