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Teacher-Child Interactions and Children's Peer Engagement
in Pre-Kindergarten

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ABSTRACT OF THE DISSERTATION

Teacher-Child Interactions and Children's Peer Engagement in Pre-Kindergarten

by

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Children's competent engagement with peers in pre-kindergarten classrooms is important for their development of school readiness social skills, as well as social relationships (Howes, 2010). This study examines the relationship between classroom-level teacher-child interactions and individual children's peer engagement across a classroom day. Multi-level regression models indicate that domain-specific teacher-child interactions focused on the intent and content of cognitive facilitation were positively associated with children's peer sociability, assertiveness, and communication, suggesting that effective instructional interactions are associated with higher level peer interactions within classrooms. In contrast, domain-specific teacher-child interactions focused on the intent and content of positive management and routines were negatively associated with all types of peer engagement, providing some support for the idea that teachers may also need to develop skill in engaging in teacher-child-peer interactions. No significant

associations were found between domain-general responsive teaching and children's peer engagement within PreK classrooms. Implications are suggested for supporting children's peer engagement within classrooms and ultimately influencing their school readiness by increasing teachers' effective use of instructionally supportive interactions.

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Teacher-Child Interactions and Children's Peer Engagement in Pre-Kindergarten

Children's competent engagement with peers in pre-kindergarten (PreK) classrooms has been linked to an array of positive outcomes including the development of school readiness social skills as well as social relationships, particularly friendships (Howes, 2010). PreK classrooms can be places where children can learn to initiate and sustain positive peer interactions in play or in small work groups oriented towards academic tasks. In these classrooms, children effectively communicate with one another and have low levels of conflict (Ladd, 2005). Early childhood teachers can support children's competent peer engagement by providing children with a secure base for exploring the world of peers (Howes, 2010), and by creating a classroom community where peer relationships are valued and supported (Howes & Ritchie, 2002). However, not all classrooms facilitate the development of peer social skills and some children have more difficulty than others in effective engagement with peers (Howes, Guerra, & Zucker, 2008; Howes & Wishard, 2004; Howes et al., 2011). The main goal of this dissertation is to examine the simultaneous relationship between classroom level teacher-child interactions and individual children's peer engagement across a single classroom day.

Creating PreK classrooms conducive to high levels of peer engagement is important for effectively supporting young children's school readiness social skills. Specifically, young children are more likely to do well upon entering formal schooling if they are knowledgeable about their emotions and the emotions of others, have developed positive ways of interacting with teachers and peers, can

demonstrate self-regulation in emotionally rousing situations, are enthusiastic and take pleasure in academic learning, can pay attention, and can work on their own and in collaboration with peers on academic tasks (see Raver & Knitze, 2002). For the large majority of children, these social-emotional skills lay the foundation for their academic success in the first years of elementary school (Ladd, Kochenderfer, & Coleman, 1997). When PreK classrooms provide frequent opportunities for peer interactions with appropriate support, children will have increased opportunities to practice and refine emerging social skills. Children who participate in competent peer interactions in preschool show higher levels of classroom engagement including attention, persistence, motivation, and attitudes toward learning (Coolahan, Fantuzzo, Mendez, & McDermott, 2000). And the relationships children form with their peers during the first 2 months of Kindergarten contribute to their ability to adapt to the new environment of formal schooling, as well as their attitudes about school (Ladd, 1990).

Children attending PreK classrooms low in peer engagement may miss valuable learning opportunities, and as a result will experience increased risk for maladaptive social behavior. A long line of empirical research supports the claim that early problems interacting with peers predict future difficulties (Hymel, Rubin, Rowden, & LeMare, 1990; Kupersmidt & Coie, 1990; Ladd & Troop Gordon, 2003; Parker & Asher, 1987). Therefore, PreK classrooms that provide little or no support for peer interactions are less likely to foster children's social and emotional school readiness. Specifically, children who struggle with paying attention, following classroom rules, engaging positively with their peers, and regulating their emotions

are at increased risk of doing poorly in school (McClelland, Morrison, & Holmes, 2000). When children are isolated from peer interactions, including exclusion and withdrawal, or experience peer interactions characterized by conflict their attentional capacity is spent focusing on aspects of their relationships rather than on learning. This is of great concern because failure to develop positive peer relationships is associated with decreased academic achievement (Fantuzzo & McWayne, 2002) and behavior problems (Hartup & Moore, 1990).

In order to insure PreK classrooms are places that support children's school readiness social skills, it is necessary to better understand the dynamic nature of PreK classrooms. Both classroom level teacher-child interactions and individual children's engagement within PreK classrooms matter for children's growth in school readiness skills. A recent study looking at differential predictive power of classroom level quality and child level engagement illustrated that children's engagement is not strictly an artifact of their individual characteristics, but is transactional and depends on child factors in relation to classroom factors, including the opportunities and experiences the learning environment provides (Williford, Maier, Downer, Pianta, & Howes, in press). Previous research also found that the classroom climate and teacher-child relationships uniquely predicted children's behavior with peers beyond children's gender, race, ethnic/racial background, and language competence (Howes et al., 2011).

This study uses the Classroom Assessment Scoring System (CLASS Pre-K; Pianta, LaParo, & Hamre, 2008), a classroom level observational measure that assesses the quality of effective teacher-child interactions within early childhood

classrooms, as a framework for understanding what features of preschool classrooms impact peer engagement. The CLASS is a measure of teacher-child interaction not classroom quality in general. Children's engagement on the classroom is measured at the child level with the Individual Classroom Assessment Scoring System (inCLASS; Downer, Booren, Lima, Luckner, & Pianta, 2010) an observational measure of individual children's engagement with teachers, peers, and tasks within early childhood classrooms.

In general, the CLASS is associated with gains in children's academic school readiness (see Howes, et. al., 2008). In my analysis I examine the extent to which the CLASS predicts aspects of social school readiness in terms of children's peer engagement in the classroom. Using the CLASS measure as a guide, I identify what domain-general and domain-specific teacher-child interactions predict peer engagement within PreK classrooms. I then examine specific dimensions of teacher-child interaction in relation to peer engagement to gain greater insight into the particular types of interactions teachers employ and how they differentially impact child outcomes.

Theoretical Framework

The Teaching Through Interactions (TTI) theoretical framework is based on the understanding that teachers and children engage in a multitude of interactions on a daily basis, and that these interactions are the mechanism through which schooling leads to children's learning (Hamre & Pianta, 2007). The CLASS is rooted in this theory and measures the quality of teacher-child interactions along a series of different dimensions. These dimensions capture both the social and the

instructional aspects of interactions. The social aspects of interactions include the level of teacher responsiveness, sensitivity, cue detection, and contingent responding, while the instructional aspects of interactions include teacher behavior that organizes and scaffolds learning and supports children's higher-order thinking skills.

Peer Engagement

Traditionally research on classroom engagement has focused on students in formal schooling across various grade levels, and accounted for multiple dimensions of engagement including behavior, emotion, and cognition (e.g., Fredricks, Blumenfeld, & Paris, 2004). However, when studying younger children in preschool, researchers tend to focus strictly on behavioral engagement (McWilliam & Casey, 2010), as it is most appropriate for this age group. Specifically, early childhood engagement has been defined as the duration of time children spend interacting with adults, peers, and tasks within their classroom in ways that are age appropriate and reflect developmental competencies (McWilliam & Bailey, 1992; McWilliam, Scarborough, & Kim, 2003). Often referred to as the processes that drive learning (Vitiello, Booren, Downer, & Williford, 2012), children's engagement, both socially and with tasks provide important learning opportunities (Hamre & Pianta, 2001). And children's individual engagement within PreK classrooms, in positive and negative ways, contributes to their learning and is predictive of their later school achievement and social skills (Buhs, Ladd, & Herald, 2006; Hamre & Pianta, 2001).

Young children's engagement varies considerably across a school day (Vitiello et al., 2012), therefore behavioral observations which can capture the ebb

and flow of children's engagement patterns over time provide a more nuanced view of children's behavior compared to teacher-reports of child behavior that generalize across instances (e.g., Mashburn et al., 2008). In the current study I used a time-sampled observational measure that documents peer engagement across time and activity settings within PreK classrooms in order to examine associations between classroom-level teacher-child interactions and individual children's peers engagement across a classroom day.

Peer engagement conceptualized here includes several dimensions of social behavior including sociability, assertiveness, and communication. *Peer Sociability* includes the ways in which children engage with one another emotionally and behaviorally, including initiation and maintenance of peer interactions, children's ability to engage in reciprocal interactions and perspective taking, and how well liked children are by the peer group. Positive affect toward peers is important for initiation and maintenance of interactions. Children who express positive affect during play initiate peer interactions more often, receive increased initiations from their peers to play (Garner & Estep, 2001), and are more likely to form friendships and be liked by peers (Denham, McKinley, Couchoud, & Holt, 1990; Park, Lay, & Ramsay, 1993).

