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Understanding how children's engagement and teachers' interactions combine to predict school readiness

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Abstract

This study examined the quality of preschool classroom experiences through the combination of teachers' interactions at the classroom level and children's individual patterns of engagement in predicting children's gains in school readiness. A sample of 605 children and 309 teachers participated. The quality of children's engagement and teacher interactions was directly observed in the classroom setting, and direct assessments of children's school readiness skills were obtained in the fall and again in the spring. The quality of teacher interactions was associated with gains across all school readiness skills. The effect of children's individual classroom engagement on their gains in school readiness skills (specifically phonological awareness and expressive vocabulary) was moderated by classroom level teacher interactions. The results suggest that if teachers provide highly responsive interactions at the classroom level, children may develop more equitable school readiness skills regardless of their individual engagement patterns.

Keywords

early childhood; child engagement; teacher-child interactions; latent class analysis; classroom observations

Introduction

Young children who enter kindergarten behind their peers in academic and social-emotional school readiness skills are at significant risk for long term negative school outcomes (Magnuson, Ruhm & Waldfogel, 2007). Because the majority of children spend substantial time in preschool prior to kindergarten entry (Adams, Tout, & Zaslow, 2007), the preschool classroom is an important context in which to provide learning experiences that are effective in fostering school readiness. Two aspects of the quality of children's preschool classroom experience —(1) the teacher's capacity to provide a stimulating environment through her interactions with children (classroom level) and (2) an individual child's engagement and interaction with the environment provided (child level) — are critical because they represent the proximal mechanisms by which children learn new academic and social-emotional skills

(Mashburn et al., 2008; McWilliam, & Casey, 2010; Vitiello, Downer, & Williford, 2012; Williford, Vick-Whittaker, Vitiello, & Downer, in press). The present study examines the extent to which patterns of preschool experience derived from a combination of classroom-level interaction quality and individual child engagement are predictive of school readiness.

Most of the research examining the impacts of early education and childcare experiences on young children's outcomes has been conducted at the classroom level (Phillips, Fox, & Gunnar, 2011), demonstrating that a teacher's capacity to provide a supportive and stimulating early childhood education experience through her interactions with children is positively associated with gains in school readiness skills (Brophy-Herb, Lee, Nievar, & Stollack, 2007; Curby, Rimm-Kaufman, & Ponitz, 2009; Early et al., 2007; Mashburn et al., 2008). But, how an individual child engages with the teachers, peers, and learning activities in the classroom is also important in that it is related to both school achievement and adjustment (Fredricks, Blumenfeld, & Paris, 2004). Few studies, however, have examined children's preschool experience from both the perspective of how the individual child engages *and* what the teacher provides. This lack of integration of observation lenses at both the classroom and child level limits our capacity to ask and answer questions related to individual differences—what types of early learning experiences matter for whom?

In this study, we set out to examine how the quality of the preschool experience at both the classroom and child level – observed through the interactions a teacher provides to the classroom as a whole as well as through individual children's patterns of classroom engagement – are differentially related to children's gains in language, literacy, and self-regulatory readiness. We were particularly interested in the extent to which the teacher provides supports at the classroom level moderated the relation between individual patterns of children's classroom engagement and their gains in school readiness skills.

Quality of Interactions at the Classroom Level

Most of the research examining the potential impacts of preschool and childcare quality on children's outcomes has focused on classroom-level features and indicates that high quality is not defined by the education level attained or major studied by the classroom teacher (Early et al., 2007) but rather by the teacher's skill level to provide emotionally and instructively supportive interactions to students within a well organized classroom (Curby et al., 2009; Howes et al., 2008; McCartney, Dearing, Taylor, & Bub, 2007). And, these interactions can be particularly salient for children who are from home environments with multiple social and environmental risks (e.g., Burchinal, Peisner-Feinberg, Bryant & Clifford, 2000; Mashburn et al., 2008). Hamre et al. (in press) propose a *Teaching through Interactions* framework that organizes teacher-child interactions into three broad domains – emotional support, classroom organization, and instructional support. Substantial research now suggests that these features of teacher-child interaction promote children's academic and social skills. In particular, children learn more, better regulate their behavior and attention, and develop more positive social skills (Burchinal et al., 2008; Guo, Piasta, Justice, & Kaderavek, 2010; Mashburn et al., 2008) when they are in classrooms where the teacher interacts with students in ways that are warm, child-focused, and sensitive (Connor, Son, Hindman, & Morrison, 2005; McCartney et al., 2007), provides consistent behavioral

expectations (Emmer & Stough, 2001), and provides cognitively-stimulating tasks, and feedback to students (e.g., Taylor, Pearson, Peterson, & Rodriguez, 2003; Wharton-McDonald, Pressley, & Hampston, 1998).

Quality of Interactions at the Individual Child Level

Assessing the quality of children's early education experience at the classroom level does not account for the fact that children *within* the same preschool classroom have different experiences and engage with learning opportunities in different ways (Hamre & Pianta, 2001; Howes, 2000; Pintrich, Anderman, & Klobucar, 1994; Bulotsky-Shearer, Fantuzzo, & McDermott, 2008). Children's individual engagement has been shown to predict school adjustment over and above the general quality of the classroom's relational environment (Birch & Ladd, 1997). Much of the research examining children's school-based engagement uses Fredricks and colleagues' (2004) conceptualization, which defines engagement as a multidimensional construct that consists of children's capacity to interact with different aspects of the school environment including teacher, peers, *and* activities. This definition considers the child's connection to the classroom environment behaviorally, cognitively, and emotionally (including both positive and negative feelings toward teachers, peers and activities) (Fredricks et al., 2004; Skinner, Kinndermann, & Furrer, 2009). Thus, engagement can be viewed as a construct consisting of the interrelations among behavior, cognition, and emotion, which provides a more nuanced representation of the child in comparison to examining a single engagement component such as attention to task.

Children's engagement has been studied more extensively in the elementary and middle school years (Fredricks et al., 2004; Roorda, Koomen, Split, & Oort, 2011) where it has been repeatedly linked with children's academic achievement (e.g., DiPema, Lei, & Reid, 2007; Fredricks et al., 2004), but it has been shown that children's early engagement (first grade) predicts later achievement, as well (Ladd & Dinella, 2009). Within the early childhood context, engagement has similarly been defined as the amount of time children spend interacting in developmentally appropriate ways with adults, peers, and materials in the classroom setting (McWilliam & Bailey, 1992; McWilliam, Scarborough, & Kim, 2003). In young children, engagement is focused on observable behaviors where children can be seen interacting with teachers, other children, and materials in developmentally and contextually appropriate ways (McWilliam & Casey, 2010). In this paper, we examined how individual children's observed engagement with teachers, peers, and tasks predicts gains in children's school readiness across language, literacy, and self-regulatory domains. Below we briefly summarize the research supporting the separate links between children's engagement with teachers, peers, or tasks in the early childhood education setting and development of school readiness skills.

