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Relating prekindergarten teacher beliefs and knowledge to children's language and literacy development

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HIGHLIGHTS

- Associations between teachers' beliefs/knowledge and child development examined.
- Teachers' language knowledge predicted children's expressive vocabulary gains.
- Teachers' literacy knowledge predicted children's gains in print knowledge.
- Teacher beliefs were not predictive of children's skill development.
- Important as the field develops mechanisms for evaluating and training educators.

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ABSTRACT

The current study examines the associations between teachers' beliefs and knowledge and children's learning during the prekindergarten year. This study describes the degree to which 262 prekindergarten teachers' beliefs and knowledge regarding children's language and literacy skills are related to learning over the prekindergarten year. Teacher beliefs were not predictive of children's skill development. However, teachers' knowledge of language positively predicted children's gains in expressive vocabulary skills. In addition, teachers' knowledge of literacy predicted children's gains in print knowledge. Understanding these associations is important as the field continues to develop mechanisms for evaluating and training early childhood educators.

1. Introduction

Renewed attention to effectiveness of teacher preparation programs (U.S. Department of Education, 2011) is fueling opportunities for systematic investigation of the educational and training experiences teachers need. A variety of pedagogical strategies, including clinical internships and coursework, are available to train teachers in the dispositions, knowledge, and practices necessary for success in today's classrooms (Darling-Hammond, Hammerness, Grossman, Rust, & Shulman, 2007; Kleickmann et al., 2013). To increase the rigor of teacher training, it is necessary to identify measurable teacher characteristics that are both related to students' outcomes and responsive to training. For example, the *Teacher Belief Q-Sort* was developed to study teachers' priorities related to discipline, classroom practice, and beliefs about children, and has been shown to change with training and teaching experience (Rimm-Kaufman, Storm, Sawyer, Pianta, & LaParo, 2006). Measures of teacher pedagogical content knowledge, understanding of both content and the best ways of presenting that content for learners of varying abilities (Ball, Thames, & Phelps, 2008; Shulman, 1987), relate to students' math achievement (Hill, Ball, & Schilling, 2008; Hill, Rowan, & Ball, 2005). However, we know very little about the beliefs and knowledge of prekindergarten teachers that contribute to children's development, specifically, children's development of language and literacy skills.

The research base has identified key domains of language and literacy skills that children should possess in early childhood to prevent later reading difficulties (National Early Literacy Panel,

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2008; Snow, Burns, & Griffin, 1998; Whitehurst & Lonigan, 1998). These precursors include meaning-based oral language skills, such as vocabulary, and code-based literacy skills, such as phonological awareness and print knowledge (Kendeou, van den Broek, White, & Lynch, 2009; NICHD Early Child Care Research Network, 2005; Storch & Whitehurst, 2002). Although the bulk of research has been conducted with English-speaking populations, there is support for similar early literacy skills affecting reading acquisition in other languages, including German (Näslund, 1990) and Spanish (Denton, Hasbrouck, Weaver, & Riccio, 2000). When well developed, these skills allow children to make a smoother transition to conventional reading once formal instruction begins (Lonigan, Burgess, & Anthony, 2000; O'Malley, Francis, Foorman, Fletcher, & Swank, 2002). There is reason to believe that teacher beliefs about and knowledge of these domains may be important for children's learning of critical early literacy skills, but there is little evidence on that regard. The current paper begins to address this question.