Peer Assertiveness includes children's positive initiations, leadership, and self-confidence with peers. In preschool aged children, peer assertiveness takes the form of joining a group of peers who are playing or taking a leadership role in play. For example, in a pretend play scenario when one child may say to another, "I'm the mommy and you're the baby," a child may reply, "No, you're the mommy and I'm the

dog!” Such assertive behaviors are related to peer sociability, children’s self-esteem, and their ability to manage frustration in the face of difficult tasks (Adams, Ryan, Ketsetzis, & Keating, 2000; Fantuzzo & McWayne, 2002).

Peer Communication includes children’s use of language with peers and their ability to initiate and sustain conversation. It encompasses a variety of uses for speech such as to communicate wants and needs, as well as ask questions and share thoughts and ideas. During play with peers, this dialogue where children share their thoughts, opinions, and ideas with one another, contributes to children’s perspective taking capabilities, which is important for conflict resolution and cooperative learning (Guralnick, 1993; Topping & Ehly, 1998). Peer interactions also provide opportunities for children to express themselves using a variety of words; and practicing their oral language capabilities promotes literacy learning (Pellegrini, Galda, Dresden, & Cox, 1991; Nicolopoulou, de Sa, Ilgaz, & Brockmeyer, 2010).

In the current study, classrooms conceptualized as high in peer engagement are places where children: 1) engage in frequent affective interactions with one another and demonstrate many positive relationships; 2) display skill in social interactions with peers, including cooperation, respect, and leadership; and 3) actively use language for peer communication, including lengthy discourse to achieve both practical and social goals.

Peer Engagement and School Readiness

Competent peer engagement within PreK classrooms contributes to young children’s social school readiness. The relationships children have with peers play

an important role in their ability to adapt to new schooling environments, as well as their feelings about school (Ladd, 1990). Furthermore, children's competence in peer interactions, including engagement in affective peer play and solving differences with peers, is associated with higher levels of motivation, persistence, and positive attitudes toward learning (Coolahan, et al., 2000), as well as increased academic achievement (Downer & Pianta, 2006; Greenberg, Kusche, & Riggs, 2001; Ladd & Burgess, 2001). Also, when friendships provide children with support, they tend to feel happier when at school, have positive views toward classmates, and show greater school liking (Ladd, Kochenderfer, & Coleman, 1997).

Peer engagement within PreK classrooms can also have important implications for children's development of self-regulation (Fein, 1989) and engagement in learning at school, both of which are considered to be foundational to academic success (Raver, 2004). Research shows that children exhibit increased task orientation and decreased dysregulation when they are highly positively engaged with peers and have low negative classroom engagement (Williford, Vick Whittaker, Vitiello, & Downer, 2013). Alternatively, if children experience difficulty with peers it can negatively affect their social school readiness. Specifically, children characterized as negative and disconnected from peer play tend to be characterized by teachers as inattentive and showing low levels of motivation, and children who engage in disruptive peer play tend to display high levels of behavior problems (Coolahan, et al., 2000). Furthermore, sustained difficulty with social skills and peers puts children at-risk for school dropout (Masten & Coatsworth, 1998).

Pre-kindergarten Classrooms

PreK programs have rapidly expanded over the past decade in order to support young children's development of appropriate school related behaviors and academic capabilities. They have particular importance for young children living in poverty who are at-risk for beginning kindergarten behind their more privileged peers. The driving force behind the creation of these state funded PreK programs is greater public awareness of the importance of early experiences, as well as growing concern regarding school readiness for all children. The purpose of PreK is to provide 4-year-old children with opportunities to engage with academic content, such as exposure to language and literacy, and to learn important social and behavioral skills that will put them on track to enter kindergarten (Clifford et. al., 2005). PreK classrooms are unique in that they are more structured and academically oriented than traditional childcare programs, and yet they are less structured than formal schooling. Recent research supports the effectiveness of these programs for gains in young children's academic skills, including language, literacy, and math achievement (Gormley, Gayler, Phillips, & Dawson, 2005; Howes et al., 2008; Magnuson, Ruhm, & Waldfogel, 2007), as well as growth in social competence (Curby et al., 2009; Howes et al., 2008). In order to better understand peer engagement within PreK classrooms, the current study uses a large predominately low-income sample of teachers and children within a variety of community and Head Start PreK programs.

Influences of PreK attendance on child learning and development occur via two critical mechanisms; through children's classroom level experiences, such as

how the teacher interacts with children and organizes the classroom, and through each child's individual experiences interacting with teachers, peers, and tasks (Mashburn et al., 2008; McWilliam & Casey, 2010; Vitiello, Downer, & Williford, 2012; Williford, Vick-Whittaker, Vitiello & Downer, in press). Children's classroom level experiences and individual engagement are related to their academic achievement and social-emotional development (Fredricks, Blumenfeld, & Paris, 2004; Williford, et al., in press). It is important to consider both in relation to one another, because assessing classroom level quality from the perspective of the teacher leaves individual children's experiences, including the various ways in which they engage in learning opportunities, unaccounted for (Hamre & Pianta, 2001; Howes, 2000). And child level engagement has been found to predict school adjustment over and above measures of classroom quality (Birch & Ladd, 1997). Furthermore, assessing child level engagement alone would discount the many contributions the teacher makes to the experiences children have within classrooms.

Considering both broader classroom level teacher-child interactions and individual children's experiences helps to elucidate the dynamic nature of PreK classrooms across a classroom day. As teachers employ particular teaching strategies, children respond in a variety of ways. For example, the teacher's level of sensitivity to the needs of children, how their classroom is organized, and their skill in prompting children to think more deeply about new concepts all have the capacity to influence peer engagement within the classroom. And some learning

opportunities and settings may fit children's individual interests and needs better than others.

Teacher-Child Interactions

The primary way children attending PreK programs gain important knowledge and skills is through effective classroom wide teacher-child interactions (Burchinal et al., 2008; Howes et al., 2008; LoCasale-Crouch et al., 2007; Mashburn et al., 2008; Pianta, Hamre, & Stohlman, 2003). A large study of state-funded PreK across 11 states revealed that emotionally and instructionally supportive teacher-child interactions explained increases in children's social behavior and academic achievement across the school year (Howes et al., 2008; Mashburn et al., 2008) and through the transition to elementary school (Burchinal et al., 2008). Furthermore, across a range of studies, effective teacher-child interactions that provide emotional support have been strongly related to growth in children's social skills (Howes et al., 2008; Mashburn et al., 2008), effective teacher-child interactions that provide organizational support have been linked to children's self-regulation development (Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009), and those that provide instructional support have been strongly related to children's growth in academic skills such as language, literacy, and math (Howes et al., 2008; Mashburn et al., 2008). Furthermore, these impacts may be particularly salient for children experiencing a range of risk factors including poverty (e.g., Mashburn et al., 2008). Recent research also suggests that because young children's social-emotional and academic learning are intricately linked, there are likely many cross-domain effects of effective teacher-child interactions as well (Downer, Sabol, & Hamre, 2010).

Research measuring classroom level teacher-child interactions and individual children's engagement within PreK classrooms suggests that both matter for children's growth in school readiness skills (Williford et al., in press). A recent study looking at the relationship between classroom level quality and child level engagement found that negatively engaged children were more likely to be in low quality classrooms, and more positively engaged children were more likely to be in high quality classrooms (Williford et al., in press). Furthermore, the quality of teacher-child interactions mattered more for typically engaged children compared to highly engaged children, suggesting that if all teachers can provide a consistently high level of effective teacher-child interactions within PreK classrooms it will lead to more equitable gains in school readiness skills for children.

Research using the CLASS provides evidence for three broad domains of teacher-child interactions including emotional support, classroom organization, and instructional support. Specifically, a study using data from over 4,000 classrooms ranging from preschool to fifth grade provides evidence for this three-factor structure compared to a one or two factor solution (Hamre, Hatfield, Jamil, & Pianta, 2013). A rich empirical literature has documented the importance of effective teacher-child interactions within these domains to child development (see Downer et al., 2010 for review).

Emotional Support

The emotional support domain focuses on the ways in which teachers support children's social and emotional well being within classrooms including providing support for positive teacher-child and peer interactions (Pianta, Hamre, &

Allen, 2012). This domain is comprised of the dimensions positive climate, teacher sensitivity, and regard for student perspectives. Emotionally supportive interactions support children's learning and social development (Howes, 2000; Howes & Ritchie, 2002; Pianta, 1998). A recent study examining thresholds of quality in relation to child outcomes suggests that high levels of emotionally supportive interactions are beneficial; results suggest there was no level of quality that was sufficient for providing a particular level of child gains, but rather as quality increased, so too did children's competence (Burchinal, Vandergrift, Pianta, & Mashburn, 2010). Furthermore, higher levels of growth in children's social skills and decreases in children's problem behaviors were evidenced when teachers scored in the high range of emotional support.