Young children who engage with teachers in warm and sensitive ways tend to have better academic, social-emotional, and self-regulatory development (e.g., Birch & Ladd, 1997; Hamre & Pianta, 2001; Palermo, Hanish, Martin, Fabes, & Reiser, 2007; Pianta & Stuhlman, 2004; Trentacosta & Izard, 2007). In contrast, when children are engaged in negative and conflictual teacher-child relationships they are at risk for increased problem behaviors, decreased academic and social skills, and school avoidance and disengagement

(e.g., Birch & Ladd, 1998; Henricsson & Rydell, 2004; Graziano, Reavis, Keane, & Calkins, 2007; Mantzicopoulos, 2005; Pianta et al., 1995; Stipek & Miles, 2008). Similarly, children who engage in positive peer interactions characterized by sharing, appropriate communication, and play tend to have higher academic achievement (Downer & Pianta, 2006; Ladd & Burgess, 2001), better social-emotional skills (e.g., Fantuzzo, Sekino, & Cohen, 2004; Mendez, Fantuzzo, & Cicchetti, 2002), and increased on-task behavior in the classroom (Elias & Berk, 2002). In contrast, children who behave aggressively or are rejected by their peers display lower school readiness skills at the end of preschool and, lower achievement across time (Bierman, Torres, Domitrovich, Welsh, & Gest, 2009; Buhs, Ladd, & Herald, 2006). Children who are reticent or withdrawn (i.e., fail to initiate pro-social peer interaction but refrain from peer conflict) are also at risk for lower school readiness skills (Bulotsky-Shearer, Fantuzzo, & McDermott, 2010; Spere & Evans, 2009). Finally, young children who independently, actively, and enthusiastically engage in classroom tasks and activities evidence better school readiness skills (Fantuzzo, Perry, & McDermott, 2004; Hughes & Kwok, 2006; McClelland et al., 2007; Schaefer & McDermott, 1999). In sum, children's individual engagement across teachers, peers, and tasks is an important contributor to their development of school readiness skills across domains.

Patterns of Individual Children's Classroom Engagement

The evidence above focuses on individual components of engagement but does not integrate these various forms of engagement to consider young children's participation with the classroom as a whole—i.e., the multidimensional nature of engagement as described above. Recent research has examined preschoolers' engagement across teachers, peers and tasks in the same model, demonstrating how levels of children's engagement in these areas predicts their language, literacy and self-regulation skills (Downer, Booren, Lima, Lucker, & Pianta, 2010; Vitiello et al., 2012; Williford et al., in press). Research such as above relies on a variable-centered approach to examine the unique contribution of each aspect of engagement on children's school readiness skills. In comparison, considering patterns of children's performance across varying forms of engagement may be important for understanding how academic and social-emotional skills emerge from a constellation of capacities.

Therefore, in this paper we sought to examine engagement as a meta-construct and to explore the complex interactions of children's engagement with teachers, peers and tasks in the preschool classroom by taking a person-oriented approach. A person-oriented theoretical perspective views development as an individualized process that is complex and comprised of many interactions (Sterba & Bauer, 2010). A person-based analytical approach is able to summarize patterns in individuals in a way that provides more information than when examining the component variables (Bergman & Trost, 2006; von Eye & Bergman, 2003) and has been used recently to examine how different aspects of children's engagement come together meaningfully to predict children's school readiness and achievement (Luo, Hughes, Liew, & Kwok, 2009; Chien et al, 2010; McWayne, Green, & Fantuzzo, 2009). We took a similar approach in this paper and used latent profile analysis to examine children's patterns of observed engagement with teachers, peers, and tasks in preschool.

Current Study

The present study describes quality of experience in preschool classrooms as the combination of the interactions a teacher provides at the classroom level and patterns of individual children's engagement in the classroom. It then examines the linkages in predicting gains in school readiness skills. We expected that observing the preschool experience using both a classroom and an individual child lens would provide a richer understanding of how early classroom experiences may either facilitate or impede the development of children's school readiness skills. Specifically, we expected that observations of teacher-child interactions at the classroom level and of individual children's engagement would provide information that was complementary but unique. We expected that experiences assessed at both the classroom and child levels would be moderately correlated and that higher quality experiences would be associated with greater gains in children's school readiness.

Based upon previous research that utilized person-centered approaches to examine children's classroom-based engagement and behaviors (e.g., Bulotsky-Shearer et al., 2010; Luo et al., 2009; McWayne et al., 2009), we expected four patterns of children's engagement to occur: 1) a large group of children that positively engaged at average levels across teachers, peers, and tasks; 2) a somewhat smaller group of children who positively engaged at high levels across teachers, peers, and tasks; 3) a small group of children who engaged negatively (i.e., exhibited high conflict) with teachers and peers and who had low levels of task engagement; and 4) a small group of children who displayed low levels of positive engagement with teachers and peers, engaged more highly with tasks, and who did not evidence negative engagement. We hypothesized that these engagement profiles would differentially predict children's school readiness skills. Furthermore, we expected the quality of teacher-child interactions at the classroom level to moderate children's gains in school readiness skills such that children who were characterized by positive patterns of individual engagement would evidence stronger gains in school readiness skill regardless of the quality of classroom level interactions (i.e., these children would demonstrate resilience to the effect of a lower quality classroom). In contrast, we expected that children who showed less optimal engagement patterns would evidence greater gains in school readiness skills in the context of high classroom-level quality (i.e., high quality teacher-child interactions would serve as a protective factor for children who are less optimally engaged in the classroom).

Methods

Participants

Data were collected as part of the National Center for Research on Early Childhood Education's (NCRECE) Professional Development Study, an 18-month study of two forms of professional development aimed to improve everyday teacher-child and instructional interactions focused on promoting children's language and literacy skills: (1) a 14-week course (Phase I) and/or (2) yearlong coaching using the MyTeachingPartner (MTP) approach, which includes individualized, web-mediated coaching (Phase II). The impact of the intervention was not of interest in the current study but was controlled for in the analysis.

A full description of the intervention and its results are described elsewhere (Hamre et al., in press; Downer et al., 2012).

The NCRECE Professional Development Study targeted large community preschool and Head Start programs in 10 sites in eight states across the country. Teachers were considered eligible for participation if they were the lead teacher in a classroom in which the majority of children were eligible for kindergarten the following school year. In addition, eligible classrooms conducted instruction in English for the majority of the school day and had high speed internet access available for teacher use. Before Phase I began, teachers were randomized at the site location level into the course or control group. After Phase I, remaining Phase I teachers and newly recruited teachers were randomized at the site location level into coaching or control group conditions for Phase II. Thus, four groups were created by crossing the Phase I Course/Control groups with the Phase II Coaching/Control groups. A full description of the study design and sample can be found in Hamre et al. (in press) and Downer et al. (2012).

Data utilized in the current study are from Phase II (the year-long coaching phase) because child outcome data were not collected during Phase I. A total of 405 teachers were recruited into the coaching phase of the study. Of these 405 teachers, 49 (26 control and 23 coaching teachers) were lost without collecting any data and 15 additional teachers were lost after participating in some data collection during Phase II. Only seven of these teachers told us why they were dropping (i.e., moved, no longer teaching, or too busy). A total of 325 teachers participated in Phase II *and* had at least one student in their class contribute some outcome data. Of consented children who did not have an IEP, four children were randomly selected from each classroom for participation (two girls and two boys whenever possible). Two of the selected children from each classroom were randomly chosen for observations of their individual engagement in the preschool classroom during the middle of the school year.