1.1. Language and literacy skills in early childhood

Language and literacy skills in early childhood represent two interrelated constructs that are predictive of children's future achievements in reading comprehension and word recognition (National Early Literacy Panel, 2008; Storch & Whitehurst, 2002). The association between early literacy skills and future reading achievement has been demonstrated internationally as well (Mullis, Martin, Foy, & Drucker, 2012). The Progress in International Reading Literacy Study (PIRLS) in 2011 identified associations between parents' assessments of their children's early literacy skills (prior to entering primary school) and fourth grade reading achievement (Mullis et al., 2012). Prekindergarten language skills are related to children's initial reading achievements, when children are learning to decode words, but have their greatest impact on later reading comprehension (NICHD Early Child Care Research Network, 2005; Storch & Whitehurst, 2002). Vocabulary knowledge, including the volume and depth of words known in both receptive and expressive modalities, arguably has the strongest relation to reading development of the language skills children are developing at this time (National Reading Panel, 2000). Children's early literacy skills, including phonological awareness and print knowledge, lay a foundation for them to "break the code" of reading and consequently contribute to subsequent word recognition (Denton et al., 2000; National Early Literacy Panel, 2008). Phonological awareness is the ability to identify and manipulate sound components of words, independent of their meaning. A number of abilities contribute to print knowledge, including identifying letter names and corresponding sounds, and an understanding of print conventions such as print conveys meaning and is read from left to right in the English language (Pullen & Justice, 2003).

1.2. Beliefs and knowledge about children's language and literacy skills

Given the influence of precursory language and literacy skills on subsequent reading development, it is important to understand what prekindergarten teachers believe and know about these developmental areas. We acknowledge debates within the literature regarding the extent to which beliefs and knowledge are unique constructs (see Murphy & Mason, 2006; Woolfolk Hoy, Davis, & Pape, 2006). Across American and European cultures, adults have conceptualized beliefs and knowledge as overlapping constructs that also maintain unique properties (Alexander & Dochy, 1995). Participants in the study by Alexander and Dochy often conceptualized both beliefs and knowledge as stemming from experiences, but that knowledge required objective external validation and beliefs did not. In fact, Alexander and Dochy described that participants perceived knowledge as formally constructed, such as would occur through school or formal training, but that beliefs developed through informal daily experiences. An important purpose of examining measures of teachers' beliefs and knowledge regarding children's language and literacy skills is to identify targets for training and professional development. Given that the mechanisms for influencing beliefs and knowledge may vary, we choose to assess beliefs and knowledge as separate constructs. We perceive knowledge to represent facts that one either knows or does not know, and beliefs to represent the values attached to information that one either knows or does not know. Prior research has shown that teachers' beliefs and knowledge are sensitive to training (Hamre et al., 2012); we would like to examine if they are associated with children's learning as well.

1.2.1. Beliefs

Prekindergarten teachers generally believe that it is important to provide children with many opportunities for language learning, particularly through the use of storybooks (Burgess, Lundgren, Lloyd, & Pianta, 2001). In one study, 86 percent of prekindergarten teachers endorsed an item that stated, "I surround students with literature and literacy experiences in order for the children to become skillful, fluent readers" (Burgess et al., 2001, p. 7). Hindman and Wasik (2008) also found that Head Start teachers valued instruction in book reading and oral language/vocabulary. Using the *Preschool Teacher Literacy Beliefs Questionnaire* (Seefeldt, 2004), they found that teachers strongly endorsed best practices in oral language and book reading instruction.

Prekindergarten teachers commonly view literacy skills as less important. Burgess et al. (2001) reported that, on average, prekindergarten teachers rated verbal language skills, such as telling a story, as more important than alphabet knowledge skills, such as the ability to write letters or words. Hindman and Wasik (2008) reported that teachers' beliefs were less aligned with best practices for instruction in literacy practices than they were with best practices in oral language/vocabulary or book reading.

Studies of early childhood teachers internationally reveal that practices for developing early language and literacy skills can vary greatly as teachers try to reconcile beliefs valued by multiple languages and cultures. For example, in multilingual, multi-cultural contexts in Singapore, kindergarten teachers value a variety of approaches to developing early literacy skills, even approaches that appear to contradict each other (Lim & Torr, 2007). Lim and Torr (2007) report that 75.9% of surveyed kindergarten teachers indicated that both code-focused and meaning-focused literacy instruction were their primary literacy philosophy (teachers did not select one over the other); this finding suggests that teachers in Singapore value an eclectic approach which can be adapted according to students' needs. In China, teachers must determine what they believe when dealing with clashes in approaches valued by Western curriculum models and those valued by Chinese traditions and existing practices (Li, Wang, & Wong, 2011).