Emotionally supportive teacher-child interactions may also help promote the development of children's self-regulation skills that contribute to their ability to competently engage with peers. Specifically, children are more likely to engage in learning when classrooms provide an emotionally safe and comfortable environment that is responsive to their needs and offers opportunities for autonomy (McWilliam, Scarborough, & Kim, 2003). By engaging in emotionally responsive behavior with children, teachers help to create a positive classroom climate that supports the development of positive teacher-child relationships and peer interactions (Howes, 2000; Howes & Ritchie, 2002; Howes, 2010). When children develop close and trusting teacher-child relationships in PreK, they also develop greater skill in interacting in positive ways with both adults and peers (Howes, et al., 2008). A recent study found the emotional climate of the classroom

and the closeness of teacher-child relationships predicted children's competence with peers above and beyond child gender, race, ethnicity, and language abilities (Howes, et al., 2011).

Classroom Organization

The classroom organization domain focuses on the ways in which teachers manage classrooms by engaging in teacher-child interactions that effectively organize children's behavior, time, and attention (Pianta et al., 2012). This domain is comprised of the dimensions behavior management, productivity, and instructional learning formats. Well-managed classrooms do a good job of effectively communicating expectations for children's behavior by clearly stating rules and consistently enforcing them. Such an environment likely promotes children's peer interactions and engagement by reinforcing prosocial behavior and limiting negative or aggressive behaviors by children (Raver & Zigler, 1997). Intervention programs have effectively trained early childhood teachers to use positive behavior support strategies (i.e., anticipating problems before they happen, stating requests in the positive: "please walk your feet," instead of: "don't run") within their classrooms (Webster-Stratton, Reid, & Stoolmiller, 2008). And when teachers' were skillful in effectively managing children's behavior in positive ways, children within their classroom exhibited increased prosocial behavior (Webster-Stratton, Reid, & Stoolmiller, 2008). Teachers that do a good job of behavior management also monitor and observe the children in their classroom more frequently. Specifically, a study investigating adult interactions in relation to child engagement found that teacher presence was associated with more active involvement by children across a

variety of activities (McWilliam et al., 2003). Teacher monitoring of academic tasks has also been associated with more active involvement by children within PreK classrooms compared to when teachers were not present (Powell, Burchinal, File, & Kontos, 2008). These findings suggest that when teachers are present and engaged, without acting in ways that are intrusive or interfere with children's participation in the classroom, children may feel more comfortable engaging in learning opportunities, including with peers.

Effectively organized classrooms can create a learning environment that capitalizes on peer engagement. A recent study of children's language development within PreK classrooms examined the extent to which teachers' effective classroom management either promoted or inhibited frequent or positive peer interactions. Results indicated that teachers' skill in managing children's behavior within classrooms moderated the relationship between peers' expressive vocabulary and children's receptive language growth in PreK (Mashburn, Justice, Downer, & Pianta, 2009). It is likely that in well-managed classrooms, children have more opportunities to engage in language learning with both teachers and peers.

Instructional Support

The instructional support domain focuses on the ways teachers effectively support children's cognitive development including teaching strategies aimed at scaffolding child learning so that children gain "usable knowledge" rather than basic facts (Pianta et al., 2012). This domain is comprised of the dimensions concept development, language modeling, and quality of feedback. The quality of feedback that teachers provide to children during instructional interactions contributes to

children's engagement within classrooms. Specifically, Powell and colleagues (2008) found that when teachers provided children with praise or social commentary that recognized their efforts, children were more likely to show active engagement during academic tasks, while when teachers gave directions and instructions children were largely unengaged, even in small groups and during one-on-one teacher-child interactions. It is likely that high quality of feedback such as this impacts peer engagement if children are participating collaboratively with one another during learning activities and the feedback orients children to their joint engagement and effort.

Effective instructional support within PreK classrooms is associated with children's increased language development (Burchinal et al., 2010; Howes et al., 2008; Mashburn et al., 2008). Teachers that engage children in frequent interactions to support learning ask lots of open-ended questions to elicit children's thoughts and ideas, and engage in high levels of back-and-forth exchanges. Therefore, classrooms high in instructional support are places where there are frequent conversations. Promoting peer conversations likely contributes to children's peer relationships and competence interacting with one another. Research on teacher involvement in children's peer play supports these ideas. Specifically, teacher practices that support peer interactions include verbally helping children initiate contact with peers or maintain interactions, as well as explaining peer behavior (Howes, Hamilton, & Matheson, 1994). And a recent qualitative study of teacher-child play interactions within preschool classrooms found that effective scaffolding of children's interactions with peers, by providing children with the optimal degree

of support, contributes to their increased autonomy in play over time (Trawick-Smith & Dziurgot, 2011).

Domain-General and Domain-Specific Teacher-Child Interactions

Drawing on systems theory, Hamre and colleagues (2013) propose a new conceptualization of the CLASS and a new method for examining the relationship between teacher-child interactions and child outcomes. Systems theory posits that there are both general properties present across all types of teacher-child interactions and specific properties of interactions that include differential intentionality. After examining the factor structure of the CLASS, results suggest a bifactor solution may provide a more nuanced examination of how the emotional and instructional qualities of interactions impact child development (Hamre et al., 2013). Specifically, there may be a domain-general factor responsive teaching that captures a teachers' level of responsivity, active engagement, cue detection, and contingent responding across all dimensions of the CLASS, and two domain-specific factors that capture the intent and content of particular interactions called positive management and routines and facilitation of cognition. In the current study, I test this claim by conducting a Confirmatory Factor Analysis (CFA) of the CLASS.

Study Aims

This dissertation examines the relationship between teacher-child interactions and children's peer engagement in PreK across a classroom day. Multi-level regression models are estimated to account for nesting of individual children within classrooms. There is a gap in the research on how broader domains of teacher-child interactions are related to direct observations of children's peer

engagement across a classroom day. And although conceptually a strong argument can be made for how effective teaching can impact peer interactions and competencies, little, if any, work has examined associations between specific dimensions of the CLASS and peer engagement.

Research Questions

The current study addressed the following research questions:

1. What is the relationship between broader domains of teacher-child classroom interactions (i.e., Responsive Teaching, Positive Management and Routines, and Cognitive Facilitation) and individual children's peer engagement within PreK classrooms on a single day?
2. What is the relationship between specific dimensions of teacher-child classroom interactions (i.e., Positive Climate, Negative Climate, Teacher Sensitivity, Regard for Student Perspectives, Behavior Management, Productivity, Instructional Learning Formats, Quality of Feedback, Concept Development, and Language Modeling) and individual children's peer engagement within PreK classrooms on a single day?

Hypotheses

My research hypotheses are as follows:

1. Responsive teaching will predict peer sociability, assertiveness, and communication.
2. Behavior management will predict peer sociability.
3. Productivity will predict peer assertiveness and communication.
4. Quality of feedback will predict peer assertiveness and communication.

5. Language modeling will predict peer communication.

Methods

For this study I conducted secondary data analysis using data from a large professional development study conducted by the National Center for Research on Early Childhood Education (NCRECE). The study was 18-months long and focused on two different approaches to professional development with the goal of improving teacher-child and instructional interactions focused on promoting children's language and literacy skills. These two approaches were: (1) a 14-week course (Phase I) and/or (2) yearlong coaching using the MyTeachingPartner (MTP) approach, which included individualized, web-mediated coaching (Phase II). The results of the intervention were not of interest for this study and were controlled for in the analyses. You can find a full description of the intervention and its results elsewhere (Hamre et al., in press; Downer et al., 2012).

Data for the NCRECE Professional Development Study was collected within large community preschool and Head Start programs in 10 sites in eight states across the country. Eligibility criteria for study participation were that they had to be the lead teacher in a classroom where most children would enter kindergarten the following school year. Also, classrooms needed to conduct instruction in English for most of the school day and have high-speed Internet access available to teachers. Prior to beginning Phase I, teachers were randomly assigned at the site location level to either the course or control group. Upon completion of Phase I, the remaining Phase I teachers and newly recruited teachers were again randomized at the site location level into coaching or control group conditions for Phase II. As a

result, four groups were created (control, course only, coaching only, course and coaching). Teachers were then followed for one-year post intervention during Phase III of the study; classroom and child measures were collected. A full description of the study design and sample can be found in Hamre et al., (2012) and Downer et al. (2012).