The subsample used for the current study consists of the children who have available individual observation data — 605 children (306 girls and 299 boys, $M = 50.18$, $SD = 5.44$ age in months) from 309 Head-Start and community-based classrooms. Sixteen classrooms were excluded from the study because no child in those classrooms had individual observation data (due to attrition from the fall time point and frequent child absence). Forty-eight percent of the children were Black or African American, 31% Hispanic or Latino, 12% White or Caucasian, 3% Asian or Asian American, and 5% Multi-ethnic. On average, maternal education was 12.83 years ($SD = 2.10$). Ninety-three percent of the teachers were female with a mean age of 42.3 years ($SD = 10.85$). Forty-six percent of the teachers were Black or African American, 32% White or Caucasian, 12% Hispanic or Latino, 3% Asian or Asian American, and 4% Multi-ethnic. Teachers had an average of 15.87 years of education ($SD = 1.598$) and 10.92 years of experience teaching below kindergarten ($SD = 8.12$). Fifty-three percent of the classrooms were Head Start classrooms, and a significant proportion of classrooms were in public schools (36%). The poverty rate among children in this sample was quite high as the proportion of children in the classroom with an income to needs ratio below 2 was .88 ($SD = .21$). Table 1 shows descriptive statistics for the subsample. There were no significant differences between the full Phase II sample ($N = 1407$ children & 405 teachers) and this subsample on classroom, teacher, or child demographics.

Procedures

Recruitment—Schools were recruited from 10 large urban areas throughout the United States. Permission was first secured from center directors or principals, followed by invitations to teachers. Full, informed consent was obtained from teachers who then allowed access to their classroom for observations, completed personal/classroom demographic surveys, and assisted with the parental consent process. All parents or guardians of children in each participating classroom were given a letter explaining the study, an informed consent form, and short family demographic survey, which they completed and returned to their child's preschool teacher. The average number of consented children per classroom was 9.98 ($SD = 3.83$) and ranged from 2 to 20. Of consented children who did not have an IEP, four children were randomly selected from each classroom for participation (two girls and two boys whenever possible). Two of those children were randomly chosen for individual observation of their engagement within the classroom.

Data collection—Teachers completed a professional and classroom demographic survey during the fall. Data collectors conducted direct child assessments during the fall and the spring. Observations of teacher-child interactions at the classroom level and children's individual classroom engagement were conducted during a single visit during the winter months.

Observation training—All data collectors attended a two-day, intensive training session for each of the two observational measures (one child-level measure of children's engagement [inCLASS] and one classroom-level measure of teacher-child interactions [CLASS]; see measures section for a description of these observation tools). Trainings included a detailed review of all content/dimensions, combined with watching, coding, and discussing five training clips. At the end of training, data collectors were required to code five reliability clips independently (without discussion), and score within one point of a mastercode on 80% of the dimensions in order to be certified as reliable and conduct observations. If data collectors did not meet this standard of reliability, they received individual consultation and then repeated reliability with new clips prior to live data collection. Finally, data collectors were required to complete a "live" coding session in a preschool classroom with a master trainer, using both observation measures. Data collector training reliability was very good and ranged from 88%–91% for the CLASS and 90%–94% for the inCLASS. Data collectors maintained reliability via weekly calibration meetings where they were required to independently watch and code CLASS and inCLASS reliability clips and discuss (via group conference call) how their scores compared with mastercodes.

Observation protocol—Observations were scheduled at the teachers' discretion and lasted for approximately four hours from the beginning of the day until mid-day dismissal or after lunch. Data collectors observed selected children and their classroom in a series of alternating cycles starting at the beginning of the school day: a 25-minute cycle for CLASS (15 minutes to observe, 10 minutes to score) and a 15-minute cycle for inCLASS (10 minutes to observe, 5 minutes to score), shifting across the two target children. The goal was to complete, at a minimum, three CLASS cycles and three inCLASS cycles per child during each visit. For the current sample, the mean number of cycles observed using the CLASS

was 3.50 ($SD = .60$; range = 2 to 6) and using the inCLASS was 3.32 ($SD = .64$; range = 1 to 6). Data collectors watched and coded nearly all activities that took place in the classroom.

Direct assessment training—Prior to the formal training days, data collectors were mailed a kit that included the various child assessment measures, a Training Manual created by the Study Team, a Reference Manual also created by the Study Team (to address questions during data collection), an example child assessment on CD, and various props for administering the assessment. Data collectors reviewed all materials carefully and gave several practice assessments prior to training. Data collectors then attended a two-day training with numerous opportunities to practice administering the assessment battery with time to ask questions and obtain feedback from trainers. After training, data collectors video recorded their administration of the assessment battery with a preschool child, which was then evaluated by the trainer. Prior to the spring data collection, data collectors completed a brief refresher training.

Direct assessment protocol—All children were administered direct assessments of their receptive vocabulary, expressive vocabulary, phonological awareness, and print knowledge in English. Children whose predominant language is English were also administered the self-regulation direct assessments in English. Children whose predominant language is Spanish were administered the self-regulation direct assessments as well as receptive and expressive vocabulary subtests, in Spanish. For the current study, we used English-administered language assessments for all children.

Measures

Child demographic information—Parents completed a survey that provided information about their child's date of birth, race/ethnicity, sex, and family income. Family income data were used to calculate poverty status based upon published U.S. Census data poverty thresholds for the year the data were collected.

Quality of individual children's engagement within the preschool classroom—The Individualized Classroom Assessment Scoring System (inCLASS; Downer et al., 2010) is an observational assessment of children's classroom engagement in interactions with teachers, peers, and tasks, comprised of 10 dimensions. The ten dimensions and descriptions of each are as follows: (1) positive engagement with teachers – attunement to the teacher, proximity seeking, and shared positive affect, (2) communication with teachers – initiates communication with the teacher, sustains conversations, and uses speech for varied purposes, (3) conflict with teachers – aggression, noncompliance, negative affect, and attention-seeking directed toward the teacher, (4) sociability with peers – proximity seeking, shared positive affect, popularity, perspective-taking, and cooperation, (5) assertiveness with peers – initiations with peers, leadership, and self-advocacy, (6) communication with peers – initiates communication with peers, sustains conversations, and uses speech for varied purposes, (7) conflict with peers – aggression, confrontation, negative affect, and attention-seeking directed toward peers, (8) engagement with tasks – sustained attention and active engagement, (9) self-reliance with tasks – personal initiative, independence, persistence, and

self-direct learning, and (10) behavior control – patience, activity level matches classroom expectations, and physical awareness.

Each dimension is rated on a seven-point scale (guided by detailed descriptors of behaviors that indicate low, medium, and high quality) with higher ratings indicating higher quality and/or more frequent positive interactions within a dimension (except in the case of conflict with teachers and peers for which higher ratings indicate more negative interactions). Children's scores for each cycle were averaged across the appropriate dimensions to produce scores with a possible range of one to seven.

In an initial validation study, exploratory factor analysis of these dimensions (Downer et al., 2010) identified four domains of child interactions: positive engagement with teachers (positive engagement and communication with teachers), positive engagement with peers (sociability, assertiveness, and communication with peers), positive engagement with tasks (engagement and self-reliance with tasks), and negative classroom engagement (conflict with teachers and peers). A more recent study of the inCLASS' construct validity found that an additional dimension, behavior control, should be reverse scored and included in the model as part of the negative classroom engagement domain (Bohlmann et al., 2012). Bohlmann and colleagues (2012) confirmed this four-factor model across multiple, diverse samples and across demographic subgroups (gender, poverty status, and ethnicity), demonstrating the inCLASS' applicability across a wide range of children and classrooms. An initial validation study provided support for the inCLASS' construct validity and criterion-related validity (Downer et al., 2010). Additionally, recent studies employing the inCLASS have demonstrated good predictive validity, with children's observed engagement predicting school readiness outcomes in language and literacy skills and self-regulation (Bohlmann & Downer, 2012; Maier, Downer, Vitiello, & Booren, 2012; Williford et al., in press; Vitiello et al., 2012).