Although we have a sense of the value prekindergarten teachers place on children's development of language and literacy skills, research has not yet been conducted to evaluate associations between teachers' beliefs and children's actual learning of these skills. In the current study, we operationalize beliefs as the degree of value teachers assign to precursory language and literacy skills that children may demonstrate in the classroom. We include beliefs related to specific domains of language (vocabulary and linguistic concepts, pragmatics and social language, and narrative skills) and of literacy (phonological awareness, print concepts, and alphabet knowledge) ability. Moving forward, one area of interest is whether

prekindergarten teachers' ratings of the importance of children's skills in domains of language (e.g., vocabulary and linguistic concepts) and of literacy (e.g., phonological awareness) align with children's development of associated skills.

1.2.2. Knowledge

There are different ways of conceptualizing teacher knowledge of language and literacy skills (Ball et al., 2008; Shulman, 1987). Research in this area has primarily evaluated elementary school teachers' knowledge in reading, which appears to be particularly low in phonological awareness, namely phonemic awareness (Bos, Mather, Dickson, Podhajski, & Chard, 2001; Brady et al., 2009). Moats (1994) surveyed 89 teachers responsible for reading instruction to students from kindergarten to adulthood. These teachers struggled with terminology such as phoneme and morpheme awareness. Researchers have since used or adapted Moats' survey to build evidence showing that knowledge is generally low for elementary school teachers (e.g., Cunningham, Perry, Stanovich, & Stanovich, 2004; Moats & Foorman, 2003). Less research has examined prekindergarten teachers' knowledge of language and literacy concepts (Cunningham Zibulsky, & Callahan, 2009), but there are indications of similar knowledge gaps. In one study, more than half of prekindergarten teachers were unable to identify the number of speech sounds or phonemes in words (Cunningham Zibulsky, & Callahan, 2009). Low levels of knowledge are particularly concerning given that both prekindergarten and elementary teachers overestimate what they know, predicting they will get more items correct on knowledge assessments than they actually do (Cunningham et al., 2004; Cunningham Zibulsky, & Callahan, 2009). Consistently low levels of knowledge regarding language and literacy concepts may make it difficult to assess associations between teachers' knowledge and children's learning.

Moats' (1994) survey of teacher knowledge and various adaptations (e.g., Cunningham et al., 2004) have emphasized teachers' own abilities in various domains of language and literacy. For example, assessments of teacher language and literacy content knowledge often focus on teachers' own ability within specific domains of language and literacy skill, such as identifying the number of speech sounds or phonemes in words to assess phonological awareness (Cunningham Zibulsky, & Callahan, 2009; Moats & Foorman, 2003). In the current paper, we take a child-focused approach. We focus on teachers' ability to identify how skills young children demonstrate represent competencies within these domains. Here, a teacher should know that a child retelling a fictional story using new vocabulary represents skill in narrative, a domain of language ability, and blending syllables into words represents phonological awareness, important for literacy. We align our assessments of knowledge and beliefs, addressing the same domains for each. We hypothesize that prekindergarten teachers need to recognize skills that young children have as representing larger domains of language and literacy ability, such as knowing that a child who identifies the front, back, and title of a book is demonstrating print knowledge. Consider the item, "For each of the following, choose whether the activity would help children acquire: a) Phonological Sensitivity (sometimes referred to as phonological awareness); b) Phoneme Awareness; c) Neither; d) Both; e) Not sure" (Brady et al., 2009, p. 448). With this type of item we can begin to understand teachers' abilities to categorize children's skills according to appropriate domains. Unfortunately, Brady et al. (2009) do not report results at the item level, and their study is focused on first grade teachers. The current study investigates prekindergarten teachers' knowledge of the component skills children may demonstrate that make up precursory language and literacy skill domains (e.g., vocabulary, phonological awareness, alphabet knowledge) and whether teacher's knowledge of these domains is related to children's gains in language and literacy skills.