This study used data from Phase III (post-intervention phase). The highest frequency of child outcome data was collected during this phase. A total of 325 teachers participated in Phase III *and* had at least one student in their class contribute some outcome data. Of consented children who did not have an IEP, up to four children were randomly selected from each classroom for participation (two girls and two boys whenever possible). Observations took place on two separate classroom days. Approximately two of the selected children from each classroom were randomly chosen for observations of their individual engagement in the preschool classroom per day. Observations took place during the middle of the school year.

Sample

The subsample used for the current study consists of the children who have available individual observation data — 714 children (359 girls and 355 boys, $M = 4.13$, $SD = 0.5$ age in years) from 214 Head Start and community-based classrooms. Because observations took place on up to two children on two separate days, child data is nested within 399 classroom days. Forty-one percent of the children were Black or African American, 35.6% Hispanic or Latino, 13.8% were White or Caucasian, and 9.6% were other. On average, maternal education was 12.71 years

($SD = 2.4$). Ninety-six percent of the teachers were female with a mean age of 42.56 years ($SD = 10.55$). Forty-seven percent of the teachers were Black or African American, 33% White or Caucasian, 12% Hispanic or Latino, and 8% other. Fifty-two 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 .87 ($SD = .23$).

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). Four of those children were randomly chosen for individual observation of their engagement within the classroom across two visits.

Data collection. Teachers completed a professional and classroom demographic survey during the fall. Observations of teacher-child interactions at the

classroom level and children's individual classroom engagement were conducted simultaneously across two classroom days. Two separate visits during the winter months were conducted. A maximum of two children were observed each day.

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 master code 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 master codes.

Observation protocol. Two 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 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.

Measures

Child demographic information. Parents completed a survey that provided information about their child's date of birth, race/ethnicity, sex, home language, 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.

Peer Engagement. 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).

The current study used only dimensions within the positive engagement with peers domain of the inCLASS measure. Specifically, the impact of teacher-child interactions on peer engagement was examined using the individual dimensions peer sociability, peer assertiveness, and peer communication. Peer conflict was not included in the current analysis because the intraclass correlation (ICC) had a value of 0.05 suggesting that peer conflict does not differ significantly by classroom.

Teacher-Child Interactions. The Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008) measures teacher-child interactions at the classroom level using 10 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, and (10) language modeling.

A principal components analysis of the CLASS results in a number of studies with a three-factor solution: emotional support, classroom organization, and instructional support, with alphas of .81-.89, respectively. However, recent work with the data set being used for the current study suggests that a bifactor model (Hamre et al., 2013) provides a more precise estimate of the association between teacher-child interactions as measured by the CLASS that I expect to relate to peer engagement. Compared to a 3-factor solution, a bifactor analysis creates independent uncorrelated domain-general and domain-specific factors that can be used in the same model to predict child outcomes (Chen, Hayes, Carver, Laurenceau, & Zhang, 2012). The analysis conducted by Hamre et al. (2013) was completed on Phase II data of the NCRECE project. In the current study I conduct a CFA and estimate a bifactor model for Phase III NCRECE data.

Analysis

Descriptive Statistics. Descriptive statistics on all variables were examined to describe the basic features of the data in the study.

Preliminary Correlational Analyses. Intraclass correlations were examined to determine the extent to which observations at the individual level (inCLASS) were influenced by clustering of observations in higher-level groups (CLASS). Pearson Product Moment simple correlations between inCLASS variables, CLASS variables, and child characteristics were also examined.

Bifactor Analysis. I conducted a bi-factor analysis to identify independent, uncorrelated domain-general and domain-specific factors that could be investigated as distinct predictors of child outcomes, with all factors in the same model (Chen et al., 2012). A bi-factor model is appropriate because it simultaneously examines the outcome variable peer engagement with the general latent factor of responsive teaching and the unique additions of the specific factors management and routines, and cognitive facilitation that are independent of the general construct. While at the same time, the bi-factor model is able to identify whether any factors no longer remain distinct once the common variance shared by other factors is accounted for.

Controlling for Child Characteristics. Because particular child characteristics may be related to their level of peer engagement within classrooms, it is essential to control for them when examining the influence of teacher-child interactions on peer engagement. The current study used age, gender, race/ethnicity, and maternal education as child-level covariates.

Controlling for Teacher Characteristics. Because the current study is not examining the impact of the original professional development intervention on peer engagement, teacher intervention status was included as a classroom-level covariate.

Hierarchical Linear Modeling. Due to the hierarchical nature of the data where children (level 1) were nested within classroom day (level 2), multilevel regression modeling using MPlus version 7.0 (Muthén & Muthén, 1998-2013) was used to predict peer engagement, using classroom level teacher-child interaction variables while controlling for child and teacher characteristics. Two-level

regressions predicted each of the following peer engagement outcomes: sociability, assertiveness, and communication. Each predictor was centered on the grand mean. The multi-level regressions controlled for the following child-level variables: age, gender, race/ethnicity, and maternal education. The following teacher-level variables were also controlled for: intervention status.

Results

Bifactor Model

In order to examine the factor structure of the classroom level measure, the CLASS, I first, conducted a CFA to determine the extent to which the bifactor model proposed by Hamre, et al. (2013) consisting of one general factor (responsive teaching) and two domain-specific factors (positive management and routines and cognitive facilitation) was a better fit for the data than a traditional 3 factor solution. Compared to a three-factor solution where the three domains of teacher-child interactions (emotional support, classroom organization, instructional support) are highly correlated with one another, the bifactor model provides three uncorrelated factors could be used in the same model to predict child outcomes. Therefore, I estimated a bifactor model with covariance between all three factors (one domain-general factor and two domain-specific factors) constrained to zero, one of the loadings in the responsive teaching general factor and the two specific factors were set to 1, and the error terms for each CLASS dimension were uncorrelated. In this model three of the CLASS dimensions: teacher sensitivity, regard for student perspectives, and instructional learning formats were constrained to load solely on the domain-general responsive teaching factor (due to the fact that in the Hamre et

al., 2013 model these three factors loaded below an absolute value of .15 onto the specific factors). Modification indices suggested that an improved model would result from allowing the CLASS dimension instructional learning formats to load onto the domain-specific factor cognitive facilitation (COGF BY ILF; M.I. = 35.7).

Therefore, I estimated a modified bifactor model with a general factor and two domain-specific factors where instructional learning formats was specified to load onto the cognitive facilitation factor; the covariance between all factors was constrained to zero, one of the loadings in each factor was set to 1, and the error terms for each dimension were also uncorrelated. The Standardized Root Mean Square Residual (SRMR) and Comparative Fit Index (CFI) both demonstrated good fit, but the Root Mean Square Error of Approximation (RMSEA) value was above the acceptable threshold for good fit (Hu & Bentler, 1999). The final bifactor model, illustrated in Figure 1, reflects one domain-general factor of teacher-child interactions, responsive teaching and two additional, domain-specific factors, positive management and routines and cognitive facilitation.

For comparison purposes, I also estimated a one-factor CFA and the previously supported three-factor model. As shown in Table 4, neither of these models fit that data as well as the final bifactor model. While model fit is important, so too are the theoretical decisions informing the research (Hayduk, Cummings, Boadu, Pazdurka-Robinson, & Boulianne, 2007). Conceptually this makes sense, as instructional learning formats measures the teacher's ability to maximize student interest, engagement, and ability to learn from lessons and activities. The domain-specific factor cognitive facilitation represents teacher-child interactions that reflect

intent and content (unique from the general factor responsive teaching) that conveys information, expands knowledge, and develops children's cognitive capacities. The CLASS dimension instructional learning formats includes indicators such as *effective facilitation*, which includes effective questioning, and *clarity of learning objectives* including summaries and reorientation statements to focus students' attention on learning. These types of teacher-child interactions also include elements of this "cognitive press." And the final bifactor model allowed greater precision in understanding the specific contribution of teacher-child interactions on children's peer engagement within Pre-K classrooms. I then used factor scores to predict peer engagement in a series of multilevel models.

Hierarchical Linear Modeling

I used Hierarchical Linear Modeling (HLM) to examine the association between teacher-child interactions and children's peer engagement across a PreK classroom day. Using HLM accounts for the nesting of children within classroom days by estimating between children and within-classroom variability. Classroom day was selected as the cluster variable to examine associations between CLASS and inCLASS scores collected simultaneously. If I had nested children within classroom, CLASS and inCLASS scores would be averaged across two separate observations conducted across the winter months. Because there is a bi-directional association between teacher behavior and child behavior (see Williford et. al., in press), nesting

within classroom day represents a more precise estimate of the associations I am examining¹.