Internal consistencies for the four domains using this study's data were as follows: positive engagement with teachers, $\alpha = .68$; positive engagement with peers, $\alpha = .82$; positive engagement with tasks, $\alpha = .61$; and negative classroom engagement, $\alpha = .78$. Interrater agreement during live observations on these scales has ranged from 0.71 to 0.99 in recent studies (Downer et al., 2010; Williford et al., in press). Inter-rater reliability for the current study was calculated across 20% of all cycles with two data collectors independently observing and rating the same children and intraclass correlations averaged .80 (ranged from .65–.87).

Quality of teacher-child interactions at the classroom level—The Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008) measures teacher-child interactions at the classroom level using 11 dimensions and a seven-point scale: (1) positive climate, (2) negative climate, (3) teacher sensitivity, (4) regard for student perspectives, (5) behavior management, (6) productivity, (7) concept development, (8) instructional learning formats, (9) quality of feedback, (10) language modeling, and (11) literacy focus.

A principal components analysis typically reveals a three-factor solution: emotional support, classroom organization, and instructional support, with alphas of .81–.89, respectively (Hamre et al., in press). CLASS instructional support has been shown to predict growth in language and literacy skills in preschool (Howes et al., 2008; Mashburn et al., 2008) and first grade (Hamre & Pianta, 2005), while emotional support and classroom organization have been linked to self-regulatory and social outcomes (Mashburn et al., 2008; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Internal consistencies for the three domains using this study's data were as follows: emotional support, $\alpha = .91$; classroom organization, $\alpha = .84$; and instructional support, $\alpha = .91$. Inter-rater reliability for the current study was calculated across 20% of all cycles with two data collectors independently observing and rating the same children and intraclass correlations averaged .83 (ranged from .78–.88).

School readiness outcomes

Language: receptive and expressive vocabulary: The Peabody Picture Vocabulary Test-3rd edition (PPVT-III; Dunn & Dunn, 1997) was developed to measure children's receptive vocabulary skills. In this assessment, the child is shown a card with four pictures, read a word that corresponds to one of the pictures, and asked to point to the corresponding picture. The PPVT-III demonstrates acceptable reliability and validity (Chow & McBride-Chang, 2003; Dunn and Dunn, 1997). Raw scores were used in the current analysis. The Woodcock-Johnson-III Psychoeducational Battery (WJ-III; Woodcock, McGrew, & Mather, 2001) is a widely used, individually administered assessment battery that measures general cognitive abilities and achievement in individuals from age two through adulthood. Twelve achievement subtests can be used with preschoolers. These subtests demonstrate high internal reliability and acceptable validity. Raw scores can be standardized so that each child's performance is relative to his/her same-age population (Woodcock et al., 2001). Expressive vocabulary was assessed using the Picture Vocabulary subtest, which measures aspects of word knowledge by asking children to name objects depicted in a series of pictures.

Emergent literacy: Phonological awareness and print knowledge: The Test of Preschool Early Literacy (TOPEL; Lonigan, Wagner, Torgesen, & Rashotte, 2007) is an assessment battery composed of three subtests (Print Knowledge, Phonological Awareness, and Definitional Vocabulary) designed to assess preschool children's (3 to 5 years of age) emergent literacy skills. These subtests have adequate internal consistency (.78–.89) and concurrent validity (Lonigan, et al., 2007). For the current study, children's phonological awareness was assessed using the Phonological Awareness subtest, which measures word elision and blending skills. Children's print knowledge was assessed using the Print Knowledge subtest, which measures knowledge of the alphabet, written language conventions, and writing form.

Self regulation: Inhibitory control and working memory: Inhibitory control was assessed using the Pencil Tap Test (Smith-Donald, Raver, Hayes, & Richardson, 2007). This assessment asks children to tap once when the assessor taps twice and vice versa. Percent of correct responses is computed as the child's score. The Pencil Tap Test has been shown to

have good concurrent and construct validity (Smith-Donald et al., 2007). Working memory was assessed using the Backward Digit Span subtest (Carlson, 2005) where the child is asked to repeat the list of digits spoken by the assessor in the reverse order. In each trial the number of digits is increased by one. The child's score is the highest number of digits the child was able to correctly repeat back, ranging from 1 (failed to get any digits correct) to 5 (got 5 digits correct).

Data Analytic Plan

Data reduction—Two steps were taken to reduce the number of variables examining quality of interactions at both the individual child and classroom level. First, due to considerable correlation among the CLASS domains (correlations ranged from .58 to .79), we averaged the three domains (Emotional Support, Classroom Organization, Instructional Support) to create a single, global score for the quality of teacher-child interactions at the classroom level (labeled CLASS composite). For the quality of interactions at the individual child level, latent class analysis (LCA) was used to create profiles, or patterns, of children's engagement across teachers, peers, and tasks. In the LCA, the multilevel nature of the data was taken into account by using a sandwich estimator (the COMPLEX command) in Mplus Version 6.11 (Muthén & Muthén, 1998–2010). Model fit of the LCA was determined by comparing different profile solutions using: (1) the Bayesian Information Criterion (BIC; Schwarz, 1978) and sample-size adjusted BIC (ABIC; Burnham & Anderson, 2004), (2) the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR) and the Adjusted Lo-Mendell-Rubin likelihood ratio test (Adjusted LRT), (3) entropy, which is a summary value of the individual class probabilities, and (4) the theoretical and practical applications of the profiles (Muthén, 2004). Lower values on BIC and ABIC indicate better fit. The likelihood ratio tests compare the current model to a model with one less profile, and a significant *p* value suggests the model with one less profile should be rejected in favor of the current model (Lo, Mendell, & Rubin, 2001; Nylund, Asparouhov, & Muthén, 2008). High (i.e., greater than .80) entropy values signify a more accurate solution (Hix-Small, Duncan, Duncan, & Okut, 2004).

Multilevel modeling—Due to the hierarchical nature of the data where children (level 1) were nested within classrooms (level 2), multilevel modeling was chosen as the data analytic strategy. Using Mplus Version 6.11 (Muthén & Muthén, 1998–2010), a single multilevel model was fit so that the quality of children's individual engagement in the classroom (dummy codes representing children's most likely profile membership) was entered as a predictor at level 1 and the quality of teacher-child interactions assessed at the classroom level (CLASS composite) was entered in at level 2 predicting gains in multiple school readiness outcomes. The following child-level control variables were included: the corresponding fall school readiness score, age (in months as of September 1st), gender (boy = 1, girl = 0), maternal education (in years), and ethnicity (three variables were dummy coded: Black/African-American, Hispanic/Latino, and Other so that White served as the reference group). Classroom-level covariates included nine dummy codes for the 10 intervention sites and two dummy codes for intervention status: course (course = 1, control = 0) and consultancy (consultancy = 1, control = 0).

Missing data for any one variable ranged between .2% and 10%. To account for missing data, full information maximum likelihood estimation with robust standard errors was used to estimate parameters under the assumption that data were missing at random (e.g., McArdle et al., 2004). This type of estimation uses all available data for each case when estimating parameters and, therefore, increases the statistical power of estimated parameters (Enders & Bandalos, 2001).