1.3. Associations with teachers' practice and children's learning

Several researchers have theorized a pathway by which teachers' knowledge and beliefs influence their classroom practice and through practice, children's learning (Desimone, 2009; Hamre et al., 2012). For knowledge, there is evidence of an association between teachers' phonological knowledge at the beginning of the school year and their practice of literacy instruction that year (McCutchen, Harry, et al., 2002). Knowledge of effective classroom interactions partially mediates observed practice of effective interactions (Hamre et al., 2012). The findings for teacher beliefs are more mixed. There is debate about the degree to which teachers' beliefs influence their classroom behavior (Fang, 1996; Stipek & Byler, 1997). Although some have reported a lack of association between teacher beliefs regarding language and literacy instruction and classroom practice (Hamre et al., 2012; McCutchen, Harry, et al., 2002), there are also indications that teacher beliefs can influence how teachers allocate instructional time (Cunningham, Zibulsky, Stanovich, & Stanovich, 2009). Scull, Nolan, and Raban (2012) describe case studies of Australian preschool teachers whose individual practices to support children's literacy are associated with their underlying beliefs regarding the importance of young children's literacy development. For example, the teacher who perceived literacy as a social practice which connects children to cultural and historical knowledge instructed children to document classroom experiences with Haiku. The teacher who stressed an interdisciplinary approach to literacy led children in a cooking activity, highlighting how print conveys meaning by having them read the recipe. Because there are indications that both beliefs and knowledge are associated with teachers' classroom practices to promote language and literacy, we anticipate that beliefs and knowledge will also be associated with children's development of these skills. However, because the research linking beliefs to classroom practice is more mixed, we hypothesize that the associations with teacher beliefs will be less strong.

Limited research is available to inform our hypotheses describing the relationship of prekindergarten teachers' beliefs and knowledge regarding language and literacy skills with children's development of those skills. We were unable to identify studies examining associations between teacher beliefs regarding language and literacy skills and children's development of those skills. There is some research on associations between teacher knowledge and student achievement, though most of this work has been conducted with elementary teachers. Studies have found significant and positive relations between teachers' reading-related knowledge and students' reading achievement for second through fifth grade classrooms (Foorman & Moats, 2004; Garet et al., 2008; McCutchen, Green, Abbott, & Sanders, 2009). McCutchen, Abbott, et al. (2002) found a correlation between teachers' phonological knowledge and children's end of year skills in reading words for kindergarten. Carlisle, Kelcey, Rowan, and Phelps (2011) measured teacher knowledge somewhat differently, framing it as teachers' use of knowledge to make instructional decisions or analyze student performance on reading and writing tasks, and identified small effects of teachers' knowledge on first-grade students' early reading comprehension. There is even less support for these associations in early childhood, though one study reports that prekindergarten teachers' increased knowledge following professional development had minimal effects on children's learning (Cunningham, Zibulsky, & Callahan, 2009).

1.4. The current study

In the current study, we investigated the following question: What is the relationship between prekindergarten teachers' beliefs and knowledge regarding language and literacy instruction and children's language and literacy gains during the prekindergarten year? We hypothesize that there will be significant associations between teachers' knowledge of language and children's gains in receptive and expressive vocabulary skills, and also between teachers' knowledge of literacy skills and children's gains in print knowledge and phonological awareness skills. We also hypothesize that there will be significant associations between teachers' beliefs regarding language and children's gains in vocabulary skills, or for teachers' beliefs regarding literacy skills and children's gains in print knowledge and phonological awareness skills. Because teacher beliefs appear to translate to practice less readily than teacher knowledge (McCutchen, Harry, et al., 2002), and because we prescribe to a theory of change in which knowledge influences practice which improves learning (Desimone, 2009; Hamre et al., 2012), we anticipate associations for teachers' knowledge will be stronger than associations for teachers' beliefs.