Models were specified for three peer engagement outcomes: sociability, assertiveness, and communication. Baseline models were fit without covariates to test if there was enough variation by classroom to warrant a multi-level analysis. The intraclass correlation coefficients (ICC) for peer engagement were .25 (peer assertiveness), .31 (peer sociability), and .32 (peer communication), indicating that between 25 and 32% of the variance in children's peer engagement is due to nesting of children within classroom day. These values suggest that classroom characteristics are an important contributor to children's individual experiences with peers at school.

This study involved a nested design that included up to four target children participating within each classroom. Observations took place across two classroom days. On average, 1.79 children were clustered within a particular classroom day. MPlus Version 7.0 (Muthén & Muthén, 1998-2013) was used to specify the models derived from the following equations. In the first level of the two-level model (Equation 1), peer engagement (Y) for child (i) who is in classroom day (j) is a function of the mean peer engagement score for children in this class (β_{00}) is a function of child level predictors (β_{01}) adjusting for child control variables (β_{0n}), and the error term associated with this estimated mean (r_{ij}).

$$Y_{ij} = \beta_{00} + \beta_{01} (\text{child predictors}) + \beta_{0n} (\text{child control}) + r_{ij}.$$

¹ Analyses were also conducted nesting individual children within classrooms and similar results were obtained.

Equation 2 specifies in the second-level model that the adjusted mean peer engagement score for children in each classroom day (β_{00}) is a function of the grand mean peer engagement score (Y_{00}), teacher-child interactions (Y_{01}), teacher intervention status (Y_{02}), and the error term associated with this estimated mean (u_{oj}).

$$\beta_{00} = Y_{00} + Y_{01} (\text{teacher-child interactions}) + Y_{02} (\text{intervention status}) + u_{oj}$$

Model 1 included only the child (age, gender, ethnicity, maternal education) and classroom day covariates (intervention status). Three separate models were then analyzed for each peer engagement outcome (sociability, assertiveness, communication) that included the covariates, as well as predictors at both level-1 and level-2. Model 2 included level-1 predictors (percentage of time in large group and poverty status) and CLASS domains (responsive teaching, management and routines, cognitive facilitation) of observed teacher-child interactions at level-2. Model 3 included child level predictors (percentage of time in large group and poverty status) and CLASS dimensions (positive climate, negative climate, behavior management, and productivity) of observed teacher-child interactions at level-2. Model 4 included child level predictors (percentage of time in large group and poverty status) and CLASS dimensions (quality of feedback, instructional learning formats, concept development, and language modeling).

Missing Data

There were missing data for a small number of child characteristics (see Table 1). In MPlus missingness is not allowed for the observed covariates because they are not part of the model. The outcomes are modeled conditional on the

covariates and the covariates have no distributional assumption. Therefore, the missing values cannot be handled using maximum likelihood based techniques. Covariate missingness can be modeled if the covariates are explicitly brought into the model and given a distributional assumption. Therefore, the mean of each variable was included in the model.

Descriptives

Descriptive statistics on observed peer engagement are presented in Table 1. Peer engagement was scored on a 7-point scale and was assessed based on the intensity, consistency, and quality of the child's interactions observed across the entire observation period. A code was then assigned for each dimension (sociability, assertiveness, and communication) where 1-2 is considered low, 3-5 is mid, and 6-7 is high. These scores were assigned if the behaviors of the child observed mostly fit into that range, or if one or two indicators were from another range. For example, in the mid range, a 4 would be assigned if most of the mid-range indicators fit the child, and a 3 would be assigned if most of the mid-range indicators fit the child and if 1 or 2 of the indicators were in the low range.

Peer sociability indicators include proximity seeking, shared positive affect, cooperation, and popularity. Peer sociability scores ranged from 1 to 6.67 ($V = 1.17$). A total of 9 out of 714 children scored in the high range. On average, peer sociability scores were in the low-mid range ($M = 3.42$; $SD = 1.08$). Peer assertiveness indicators include initiation and leadership. Peer assertiveness scores ranged from 1 to 6.33 ($V = .87$). A total of 1 out of 714 children scored in the high range. On average, peer assertiveness scores were in the low range ($M = 1.96$; $SD = 0.93$). Peer

communication indicators include initiates communication, sustains conversations, and varied purposes of speech. Peer communication scores ranged from 1 to 7 ($V=1.02$). A total of 3 out of 714 children scored in the high range. On average, peer communication scores were in the low range ($M=2.13$; $SD=1.01$).

Descriptive statistics on observed teacher-child interactions are presented in Table 2. Teacher-child interactions were scored on a 7-point scale and were assessed based on the quality and frequency of the teacher's interactions with all children in the classroom observed across the entire observation period. A code was then assigned for each dimension (positive climate, negative climate, teacher sensitivity, regard for student perspectives, behavior management, productivity, instructional learning formats, concept development, quality of feedback, and language modeling) where 1-2 is considered low, 3-5 is mid, and 6-7 is high. These scores were assigned if the behaviors of the teacher observed mostly fit into that range, or if one or two indicators were from another range.

On average, teacher-child interactions within the dimension negative climate were low ($M=1.25$; $SD=0.57$) indicating very low levels of negativity. On average, teacher-child interactions that scored in the upper-mid range were those within the dimensions behavior management ($M=5.66$; $SD=1.02$), productivity ($M=5.61$; $SD=1.02$), and positive climate ($M=5.24$; $SD=1.14$). Those that scored in the mid range were those within the dimensions teacher sensitivity ($M=4.76$; $SD=1.26$), regard for student perspectives ($M=4.5$; $SD=1.23$), and instructional learning formats ($M=4.12$; $SD=1.17$). Those that scored in the low-mid range were within the dimensions language modeling ($M=2.76$; $SD=1.03$), quality of feedback ($M=2.57$; $SD=0.94$).

Finally, the dimension that scored the lowest was concept development ($M= 1.83$; $SD= 0.75$).

Associations between Peer Engagement and Teacher-Child Interactions

To evaluate the possibility that peer engagement and effective teacher-child interactions are related, I examined the bivariate correlations between peer engagement, child characteristics, and CLASS scores (see Table 3). Most correlations were significantly different from zero. All three types of peer engagement (sociability, assertiveness, and communication) had statistically significant associations with dimensions of observed teacher-child interactions, child poverty status, and percent time spent in large group settings.

CLASS Domains

Table 5 presents unstandardized coefficients and standard errors that indicate the magnitude of associations between child peer engagement and child characteristics, percentage of time in large group, poverty status, and observed teacher-child interactions. The first block of predictors I included in the analyses was control variables including child characteristics and the intervention status of the classroom teacher (Model 1). In Model 2 I included the child and intervention control variables, level-1 predictors percentage of time in large group and poverty status, and level-2 domains of observed teacher-child interactions (responsive teaching, management and routines, and cognitive facilitation). Results indicate that across all three types of peer engagement there is a negative association between the percentage of time children spent in large group settings and the quality and frequency of their peer engagement. Responsive teaching was not associated with

children's peer engagement. Management and routines was associated negatively with children's peer engagement. And cognitive facilitation was associated positively with children's peer engagement.

CLASS Dimensions

Model 3 included the child and intervention control variables, level-1 predictors percentage of time in large group and poverty status, and level-2 dimensions of observed teacher-child interactions that load onto the domain positive management and routines. Behavior management is negatively associated with peer communication. Productivity is associated negatively with peer assertiveness. Positive climate and negative climate are not associated with peer engagement.

Model 4 included the child and intervention control variables, level-1 predictors percentage of time in large group and poverty status, and level-2 dimensions of observed teacher-child interactions that load onto the domain cognitive facilitation. Instructional learning formats is negatively associated with peer communication. Concept development is positively associated with peer sociability, assertiveness, and communication. Quality of feedback is negatively associated with peer sociability. Language modeling is positively associated with both peer sociability and assertiveness.

Discussion

I examined classroom-wide teacher-child interactions in relation to individual children's peer engagement in PreK classrooms on a classroom day. Teacher-child interactions were associated with children's peer sociability,

assertiveness, and communication. This is consistent with the Teaching Through Interactions (TTI) conceptual framework that posits the primary mechanism responsible for young children's learning is their daily experiences interacting with both teachers and peers (Hamre & Pianta, 2007). Contrary to expectations, compared to teachers that did not participate in the 14-week course aimed at improving effective teacher-child interactions and children's language and literacy skills, course participation was a significant predictor of children's peer engagement.

Peer Engagement

In general, children were not very social and very few scored in the upper range of peer engagement. The average child scored in the mid-range for peer sociability and in the low range for peer assertiveness and communication. In the current study teacher-child interactions and children's peer engagement are considered to be bidirectional where the environment impacts the child and the child also impacts the environment. Therefore, the peer engagement scores captured here do not necessarily represent children lacking in particular skills or attributes, but may also represent children with little opportunity for such experiences at school. Across a PreK classroom day this represents a child that occasionally maintains close physical proximity to peers, sometimes shares positive affect with peers, occasionally or selectively demonstrates an awareness or concern for others. Peers receive them with some degree of warmth. But they rarely, if ever, initiate contact or play with peers. There is very little evidence that the child organizes peer interactions or teaches others. They may not successfully defend

their ideas or communicate their needs. Such a child may ignore peers altogether, or adopt a role of follower. This is a child that rarely leads, joins in, or persists in efforts to converse with peers. The child does not extend or sustain conversation with peers, and the child uses language for limited purposes and does not use language to create play situations.