Effect sizes were calculated for the variables of interest when they significantly predicted children's school readiness gains. Although there is not a single accepted method for calculating effect sizes in multilevel models (Roberts & Monoco, 2006; Snijders & Bosker, 1999), we multiplied the coefficient with the standard deviation for the predictor, then divided by the standard deviation for the corresponding school readiness outcome, an approach that has been used in several studies employing multilevel modeling (see Gutman, Sameroff, & Cole, 2003; Mashburn, Justice, Downer, and Pianta, 2009; NICHD ECCRN, & Duncan, 2003).

Results

Descriptions of Children's Patterns of Engagement

To reduce the number of variables examining quality of interactions at the individual child level, LCA was used to create profiles of children's engagement with teachers, peers, and tasks. LCA models controlled for child-level covariates, such as age, gender, ethnicity, and maternal education, as well as the classroom-level covariate, intervention status. Including the nine dummy codes for the 10 intervention sites resulted in a error suggesting that "site" may overlap with the profiles (i.e., some sites may have only one latent profile, instead of three). Therefore, site was removed from the LCA model.

Two-, three-, and four-profile solutions were examined. Results replicated a three-profile solution (BIC = 7731.20; ABIC = 7616.91; VLMR & Adjusted LRT p value = 0.14; entropy = .81) found in a previous study with a different sample (Maier et al., 2012). A four-profile solution seemed to have slightly better model fit (BIC = 7654.17; ABIC = 7498.61; VLMR & Adjusted LRT p value = 0.03; entropy = .81). However, because one of the profiles in the four-profile solution had a very small percentage of children (2%), the four profile solution was not consistent with the hypothesized profiles, and the three-profile solution replicated findings from another study (Maier et al., 2012), further analyses utilized the three-profile solution.

Figure 1 provides a graphical representation of the three profiles and Table 2 provides the three profiles' means, standard deviations, and ranges on the inCLASS variables. Seventy percent ($n = 416$) of the sample was classified into the *Typically-Engaged* profile, as they comprised the majority of the sample. This profile was characterized by relatively low positive engagement with teachers and peers, moderate engagement with tasks and low negative engagement. The mean scores of the children in this profile were consistent with means from previous samples of preschoolers who were demographically at risk (Downer, Booren, Hamre, Pianta, & Williford, 2011). The second profile was labeled *Positively-Engaged* 26% ($n = 157$). Compared to the Typically-Engaged Profile, the children in this

profile demonstrated significantly higher positive engagement with teachers, peers and tasks and significantly lower negative engagement. The final profile, *Negatively-Engaged*, consisted of 4% of the sample ($n = 23$) and displayed lower task engagement and higher negative engagement compared to the Typically-Engaged profile.

The average probabilities for the children's most likely class membership revealed an adequate degree of fit among the profiles and children in the sample: children classified into the Typically-Engaged profile had a 91.9% probability of being assigned to that profile and complementary small probabilities of being classified in the Positively-Engaged [7.3%] or Negatively-Engaged profiles [0.8%]; children in the Positively-Engaged profile had 88.8% probability being assigned to that profile (11.2% for Typically-Engaged; 0% for Negatively-Engaged); children in the Negatively-Engaged profile had 94.5% probability being assigned to that profile (5.5% for Typically Engaged; 0% for Positively-Engaged). Individual children's most likely class membership was dummy coded into two variables (Positively-Engaged profile and Negatively-Engaged profile) so that the largest profile (Typically-Engaged) served as the reference group.

Descriptive Results

Descriptive statistics of study variables, which were adequately distributed, can be found in Table 3. Correlations among study variables are presented in Table 4. The CLASS composite was positively associated with the Positively-Engaged profile, but modestly negatively associated with the Typically-Engaged and Negatively-Engaged profiles. Table 5 displays the number of children classified into each profile that are in a low, mid, or high quality classroom. The frequency counts show that the number of Typically-Engaged children in low- and mid-quality classrooms is greater than would be expected, and the number of Positively-Engaged children in high-quality classrooms is greater than would be expected, $\chi^2(2) = 35.83, p < .001$. This suggests a relationship between classroom engagement at both the child and classroom level.

Moderate to high positive correlations were found among fall and spring school readiness scores. There was a small positive association between the CLASS composite and most of the school readiness outcomes. Small, positive correlations were found between the dummy code for the Positively-Engaged profile and fall and spring school readiness scores. In contrast, small negative associations were found between the Typically-Engaged profile and school readiness scores. The Negatively-Engaged profile showed little association to school readiness scores in the fall or spring. The intraclass correlations for the spring school readiness scores ranged from .06 (inhibitory control) to .15 (print knowledge).

Multilevel Modeling Results

A multilevel model was fit with the six school readiness outcomes predicted by child covariates, as well as the two dummy codes representing the pattern of individual children's classroom engagement (Positively-Engaged profile and Negatively-Engaged profile; the Typically-Engaged profile was the reference group), entered in at level 1 and the composite of the quality of teacher-child interactions assessed at the classroom level (CLASS composite) entered in at level 2. A cross-level interaction between the Positively-Engaged

profile dummy code and the CLASS composite was also entered as a predictor of each of the outcomes. However, the effect of the Negatively-Engaged profile on outcomes did not vary across classrooms and, therefore, cross-level interactions using that predictor were not specified.

Results regarding covariates indicated that child age and fall scores were significant, positive predictors of all outcomes. In comparison to girls, boys made fewer gains in phonological awareness, print knowledge, and inhibitory control. In comparison to white children, Black or African-American children made fewer gains in expressive and receptive vocabulary and phonological awareness, and Hispanic children made fewer gains in expressive and receptive vocabulary, phonological awareness, and print knowledge. Children whose parents reported them as being of other ethnicities made fewer gains in expressive and receptive vocabulary, in comparison to White children. Having a mother with higher maternal education was associated with greater gains in expressive and receptive vocabulary as well as phonological awareness. See Table 6 for the full set of results.

Results regarding the variables of interest indicated that being classified into the Positively-Engaged profile, in comparison to the Typically-Engaged profile, was associated with marginally significant gains in inhibitory control ($b = 0.27$, $SE = .16$, $p = .09$; effect size = .36). Being classified into the Negatively-Engaged profile, in comparison to the Typically-Engaged profile, was not associated with gains in any of the outcomes. The CLASS composite significantly predicted gains in receptive vocabulary ($b = 2.13$, $SE = .98$, $p = .03$; effect size = .08), print knowledge ($b = 2.12$, $SE = .59$, $p < .001$; effect size = .14), working memory ($b = 0.09$, $SE = .04$, $p = .03$; effect size = .09), and inhibitory control ($b = 0.07$, $SE = .02$, $p = .002$; effect size = .16). Two significant interactions between the Positively-Engaged profile and CLASS composite were found to predict gains in expressive vocabulary ($b = -2.90$, $SE = 1.11$, $p = .009$; effect size = .40; see Figure 2a) and phonological awareness ($b = -1.19$, $SE = .62$, $p = .05$; effect size = .42; see Figure 2b). For both school readiness outcomes, the results indicated that as teacher-child interactions assessed at the classroom level increased in quality, the differences in school readiness gains between children classified as Positively-Engaged versus children classified as Typically-Engaged decreased. Thus, teacher's interactions at the classroom level had a greater association with gains in school readiness skills for the children classified as Typically-Engaged.