2. Method

The present study represents secondary data analyses from a multi-site, randomized controlled trial, the National Center for Early Childhood Education Professional Development Study (see Hamre et al., 2012; Pianta et al., 2014). Although intervention status was not of interest in the current study, we included it as a covariate in the analyses. The randomized controlled trial included 496 prekindergarten teachers in an evaluation of two types of professional development, both designed to improve teachers' interactions with children in the classroom. The trial was organized into two phases of randomly assigned professional development. In Phase I, teachers were randomly assigned to participate in a 14-week college-level course (see Hamre et al., 2012 for additional details regarding course implementation). Phase II immediately followed Phase I and involved a web-mediated consultancy using the MyTeachingPartner (MTP) coaching model (Pianta, Mashburn, Downer, Hamre, & Justice, 2008). For the current study, we focused on teacher questionnaires collected following Phase I but before Phase II. Child assessments were collected during Phase II, in the fall and spring of children's prekindergarten year.

2.1. Participants

Participants were recruited from large community prekindergarten and Head Start programs across ten sites in the United States. Two cohorts of programs were recruited in a process that included negotiation with program administrators, creation of program agreements, and IRB approval. Cohort 1 included five sites that started in spring 2008: New York, NY; Chicago, IL, Stockton, CA; Hartford, CT; and Dayton, OH. Cohort 2 also included five sites and started in spring 2009: Columbus, OH; Memphis, TN; Charlotte, NC; Providence, RI; and a second cohort in Chicago, IL.

2.1.1. Teachers

Program administrators and potential teacher participants were invited to attend recruitment meetings at each site to review study details. Additional phone and email follow-up was coordinated through site-specific liaisons. Teachers were considered eligible to participate if they were the lead teacher in a publicly funded classroom, the majority of classroom instruction was in English, the majority of the children in their classroom were eligible for kindergarten in the following year, and the majority of the children in their classroom did not have an Individualized Education Program (IEP) reflecting special education and related services at the start of the current year. Participating teachers were randomized, blocked by site, into either course or control for Phase I and randomized again for Phase II into either consultancy or control.

For the present study, a total of 262 teachers were included from both cohorts who participated in both Phase I and Phase II and had some child data available. Teachers were excluded if they dropped out of the study after Phase I or were added to the study for Phase II due to the timing of pertinent survey items. Classrooms were housed in 165 schools or centers, with an average of two teachers participating per school or center ($M = 1.59$, $SD = 1.13$; range 1–7). More than half of the teachers taught in Head Start programs (60.9%) and slightly less than half taught public prekindergarten (40.2%). Teachers were African American (44.0%), Caucasian (34.2%), Hispanic/Latino (14.0%), or Multi-ethnic/other (7.8%). Teachers averaged 11.18 (SD = 7.85) years of experience teaching prekindergarten and had an average of 15.73 years of education ($SD = 1.56$). These teachers did not significantly differ from the 70 teachers who participated in both Phase I and II but had no associated child data available with regard to ethnicity or years of experience teaching prekindergarten. However, teachers participating in the present study had a slightly more years of education ($M = 15.73$ years, $SD = 1.57$; $M = 15.20$ years, $SD = 1.70$), $t(322) = 2.43$, $p = .016$.

2.1.2. Children

Children were recruited at the beginning of Phase II. Teachers sent packets home that included a letter explaining the project, a document for parental consent, a family contact form, and a family questionnaire. Completed packets were collected by teachers and retrieved by data collectors on the morning of a school/center visit.

In Phase II, data collectors scheduled fall and spring child assessments with teachers. During the first scheduled visit in the fall, data collectors determined parental consent and child eligibility. Children were considered eligible if they spoke English or Spanish, did not have an Individualized Education Program reflecting special education and related services, and four-year-olds were prioritized. From the list of eligible children, an average of four children was randomly selected, stratified by gender. Data collectors assessed as many of the selected children as possible during the initial visit. If anyone was absent, the next eligible child was selected and assessed. If a child refused, the data collector tried again later in the day; if a child continued to refuse that day, the data collector scheduled a day to return for another attempt. In the spring, data collectors scheduled a second visit if any child was absent. Children who had left the original classroom were replaced with the next eligible child when possible.