CLASS Domains and Peer Engagement

In general, there were very low levels of negativity within classrooms. Teachers scored the highest in the dimensions that load onto the domain positive management and routines and the lowest on dimensions that load onto the domain facilitation of cognition. For dimensions that load solely onto responsive teaching (teacher sensitivity and regard for student perspectives) teachers scored in the mid-range. Across a PreK classroom day this represents a warm environment where there are clear expectations for behavior, children spend the majority of their time on-task, where there are moderate levels of sensitivity and opportunities for autonomy, and low levels of higher level instructional interactions that prompt deep thinking, active engagement, and language. Children likely feel comfortable and safe, and are quite busy. However, their on-task behavior may be focused on practicing general skills and rote instruction rather than plentiful opportunities to make connections to previous learning and explain their reasoning.

Cognitive Facilitation and Peer Engagement

Findings examining the relationship between domains of teacher-child interactions, using a bifactor analytic approach, and children's peer engagement indicate that after adjusting for child characteristics, teacher intervention status,

and child percentage of time in large group settings, domain-specific teacher-child interactions focused on cognitive facilitation positively predict all three types of peer engagement. These findings suggest that if teachers interacted with children in ways that fostered their thinking, they were more likely to engage positively with peers. Unfortunately, few teachers in this study scored in the high range for these behaviors and few children had high levels of engagement with peers.

Instructional supports as conceptualized in the TTI framework should scaffold child learning beyond the basic memorization of facts based on rote instruction, and should help children make connections to previous knowledge and learning (Pianta, Cox, Taylor, & Early, 1999; Mayer, 2002). The dimensions present within cognitive facilitation focus on teachers' use of intentional strategies that target children's higher-level understanding, engagement in learning, and persistence at tasks. This includes teaching strategies such as effective facilitation, scaffolding, asking open-ended questions, and frequent conversations. The activities most conducive to these types of interactions would be more hands-on, include a variety of modalities, and involve children in close proximity to peers. When children are excited about learning and participating in activities that are stimulating they are more likely to share proximity and positive affect with peers, which is related to children's peer sociability. Prompting children to explain their thinking and understanding targets skills that are important for peer assertiveness including coming up with ideas for play. And frequent conversations, including peer conversations, provide opportunities for peer communication.

Previous studies using a three-factor structure for examining the relationship between domains of teacher-child interaction and child outcomes found teachers' instructional interactions within PreK classrooms predicted direct assessments of children's language skills (Burchinal et al., 2010; Howes et al., 2008; Mashburn et al., 2008). The results from the current study extend this work by suggesting instructionally oriented teacher-child interactions also predict children's language skills with peers. Specifically, the intent and content of the instructional interactions seem to be what matters for children's peer engagement. These cross-domain effects are consistent with results linking the instructional quality of PreK to teacher ratings of children's social behavior more than one year later (Burchinal et al., 2008). Specifically, these findings illustrate teacher-child interactions focused on cognitive facilitation predict young children's social development with peers including their sociability, assertiveness, and communication. Recent work highlighting the complex linkages between young children's social-emotional and academic learning also supports these findings (Downer, Sabol, et al., 2010).

CLASS Instructional Dimensions and Peer Engagement

After examining the broader domain of cognitive facilitation and its relationship to individual children's peer engagement, I took a more detailed look at the specific dimensions that load onto this factor and child outcomes to better understand which specific behaviors are most salient for children's peer interactions within classrooms. Positive associations were found between language modeling and peer sociability and assertiveness. Language modeling includes the extent to which teachers facilitate and encourage students' language, including peer

conversations. Promoting peer conversations likely contributes to children's peer sociability, which captures whether children are in close proximity, sharing positive affect, and are socially aware of others, because such behaviors tend to be present when children are engaged in conversation with one another. Similarly, peer assertiveness requires that children take the lead in peer interactions. Teachers that promote peer communication create opportunities for children to engage with one another. However, contrary to my hypothesis, language modeling was not significantly associated with peer communication. A possible explanation may be that peer conversations in this study were quite pleasant but short in nature and lacking in more sophisticated uses of language. Language modeling also includes the teaching strategies repetition and extension, and self and parallel talk. If language modeling took the form of explaining peer behavior it could result in teacher behavior supportive of peer sociability (Howes, Hamilton, & Matheson, 1994). Effective scaffolding of children's interactions with peers contributes to their increased autonomy in peer interactions over time (Trawick-Smith & Dziurgot, 2011).

Teacher-child interactions focused on concept development were positively associated with children's peer sociability, assertiveness, and communication. Concept development captures how teachers use instructional discussions and activities to promote higher-order thinking and problem solving, going beyond fact and recall discussions with children. Effective concept development involves engagement in instructional conversation where the teacher assumes that the child has something greater to say than simply the correct answer (Tharp & Gallimore,

1991). And when teaching through conversations is successfully accomplished, learning becomes a collaborative process that capitalizes on the experiences and shared understandings of many children. A primary aspect of peer assertiveness includes coming up with the play scenario, teaching peers, as well as successfully defending ones ideas. Interactions that prompt children to explain their thinking such as those categorized as concept development provide opportunities for children to practice many of these same skills.

Research has documented the co-occurrence of particular types of child engagement and activity settings (Vitiello et al., 2012), and particular activity settings may provide an opportunity structure that promotes peer engagement. Support for effective instructionally supportive interactions and ultimately child learning involves creating activity settings conducive to high levels of joint engagement and participation, conversation, and peer interaction (Tharp & Gallimore, 1991). Many teacher-interactions geared toward high concept development (e.g., prediction, experimentation, and brain storming) are more conducive to cooperative learning than other types of teacher-child interactions (e.g., providing advanced organizers so children know what to expect). Cooperative learning is associated with children's development of higher-order thinking and prosocial behavior (see Cohen, 1994). Sharing ideas with peers and teaching peers skills (assertiveness), as well as initiating and sustaining conversations with peers (communication) are more likely to be present within cooperative learning activities.

Teacher-child interactions focused on instructional learning formats were negatively associated with peer communication. Instructional learning formats captures how teachers engage children in activities, provide interesting materials, and facilitate activities so that learning opportunities are maximized. The importance of instructional learning formats for child engagement and learning is rooted in constructivist theories of learning (Rogoff, 1990; Vygotsky, 1978), and is dependent on teachers' effective interactions using both instruction and materials (Rimm-Kaufman, La Paro, Downer, & Pianta, 2005). Teachers' moderate scores on this dimension suggest that teachers only occasionally format instruction to capitalize on student interest and engagement, and most likely spend a significant proportion of the day using one format such as rote instruction. The negative association between percentage of time spent in large group settings and children's peer engagement supports this claim. Perhaps higher levels of instructional learning formats are needed before they positively impact peer engagement.

Positive Management and Routines and Peer Engagement

Contrary to expectations, there was a negative association between positive management and routines and all three types of peer engagement. Across all ten dimensions of teacher-child interactions measured in this study, teachers scored the highest across the four dimensions that load onto positive management and routines (positive climate, negative climate, behavior management, and productivity) indicating that they were using effective strategies for organizing child behavior, attention, and time fairly consistently. Classroom management is thought to be at the core of organizing all experience within the classroom environment, and

therefore is essential for creating a well-functioning classroom (Emmer & Stough, 2001). Effective classroom management interactions have been linked to lower levels of child problem behavior and higher levels of child engagement and learning (Bohn, Roehrig, & Pressley, 2004; Bruner, 1996; Cameron, Connor, & Morrison, 2005; Emmer & Stough, 2001; Rogoff, 1990). Previous research has also found PreK children benefit more from peers' expressive vocabulary in terms of their own language development when classrooms are well managed (Mashburn, Justice, Downer, & Pianta, 2009). In the current study you would expect that more effective positive management and routines would result in a classroom that is a comfortable place to be, where there are low levels of conflict and negativity, clear expectations for child behavior, and ultimately where children spend more time on-task engaged in learning. And this may be true, however the current study suggests that children may be engaged more often in teacher-child interactions or with tasks, rather than in learning opportunities with peers. Conceptualizations of high quality classrooms point to the importance of having effective management and routines along with high degrees of emotional support and instructionally focused interactions (Pianta et al., 2012). Furthermore, positive management and routines captures the intentional aspects of classroom organization after responsiveness is accounted for. Perhaps these findings suggest that teacher-child interactions must be more intentionally focused on promoting peer interactions and relationships.