Discussion

The purpose of this study was to examine the quality of the preschool experience at both the classroom and the child level by observing the interactions a teacher provides to the classroom as well as individual children's patterns of engagement. Our aim was to obtain a more rich assessment of the association between children's early learning experiences and their short-term development of school readiness skills. We were particularly interested in how the teacher-child interactions assessed at the classroom level would moderate children's gains in readiness skills as a function of children's individual patterns of classroom engagement.

As expected, both children's individual positive engagement *and* the quality of teacher-child interactions at the classroom level were uniquely predictive of children's school readiness skills. After controlling for nesting and covariates, teachers' effective interactions at the classroom level promoted children's gains in receptive vocabulary, print knowledge, working memory, and inhibitory control. At the individual level, children who were more positively engaged within the classroom showed greater gains in inhibitory control. Finally, the effect of children's individual classroom engagement on gains in phonological awareness and expressive vocabulary was moderated by classroom level teacher-child interactions.

Specifically, children classified as typically engaged made greater gains in expressive language and phonological awareness when they attended preschool classrooms where the teacher displayed high quality interactions with her students. This is in contrast to children classified as positively engaged who made similar gains in phonological awareness regardless of the quality of classroom level teacher-child interactions and who made greater gains in expressive language when attending preschool classrooms with lower quality teacher-child interactions. Together, these results indicate that children's level of individual engagement appears to matter less in classrooms characterized by high quality teacher-child interactions. This emphasizes the importance of what the teacher can bring to the classroom—if teachers interact with the children in their classroom in ways that are emotionally, organizationally, and instructionally responsive, children in that classroom may have more equitable gains in language and literacy skills regardless of their individual patterns of classroom engagement.

With regard to children classified as positively engaged, the results broadly indicate that these children may show resilience to the negative impacts of lower quality teacher-child interactions. We must note the somewhat counterintuitive finding that children classified as positively engaged made the greatest gains in expressive language skills in the context of being in classrooms where the teacher's interactions with students were of lower quality rather than of higher quality (relative to the gains made by other groups). Perhaps these children are able to make the most of whatever learning opportunities the teacher and classroom provide. In comparison to the other children in the classroom, these positively engaged children may be more likely to explicitly seek out more interactions and conversations with teachers and peers. And, it may be that the frequency of these types of interactions, which are likely to include one-on-one conversations that might maximize growth in expressive language (Ruston & Schwanenflugel, 2010), is higher in lower-quality classrooms where the teacher is perhaps not structuring whole group activities or facilitating small group activities that would reduce or better distribute opportunities for one-to-one conversations. It could also be the case that the teacher is more responsive to children who display a positively engaged engagement pattern; teachers generally favor and are more responsive to children who exhibit cooperative and social behaviors in comparison to children who display disruptive or aggressive behaviors (Brophy & Good, 1974; McComas, Johnson, & Symons, 2005; Wentzel, 1991).

Taken together, these results indicate that looking through both the teacher and the child lens provides us with a better understanding of how children develop school readiness skills.

These results also stress the transactional nature between teacher interactions and children's engagement (McWilliam et al., 2003). This is evidenced by the inconsistent distribution of children who were classified as positively, typically, or negatively engaged across classrooms characterized by lower or higher quality. For instance, children classified as positively engaged were less likely to be in low quality classrooms compared to high quality classrooms. And, there were more children who were classified as negatively engaged in low quality classrooms compared to high quality classrooms. These results suggest that the ways in which an individual child engages and interacts in the classroom is related not only to that particular child's capacities and behaviors but also the kinds of opportunities and experiences that the classroom affords. Future research should certainly dive deeper into this interplay between how the classroom context and child characteristics interact to promote or impede children's early learning. For example, recent research by Belsky and Boyce has focused on how differences in children's temperament and biological reactivity make them more or less susceptible to the stress associated with certain rearing conditions (e.g., parental, childcare, school) and potentially subsequent negative outcomes (Boyce & Ellis, 2005; Belsky & Pleuss, 2009). Repeated measures, longitudinal research using cross-lag models both across a day and across the year will be helpful in further understanding how children's competencies in engagement may influence a teacher's practices and interactions in the early childhood classroom and vice-versa.

Our approach to examining the quality of preschool interactions using observation lenses at the classroom and individual level included data reduction techniques that warrant some comment. First, we examined the quality of interactions at the classroom level quite globally through an overall CLASS composite that aggregated together the domains of Emotional Support, Classroom Organization, and Instructional Support, which were considerably correlated with each other. Through the creation of this composite, it is possible that we have lost some specificity to examine the interrelations between children's patterns of engagement and the quality of a teacher's interactions at the classroom level. For example, instructionally supportive interactions may have more compensatory power relative to emotionally or organizationally supportive interactions. However, the substantial overlap among the domain scores suggest there is an important and overarching aspect of how teachers interact with their students that is *not* domain specific. When examining the conceptual framework of the CLASS, an underlying emphasis on a teacher's ability to effectively respond to students through warm interactions that are contingent and sensitive to the child's needs is evident (Hamre, Hatfield, & Pianta, 2012). The current study provides support that a domain-general aspect of quality interactions that captures a teacher's responsivity relates to gains in preschoolers' school readiness in areas of language, literacy, and self-regulation.

We used Fredrick's and colleagues (2004) multidimensional construct of engagement to conceptualize children's individual interactions in the preschool classroom which emphasizes the interrelations among children's engagement with teachers, peers, and tasks. For example, one child may often engage positively with tasks and peers when he and a favorite peer play "house" in the dramatic play center every day. In addition, this child seeks the teacher's attention to share his play accomplishments (e.g., "look, we are taking the baby

to the doctor”) which may advance the play (e.g., teacher talks through what happens at the doctor’s office). This is in contrast to another child who engages highly in task through solitary cutting and pasting activities in the art center. This child, who plays well alone, has difficulty navigating cooperative play when a peer wants to use the same art materials and seems disinterested in the teacher’s attempts to provide scaffolding toward parallel play with her peer. We chose to use a person centered approach in the hopes of capturing the complexity of children’s engagement patterns described above in ways that are difficult to do using a variable centered approach, which examines the independent contribution of the individual engagement components.

We hypothesized four engagement profiles: a large group of averagely engaged children (moderately positive engagement with teachers, peers, and tasks and low negative engagement); a smaller group of highly positively engaged children; a smaller group of children who engaged high on task but who evidenced low inter-personal engagement and a small group of children who displayed low positive engagement and high negative engagement. Our results supported a three-profile solution which was only partially supportive of our expected groupings. The largest group of children labeled “typically-engaged”, evidenced low positive engagement with teachers and peers, moderate engagement with task and low negative engagement. What this means is that, for this sample, the majority of children evidenced good involvement with classroom tasks and activities but had little emotional connection to and few verbal interactions with their teachers and peers. This description is more consistent with our expected small group of “socially reticent” children. The difference between our expected and observed classes of children may be because we do not have a normative sample of preschoolers or preschool programs. Our sample included were state and federally funded preschool programs that served children at-risk for school failure due to low income or a developmental delay. Thus, our sample did not include private preschool and childcare programs that the vast majority of 3- and 4- year old children attend. The at-risk nature of this sample may be the reason that we did not find a group of children who displayed higher levels of positive teacher and peer engagement. We note that this set of profiles have been replicated in a separate sample of at-risk preschoolers (Maier et al., 2012). Future research should examine preschool engagement in children from diverse socio-economic backgrounds that includes preschool programs that serve children from higher socio-economic status levels.