Children were included in the current study if they met eligibility requirements and they were students in the classrooms of teachers eligible for the current study. We analyzed data from 1134 children (564 boys, 570 girls) for the present study across the 262 classrooms (range 2–8 children per classroom). Children were approximately four years old ($M = 4.17$, $SD = 0.47$, range = 2.65–5.45). For children for whom ethnicity data were available, 46.3% were African American, 34.7% were Hispanic/Latino, 11.6% were Caucasian, and 7.5% were multiracial or other. The average family income-to-needs ratio was 1.05 ($SD = 0.96$). Approximately 87% of children spoke English at home.

2.2. Measures

2.2.1. Teachers' beliefs and knowledge

All teachers were asked to complete an online questionnaire within a month of completion of Phase I. Over 80% of teachers from

the larger sample responded to the survey. Two of the scales were of primary interest in the present study.

To measure teachers' beliefs about language and literacy skills, *Beliefs about Importance of Language and Literacy Skills* (adapted from Burgess et al., 2001) asked teachers to rate the importance of specific skills for children as they enter kindergarten. Items were rated on a scale from 1 (not important) to 4 (essential) and are listed in Appendix A. Six items related to beliefs about the importance of children's language skills (α = .82), such as "Initiate a conversation with an adult or a peer." These included two items each relating to vocabulary and linguistic concepts, pragmatics and social language, and narrative skills. Six items related to beliefs about the importance of children's literacy skills as they enter kindergarten (α = .82), such as "Blend syllables into words." Of the six items, two items covered each of the domains of phonological awareness, print concepts, and alphabet knowledge. In a prior study, teachers' reported beliefs on this scale were internally consistent with self-reported language and literacy practices (Burgess et al., 2001). For this study, two scores were calculated, teachers' average rating of the importance of language skills and teachers' average rating of the importance of literacy skills.

To measure teachers' knowledge of language and literacy skills, *Knowledge about Language and Literacy Skills* (Hamre & Justice, 2007) asked teachers to categorize skills by language/literacy domain. Items are listed in Appendix B. In parallel with the Beliefs Scale, there were six items related to language skill domains (covering vocabulary and linguistic concepts, pragmatics and social language, and narrative skills) and six items related to literacy domains (covering phonological awareness, print concepts, and alphabet knowledge). The items asked teachers to categorize skill statements such as "Retell a fictional story using newly-learned vocabulary" into the correct domain (Narrative). For this study, teachers' percent correct for language (Guttman's Lambda-2 = λ_2 = 0.534) and percent correct for literacy (Guttman's Lambda-2 = λ_2 = 0.473) were used.

2.2.2. Children's language and literacy skills

Direct assessments of language and literacy skills were administered to all children in English, because the majority of teaching in the study classrooms was conducted in English. All outcome measures are described below. Raw scores were used for all analyses.

2.2.2.1. Receptive vocabulary. The *Peabody Picture Vocabulary Test-3rd edition* (PPVT-III, Dunn & Dunn, 1997) assessed receptive vocabulary skills. For a series of items, the child is asked to point to the picture that corresponds to the word spoken by the examiner on a card with four different pictures. The PPVT-III demonstrates acceptable reliability and validity; split-half reliability ranges from 0.86 to 0.97 (median = 0.94) and the measure is strongly correlated with other measures of receptive vocabulary and verbal ability (Dunn & Dunn, 1997; Wing-Yin Chow & McBride-Chang, 2003).

2.2.2.2. Expressive vocabulary. The Picture Vocabulary subtest of the *Woodcock-Johnson III Tests of Achievement* (WJ III ACH; Woodcock, McGrew, & Mather, 2001) measured expressive vocabulary. The WJ III ACH is a widely used assessment batter that measures general cognitive skills for individuals age two through adulthood. The Picture Vocabulary subtest asked children to name objects depicted in a series of pictures. This subtest has acceptable reliability and validity with a median split-half reliability of 0.81 (Schrank, McGrew, & Woodcock, 2001).