CLASS Organizational Dimensions and Peer Engagement

After examining the broader domain positive management and routines, I took a more detailed look at the specific dimensions that load onto this factor and

child outcomes. A negative association was found between productivity and peer assertiveness. Productivity captures how well the classroom runs with respect to routines and the degree to which teachers organize activities and directions so that maximum time can be spent in learning activities. In order for children to exhibit competent peer assertiveness they need ample time to initiate and then engage in peer interactions worthy of leadership. The low levels of effective instructional interactions in the current study suggest that children's time spent on-task is likely teacher directed and may not permit the types of ideal activity settings needed for lengthy peer exchanges with the freedom to assert oneself.

Findings also indicate that teacher-child interactions focused on behavior management were negatively associated with peer communication. Behavior Management captures how effectively teachers monitor, prevent, and redirect behavior. Previous research suggests that teachers' skill in effectively managing children's behavior in positive ways is related to children's social skills with peers (Webster-Stratton et al., 2008). The findings in the current study are contradictory to this research. Again, these findings highlight the need to examine the intentionality of teachers. The significant association between course participation and peer engagement suggests that perhaps teachers who took the course got better at teacher-child interactions, particularly those geared toward classroom organization, but not better at managing teacher-child-peer interactions.

Responsive Teaching and Peer Engagement

The most surprising finding in the current study is the lack of significant associations between child outcomes and responsive teaching. The domain-general

factor responsive teaching includes the aspects of dyadic teacher-child interactions involving responsivity, active engagement, cue detection, and contingent responding present across all ten CLASS dimensions. Teacher responsiveness is a primary contributor to creating a positive classroom climate important for the development of positive teacher-child relationships and peer interactions (Howes, 2000; Howes & Ritchie, 2002; Howes, 2010). However, overall CLASS scores in the current study were in the low to moderate to range. Consistent with associations between classroom climate and children's academic skill growth (Burchinal, Vandergrift, Pianta, & Mashburn, 2010), responsivity may need to reach a higher threshold than observed in the current study before it impacts children's peer engagement. Recent research findings showing no association between the emotional climate of the classroom as measured by the CLASS and observed teacher-child relationships support this idea (Howes, Fuligni, Hong, Huang, Lara-Cinisomo, 2013). Furthermore, peer engagement as measured using the inCLASS is conceptually different than social competence with peers as measured in many previous studies (Burchinal et al., 2008; Howes et al., 2013). In the current study peer interactions were measured observationally across a range of activities, settings, and time. And therefore represent a realistic picture of child engagement with peers across a typical PreK classroom day. Furthermore, compared to other measures of peer interaction such as the Peer Play Scale (Howes & Matheson, 1992) that captures the frequency of occurrence and the highest level of complexity in interaction separately, the inCLASS requires observers to take a holistic assessment of intensity, consistency, and quality. The lack of association between responsive teaching and peer

engagement may be due to the inCLASS capturing more regarding the frequency of peer interactions than the quality. Specifically, a child with high social competence in terms of the ability to engage in complex peer interactions could score lower on the inCLASS if they had little or infrequent opportunity to engage in such behavior.

In summary, my study contributes to current thinking about peer engagement in early childhood classrooms and how classroom-level teacher-child interactions can either promote or hinder the quality of children's peer engagement. In the current study, positive management and routines was negatively associated with peer engagement, while higher-level instructional practices were positively associated with peer engagement within PreK classrooms. Findings seem to suggest that appropriate support for peer engagement must include a balance between creating warm sensitive well-organized classrooms in conjunction with high levels of instructionally supportive interactions. Furthermore, in order to see higher levels of peer engagement it is likely that teachers must be more explicit in promoting such types of interactions both in the learning opportunities and settings they provide. In the current study, the quality and frequency of peer engagement were on the low end of the scale. This may be in large part due to insufficient opportunity to engage in meaningful exchanges with peers across the school day.

Limitations

Although these analyses provide more insight into the particular relationships between teacher-child interactions and children's peer engagement than have been previously published, they are still somewhat limited in their specificity. For example, the inCLASS captures the intensity, consistency, and quality

of children's peer interactions simultaneously. And although the bifactor approach can parse out the responsive teaching from the aspects of teacher-child interactions focused on intent and content, questions still remain regarding the specificity of such associations. Many of the associations found in the current study are contradictory to research linking specific types of teacher behavior to children's social development. Much more research is needed in order to "unpack" these findings. Because teacher-child interactions are embedded within larger systems and are influenced by both characteristics of teachers and children, research incorporating teacher intentionality proves promising. Similarly, research incorporating the contextual features of teacher-child interactions including the activity settings and opportunities for peer engagement are necessary.

Implications

This dissertation has significant implications for both policy and research. As policymakers decide how to best spend the limited funds available for early care and education, this study sheds light on areas of quality improvement, particularly for teacher education and professional development that support effective instructionally supportive interactions related to children's peer engagement within PreK classrooms. This is particularly important for children's school readiness because children's competent social skills and interactions with peers are related to their engagement in learning and feelings toward school.

Applied developmental psychologists have extensively studied the benefits of peer relationships in early childhood. However, if teachers are continually pressured to prepare young children for the academic world of Kindergarten

without support for improving classroom instructional interactions children's social school readiness may suffer. This is particularly salient because recent research has documented that children were most engaged within classrooms when they were interacting with peers (Vitiello et al., 2012), suggesting that teachers who are particularly skilled at creating learning opportunities for children that incorporate peer interaction may best be able to get children excited about learning.

Table 1
 Descriptives of Child Characteristics and Peer Outcomes (n=714)

	<i>n</i>	<i>%</i>	Missing	<i>M</i>	<i>SD</i>
Child Characteristics					
Age	714		0	4.13	0.5
Gender					
Boy	355	49.7	0		
Girl	359	50.3	0		
Ethnicity	696		18		
Black	285	40.9			
White	96	13.8			
Latino	248	35.7			
Asian	30	4.3			
Other	37	5.3			
Mother's Education	682		32	12.71	2.4
Poverty	617		97	1.1	1.05
% Large Group	714	25.3	0		
Child Outcomes					
Peer Sociability	714		0	3.42	1.08
Peer Assertiveness	713		1	1.96	0.93
Peer Communication	714		0	2.13	1.01

Table 2
 Measures of Teacher-Child Interactions (n=399)

	<i>n</i>	Missing	<i>M</i>	<i>SD</i>
Teacher-Child Interactions				
CLASS Domains				
Emotional Support	399	0	5.31	0.91
Classroom Organization	399	0	5.13	0.92
Instructional Support	399	0	2.39	0.83
CLASS Dimensions				
Positive Climate	399	0	5.24	1.14
Negative Climate	399	0	1.25	0.57
Teacher Sensitivity	399	0	4.76	1.26
Regard for Student Perspectives	399	0	4.5	1.23
Behavior Management	399	0	5.66	1.02
Productivity	399	0	5.61	1.02
Instructional Learning Formats	399	0	4.12	1.17
Concept Development	399	0	1.83	0.75
Quality of Feedback	399	0	2.57	0.94
Language Modeling	399	0	2.76	1.03