Limitations

The results of this study stress the importance of assessing the quality of the preschool classroom at both the classroom and child level to better understand how children gain school readiness skills. However, there are several limitations that deserve attention. First, we note that the same observer assessed the quality of interactions at both the classroom and child level. This may have overestimated the association between individual and classroom level quality, though these were modest (significant r ’s ranged from $-.09$ to $.33$). Additionally, these observation data were conducted during a single day of observation which may have reduced the reliability of our measures, and thus the strength of our results may be underestimated. Despite this limitation, we did find some support for differential prediction of the classroom experience at the child and classroom level, suggesting that the

data collectors were able to pick up different aspects of quality within the same observation day using two different observation tools. Future work should carefully consider the need to capture the most independent and reliable measures of quality using multiple lenses with the practical constraints of conducting observations in classrooms (e.g., multiple observers and observations over many days are more likely to be seen as disruptive to normal classroom functioning).

The LPA results identified three patterns of classroom engagement in this sample. This suggests that children are interacting with and experiencing the preschool classroom in different ways. However, we are unable to confirm that individual children within the same classroom have disparate learning experiences because this sample only had two children observed in each classroom. Future research with greater numbers of children within classrooms would help further our understanding of the diversity across individual children's experiences.

Finally, due to the small number of children being classified into the negatively-engaged profile, we were unable to adequately examine the predictive ability of this pattern of engagement for children's gains in school readiness or how the quality of teacher interactions at the classroom level may moderate this association. It will be important for future studies to replicate the patterns of child engagement found in this study. We hypothesize this small group of negatively engaged children represent the small percentage of children who are at high risk for a future diagnosis of a behavioral or emotional disorder and expect this group to replicate in future studies. In addition, in larger samples of children, we would expect this negative pattern of engagement to be associated with smaller gains in school readiness skills.

Conclusion

The majority of children spend substantial time in preschool prior to kindergarten entry (Adams et al., 2007) and so preschool is a prime context where children can be exposed to the early learning experiences necessary to enter formal schooling with well-developed academic and social-emotional skills. Integrating observation lenses at the classroom and child level will help us better understand how the impact of early learning experiences on readiness skills differs for individual children. This focus can lead us to develop more refined preschool-based interventions that target children who have both the greatest need for and may be most susceptible to improved early learning experiences.

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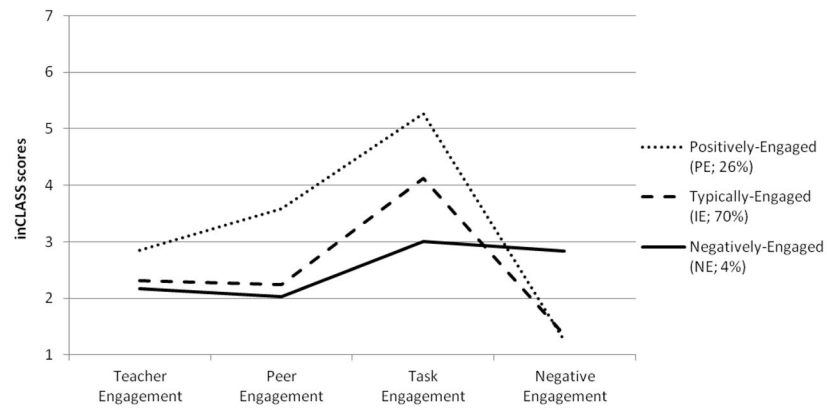
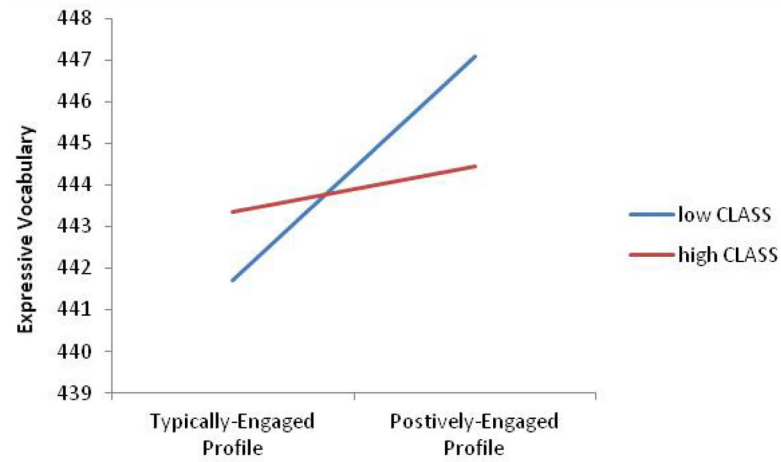
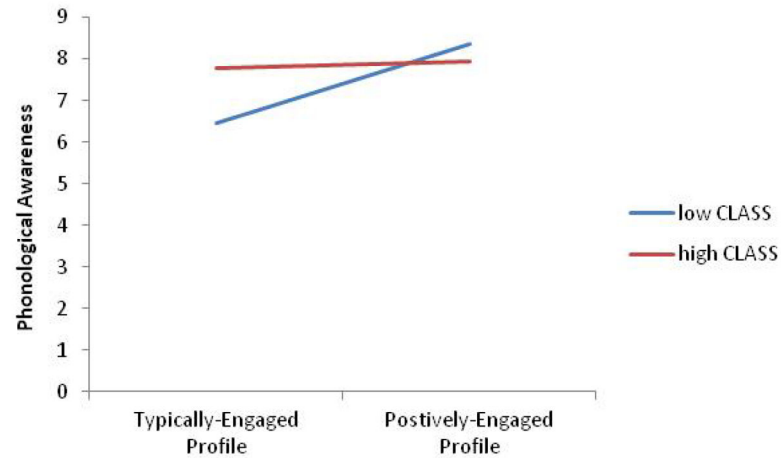


Figure 1.

Graphical representation of the final three-profile solution using the four inCLASS domains that assess the quality of interactions at the individual child level. inCLASS scores are on a scale of 1 (low quality) to 7 (high quality), with the exception of negative classroom engagement, for which higher ratings indicate more negative interactions.



a) Expressive vocabulary



b) Phonological awareness

Figure 2.

Graphical representation of the interaction effect between profile membership and one standard deviation above (high CLASS) and below (low CLASS) the CLASS composite on expressive vocabulary (Figure a) and phonological awareness (Figure b).

Table 1

Descriptive Statistics for Classroom, Teacher, and Child Demographics

	<i>N</i>	<i>Mean</i>	<i>SD</i>
<i>Classroom demographics</i>			
Located in a public school	296	0.37	0.48
Head Start	285	0.57	0.50
Proportion of poverty in classroom	309	0.88	0.21
<i>Teacher demographics</i>			
Male	299	0.04	0.20
Age	299	42.30	10.85
White	298	0.33	0.47
Black	298	0.47	0.12
Hispanic	298	0.12	0.33
Asian	298	0.03	0.17
Multi-ethnic	298	0.04	0.20
Course condition	309	0.38	0.49
Coaching condition	309	0.51	0.50
Total years of teaching experience	295	10.92	8.12
Years of education	299	15.87	1.60
<i>Child demographics</i>			
Age (in months)	605	50.18	5.45
Male	605	0.49	0.50
Income to needs	556	1.15	1.03
Maternal education	590	12.83	2.10
White	597	0.12	0.33
Black	597	0.48	0.50
Hispanic	597	0.31	0.46
Asian	597	0.03	0.17
Multi-ethnic	597	0.05	0.23

Note. The current study sample included 605 children in 309 classrooms.