2.2.2.3. Print knowledge and phonological awareness. Two subtests from the *Test of Preschool Early Literacy* (TOPEL; Lonigan, Wagner, Torgesen, & Rashotte, 2007) were used to measure children's literacy skills. The Print Knowledge subtest measured children's knowledge of the alphabet and conventions of written language. The Phonological Awareness subtest measured children's word elision and blending ability. These subtests have adequate internal consistency (α = .78 to 0.89) and concurrent validity (r = 0.41 to 0.43).

3. Results

Table 1 provides descriptive statistics for children's raw scores on the prekindergarten achievement tests of language and literacy skills at both fall and spring time points. As expected, children made gains across all measures during the year. It is important to note, however, that many children in this sample were at risk for later reading difficulties, as evidenced by end of year scores; at the end of the year, one-quarter to one-half of all children scored at or below the 25th percentile when compared to a norm-referenced sample (47.5% for the PPVT-III, 22.9% for the WJ II ACH, 27.8% for TOPEL Print Knowledge, and 48.6% for TOPEL Phonological Awareness). Table 2 presents descriptive statistics for teachers' beliefs about and knowledge of language and literacy skills. In general, teachers' did feel that language and literacy practices were important.

3.1. Relations between teacher language beliefs and knowledge and children's language development

Table 3 displays standardized model results for receptive and expressive vocabulary outcomes. We first tested the association between teachers' beliefs and knowledge of language development and children's gains in vocabulary skills, controlling for teacher and classroom effects. For all analyses, we examined multi-level models, with children nested within classrooms, using Mplus Version 6.11 (Muthén & Muthén, 1998–2010). The statistical models were analyzed using full information maximum-likelihood estimation, which allowed for parameter estimation based on all available data, with the assumption that data were missing at random. The intraclass correlations (ICCs) from the unconditional models indicated that there was substantial variance between classrooms in both receptive and expressive vocabulary outcomes (ICCs = 0.23, 0.25, respectively). Gains in vocabulary were estimated using children's raw scores, with spring scores entered as outcomes and fall scores as covariates. Child-level covariates included age in months, gender, income-to-needs ratio, and ethnicity (i.e., Caucasian, African American, Hispanic, Other). Classroom-level covariates included program site, program type (Head Start, public school), intervention condition in the larger study, teacher ethnicity, teachers' years of experience teaching preschool, and teachers' years of education. Predictors of

Table 1
Children's raw scores for language and literacy skills.

Variable	Fall			Spring		
	n	*M*	*SD*	n	*M*	*SD*
Preschool skills						
Receptive vocabulary[a]	976	40.03	18.46	960	51.05	19.35
Expressive vocabulary[b]	964	11.95	4.23	957	13.5	3.71
Print knowledge[c]	978	13.04	10.22	961	21.41	11.38
Phonological awareness[d]	914	11.78	5.19	938	14.84	5.55

[a] PPVT-III receptive vocabulary (maximum = 104).
[b] Woodcock-Johnson III Tests of Achievement Picture Vocabulary subtest (maximum = 44).
[c] TOPEL Print Knowledge subtest (maximum = 36).
[d] TOPEL Phonological Awareness subtest (maximum = 27).

Table 2
Teacher beliefs and knowledge.

Variable	n	*M*	*SD*	Actual range
Beliefs about language[a]	237	3.34	0.51	1.83–4.00
Beliefs about literacy[a]	237	3.35	0.57	1.40–4.00
Knowledge of language[b]	237	67.79	25.04	0–100
Knowledge of literacy[b]	237	78.90	20.13	0–100

[a] Items were rated on a scale from 1 (not important) to 4 (essential).
[b] Percent of items correctly categorized.

substantive interest included teacher beliefs about language skills and teacher knowledge of language skills. All continuous variables were grand-mean centered. Analyses related to both receptive and expressive vocabulary gains were examined in a single statistical model to better account for Type I error.