Table 3

Interrelations Between Child and Classroom Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
InCLASS																						
1. Peer Sociability	1	.74**	.69**	-.01	-.01	0.04	.18**	-.04	-.06	.11**	.21**	.12**	.18**	.15**	-.01	0.05	-.03	0.01	-.02	0.05	.09*	-.19**
2. Peer Assertiveness		1	.74**	0.01	-.04	0.07	.15**	-.04	-.11	.1**	.25**	.14**	.17**	.21**	0.01	0.05	-.04	-.04	0	.08*	.12**	-.25**
3. Peer Communication			1	-.05	-.01	-.04	0.06	-.11**	-.06	0.03	.23**	.13**	.13**	.12**	-.01	0.07	-.05	0.02	-.03	.11**	.13**	-.24**
CLASS																						
4. Positive Climate				1	-.55**	.84**	.65**	.74**	.67**	.62**	.34**	.60**	.58**	0.07	0.01	-.08*	-.04	0.02	0.06	.12**	.18**	0.01
5. Negative Climate					1	-.46**	-.36**	-.6**	-.52**	-.34**	-.22**	-.29**	-.29**	-.08*	0.03	.12**	-.04	-.05	-.01	0.01	-.07	0.04
6. Teacher Sensitivity						1	.78**	.7**	.59**	.72**	.39**	.63**	.64**	.1**	0.02	-.07	-.07	0.03	0.04	.11**	.17**	0.003
7. Regard for Student Perspectives							1	.52**	.47**	.73**	.42**	.56**	.63**	0.03	0.01	-.05	-.13**	.09*	0.05	.18**	.25**	-.01
8. Behavior Management								1	.73**	.52**	.26**	.49**	.47**	0.07	0.003	-.08*	-.05	0.04	0.04	0.03	.09*	.09*
9. Productivity									1	.56**	.25**	.49**	.46**	0.03	0.01	-.06	0.01	.09*	0.05	0.04	0.04	0.02
10. Instructional Learning Formats										1	.55**	.68**	.68**	.12**	0.04	-.01	-.03	0.04	-.002	.16**	.18**	-.04
11. Concept Development											1	.71**	.68**	.14**	-.03	-.07	0.04	0.04	0.01	.16**	.25**	-.09*
12. Quality of Feedback												1	.85**	.13**	0.004	-.07*	0.02	0.01	-.01	.17**	.22**	0.002
13. Language Modeling													1	.12**	-.01	-.04	-.04	0.03	0.02	.16**	.21**	0.002
Child Characteristics																						
14. Age														1	-.03	-.1**	.11**	-.05	-.05	-.08*	-.07	-.01
15. Girl															1	0.03	0.02	0.04	0.04	-.05	-.04	-.003
16. Black vs. White																1	-.56**	-.19**	.08*	.13**	-.11**	-.07
17. Latino vs. White																	1	-.17**	-.17**	-.35**	-.12**	0.03
18. Asian vs. White																		1	.15**	.14**	0.06	-.02
19. Other vs. White																			1	.08*	0.07	-.09*
20. Mother's Education																				1	.58**	-.09*
21. Poverty																					1	-.08*
22. Large Group																						1

Note: Numbers in Table are Pearson Product Moment Correlations; * $p < .05$, ** $p < .01$.

Table 4
 Comparison of Fit Indices for Final Bifactor Model, Bifactor Model CFA, Theoretical Model CFA, and One-Factor CFA

	CFI	RMSEA	SRMR	χ^2 (df)
Final Bifactor Model	0.96	0.13	0.03	121.52(27)
Bifactor Model CFA	0.94	0.15	0.04	160.71(28)
Theoretical Bifactor CFA	0.85	0.21	0.08	349.02(32)
One-Factor CFA	0.72	0.28	0.1	621.98(35)

Table 5

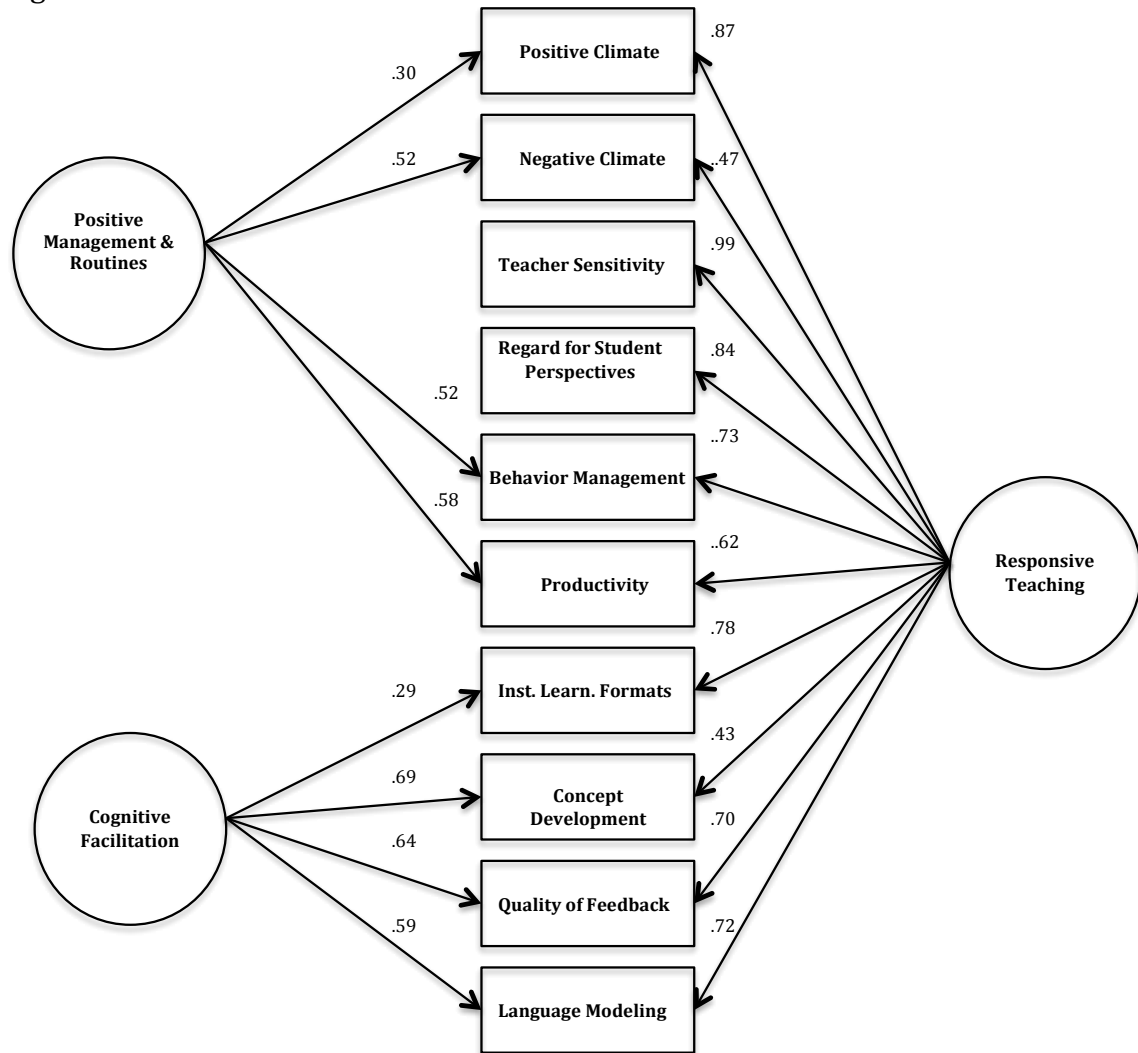
Table 5
Associations Between Child and Classroom Variables and Children's Peer Engagement

	Sociability		Assertiveness		Communication	
	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE
Model 1: Child Characteristics						
Age	0.38***	0.08	0.43***	0.07	0.32***	0.08
Girl	0	0.07	0.06	0.06	0.01	0.06
Black vs. White	0.16	0.1	0.14	0.09	0.23	0.1
Latino vs. White	0.004	0.11	0.004	0.1	0.01	0.11
Asian vs. White	0.07	0.19	-0.14	0.17	0.11	0.18
Other vs. White	-0.11	0.17	-0.02	0.15	-0.25	0.16
Mother's Education	0.02	0.02	0.03*	0.02	0.04**	0.02
Model 2: CLASS Domains						
Level 1						
Large group	-0.82***	0.18	-0.96***	0.15	-0.81***	0.18
Poverty	0.07	0.05	0.07	0.04	0.08	0.05
Level 2						
Responsive teaching	0.06	0.05	0.05	0.04	0.06	0.05
Management and routines	-0.46**	0.18	-0.49***	0.15	-0.46**	0.18
Cognitive facilitation	0.3**	0.1	0.27***	0.08	0.31***	0.1
Model 3: CLASS Dimensions (Positive Management & Routines)						
Level 1						
Large group	-0.82***	0.19	-0.97***	0.16	-0.96***	0.17
Poverty	0.1*	0.05	0.08*	0.04	0.11**	0.04
Level 2						
Positive climate	0.03	0.06	0.07	0.05	-0.003	0.06
Negative climate	-0.06	0.1	-0.12	0.08	-0.15	0.09
Behavior management	0.004	0.08	0.01	0.06	-0.16*	0.07
Productivity	-0.09	0.07	-0.19***	0.06	0.03	0.06
Model 4: CLASS Dimensions (Cognitive Facilitation)						
Level 1						
Large group	-0.8***	0.18	-0.94***	0.15	-0.99***	0.17
Poverty	0.07	0.05	0.06	0.04	0.08*	0.04
Level 2						
Instructional learning formats	-0.03	0.05	-0.07	0.04	-0.16***	0.05
Concept development	0.23**	0.08	0.3***	0.07	0.3***	0.08
Quality of feedback	-0.23**	0.09	-0.13	0.08	0.05	0.09
Language modeling	0.26***	0.08	0.13*	0.07	0.05	0.08

Note. Child characteristics in Model 1 are included as covariates in each of the subsequent models. In each model, intervention status is entered as a Level 2 covariate. Values are unstandardized regression coefficients, with standard errors provided. CLASS = Classroom Assessment Scoring System.

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

Figure 1. Bifactor Model



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