Table 2
Means, Standard Deviations, and Ranges on inCLASS scores for the Full Sample and Three Profiles

	Full Sample			Positively Engaged			Typically Engaged			Negatively Engaged		
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range
Teacher Engagement	2.47 ^a	0.93	1.00–5.75	2.93 ^b	1.10	1.00–5.33	2.30 ^c	0.79	1.00–5.75	2.19 ^{a,c}	0.56	1.25–3.42
Peer Engagement	2.62 ^a	0.95	1.00–6.17	3.67 ^b	0.91	1.56–6.17	2.26 ^c	0.63	1.00–4.33	1.99 ^c	0.64	1.17–3.38
Task Engagement	4.40 ^a	0.86	1.50–6.92	5.38 ^b	0.54	3.58–6.92	4.12 ^c	0.61	2.38–5.83	3.00 ^d	0.80	1.50–4.38
Negative Engagement	1.38 ^a	0.46	1.00–4.00	1.24 ^b	0.27	1.00–2.50	1.35 ^{a,b}	0.34	1.00–2.42	2.91 ^c	0.54	2.33–4.00

Note. inCLASS scores are on a scale of 1 (low quality) to 7 (high quality), with the exception of negative classroom engagement, for which higher ratings indicate more negative interactions. In each row, significant pairwise differences are denoted by different superscript letters ($p < 0.01$). If settings have corresponding superscript letters, then the pairwise difference is non-significant.

Table 3

Descriptive Statistics for Study Variables

	M	SD	Range	
			Min	Max
Quality of Interactions				
CLASS Composite	4.18	0.74	1.95	6.12
Emotional Support	5.12	0.87	2.42	6.92
Classroom Organization	5.06	0.78	1.78	6.78
Instructional Support	2.36	0.86	1.00	5.00
inCLASS -- Teacher Engagement	2.47	0.93	1.00	5.75
inCLASS -- Peer Engagement	2.62	0.95	1.00	6.17
inCLASS -- Task Engagement	4.40	0.86	1.50	6.92
inCLASS -- Negative Engagement	1.38	0.46	1.00	4.00
Outcome Variables				
Receptive Vocabulary	40.91	19.48	3	104
	52.58	19.73	7	101
Expressive Vocabulary	455.56	19.53	374	491
	462.00	14.86	384	509
Phonological Awareness	12.22	5.52	0	27
	15.36	5.71	0	27
Print Knowledge	13.75	10.69	0	36
	22.32	11.10	0	36
Inhibitory Control	0.46	0.33	0	1
	0.66	0.33	0	1
Working Memory	1.16	0.48	1	4
	1.42	0.72	1	5

Table 4

Bivariate Correlations Among Predictor and Outcome Variables

	CLASS	FRV	SRV	FEV	SEV	FPA	SPA	FPK	SPK	FIC	SIC	FWM	SWM
1. Positively-Engaged	.28***	.23***	.22***	.16***	.22***	.13**	.18***	.19***	.20***	.12**	.15***	.11**	.20***
2. Typically-Engaged	-.23***	-.20***	-.21***	-.17***	-.21***	-.12**	-.17***	-.17***	-.16***	-.11*	-.12**	-.10*	-.16***
3. Negatively-Engaged	-.10*	-.03	-.01	.03	-.01	-.02	-.00	-.03	-.10*	.03	-.07	-.01	-.07
4. CLASS composite	--	.09*	.20***	.06	.11**	.09*	.16***	.15***	.24***	.04	.10*	.05	.14**
5. Fall Receptive Vocab		--	.83***	.68***	.66***	.62***	.58***	.52***	.47***	.48***	.43***	.35***	.38***
6. Spr Receptive Vocab			--	.66***	.73***	.59***	.60***	.51***	.54***	.47***	.44***	.33***	.44***
7. Fall Expressive Vocab				--	.80***	.48***	.46***	.39***	.35***	.28***	.25***	.19***	.28***
8. Spr Expressive Vocab					--	.43***	.51***	.41***	.43***	.28***	.30***	.21***	.33***
9. Fall Phono Awareness						--	.60***	.52***	.45***	.56***	.40***	.39***	.46***
10. Spr Phon. Awareness							--	.47***	.48***	.47***	.47***	.31***	.45***
11. Fall Print Knowledge								--	.72***	.43***	.35***	.40***	.47***
12. Spr Print Knowledge									--	.39***	.43***	.29***	.44***
13. Fall Inhibitory Control										--	.48***	.40***	.43***
14. Spr Inhibitory Control											--	.24***	.36***
15. Fall Working Memory												--	.46***
16. Spr Working Memory													--

Note. Positively-Engaged, Typically-Engaged, and Negatively-Engaged are dummy codes designating profile membership (1 = classified into that profile; 0 = not classified into that profile). Vocab = vocabulary; Spr = spring; Phono = phonological.

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Table 5

Frequency Counts of Individual Children in Each Profile in Classrooms with Low, Mid, or High Classroom Quality

	Low CLASS (<i>n</i> = 52 classrooms; 17%)	Mid CLASS (<i>n</i> = 206 classrooms; 67%)	High CLASS (<i>n</i> = 51 classrooms; 17%)
Positively-Engaged Profile (<i>n</i> = 157 children)	10 (6%)	98 (62%)	49 (31%)
Typically-Engaged Profile (<i>n</i> = 416 children)	79 (19%)	286 (69%)	51 (12%)
Negatively-Engaged Profile (<i>n</i> = 23 children)	10 (43%)	11 (48%)	2 (9%)

Note. Low CLASS = classroom quality score one standard deviation below the mean (3.44); Mid CLASS = classroom quality score at the mean (4.18); High CLASS = classroom quality score one standard deviation above the mean (4.92).

Quality of interactions at Individual Child and Classroom Level and their Interaction Predicting School Readiness

Table 6

	Receptive Vocabulary		Expressive Vocabulary		Phonological Awareness		Print Knowledge		Working Memory		Inhibitory Control	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Positively-Engaged	7.57	6.79	15.35**	5.13	6.00*	2.82	6.28	4.34	0.65	0.40	0.27 ^a	0.16
Negatively-Engaged	3.03	2.88	-1.06	3.13	0.76	1.24	-2.60	1.73	-0.14	0.09	-0.06	0.07
CLASS composite	2.13*	0.98	1.11	0.82	0.90**	0.34	2.12***	0.59	0.09*	0.04	0.07**	0.02
Positively-Engaged x CLASS	-1.41	1.49	-2.90**	1.11	-1.19*	0.62	-1.28	0.96	-0.11	0.09	-0.04	0.04

Note. Values are unstandardized coefficients, controlling for intervention status, site, maternal education, child age, sex, ethnicity, and fall school readiness score. Positively-Engaged and Negatively-Engaged are dummy codes designating profile membership (1 = classified into that profile; 0 = not classified into that profile), with the Typically-Engaged profile as the reference group. White served as the reference group in ethnicity dummy codes. AA = African American; educ = education; CLASS = Classroom Assessment Scoring System.

^a
 $p = .09$,

*
 $p = .05$,

**
 $p < .01$,

 $p < .001$.