Neither teacher beliefs nor knowledge regarding language practices significantly predicted children's gains in receptive vocabulary after controlling for teacher and classroom effects. Teacher beliefs also did not significantly relate to children's gains in expressive vocabulary. However, teacher knowledge of language practices was positively related to children's gains in expressive vocabulary after controlling for teacher and classroom effects.

3.2. Relations between teacher literacy beliefs and knowledge and children's literacy development

To test the associations of teacher beliefs and knowledge regarding literacy with children's literacy development, we examined a multi-level model similar to the previous model predicting language development. The model included the same set of covariates as the previous model, but the predictors of interest were teacher beliefs about literacy skills and teacher knowledge of literacy skills. Outcomes included children's print knowledge and phonological awareness (ICCs = 0.29, 0.10, respectively). See Table 4 for the results. Teachers' beliefs about the importance of literacy skills did not significantly relate to either print knowledge or phonological awareness gains. However, teachers' knowledge of literacy skills was positively related to children's gains in print knowledge after controlling for teacher and classroom effects.

4. Discussion

The identification of specific, measurable teacher competencies related to children's learning is an important step in efforts to improve the quality of today's educators. There is clear evidence describing key domains of language and literacy skills that children need in early childhood to prevent later reading difficulty (Kendeou et al., 2009; National Early Literacy Panel, 2008; Storch & Whitehurst, 2002). There is less research describing how teachers' beliefs and knowledge about these language and literacy skill domains relate to children's learning. This is particularly true for prekindergarten teachers. This study contributes to the literature by describing associations between prekindergarten teachers' knowledge of language and literacy skill domains and children's gains in these skills during the prekindergarten year. We did not identify significant associations between prekindergarten teachers' beliefs about language and literacy skill domains and children's learning of these skills and suggest that teachers' knowledge may be more important for children's development than teachers' beliefs.

Prekindergarten teachers' ability to categorize children's skills by language domain (vocabulary and linguistic concepts,

Table 3
Association between language beliefs and knowledge and Children's prekindergarten receptive and expressive vocabulary development.

Variable	Receptive vocabulary		Expressive vocabulary	
	Estimate	S.E.	Estimate	S.E.
Intercept	16.47**	3.63	19.42**	3.71
Child-level covariates				
Fall receptive vocabulary score	0.76**	0.02	0.78**	0.03
Age in months	0.11**	0.02	0.06*	0.03
Gender	0.01	0.02	−0.004	0.02
Income-to-needs ratio	0.06*	0.03	0.06**	0.02
Ethnicity: African American	−0.09**	0.03	−0.05	0.03
Ethnicity: Hispanic	−0.14**	0.04	−0.17**	0.04
Ethnicity: Other	−0.05*	0.02	−0.05	0.02
Classroom-level covariates				
Head start	0.03	0.15	−0.01	0.12
Public school	<0.01	0.14	0.18	0.12
Teacher years of experience in Pre-K	−0.05	0.12	0.11	0.15
Teacher years of education	0.37*	0.16	0.03	0.13
Teacher ethnicity: African American	−0.19	0.15	0.02	0.14
Teacher ethnicity: Hispanic	−0.19	0.14	0.17	0.14
Teacher ethnicity: Other	−0.34**	0.12	−0.14	0.13
Phase I intervention status	<0.01	0.12	−0.11	0.11
Phase II intervention status	0.29*	0.12	0.07	0.11
Teacher beliefs and knowledge				
Beliefs about language skills	0.05	0.12	−0.03	0.11
Knowledge of language skills	−0.12	0.13	0.28*	0.14

Note. Beliefs about Language Domains = vocabulary and linguistic concepts, pragmatics and social language, and narrative skills. Knowledge of Language Domains = vocabulary and linguistic concepts, pragmatics and social language, and narrative skills. Nine dummy coded site variables were included in analyses but omitted from table.
*$p < .05$. **$p < .01$.

Table 4
Association between literacy beliefs and knowledge and Children's prekindergarten print knowledge and phonological awareness.

Variable	Print knowledge		Phonological awareness	
	Estimate	S.E.	Estimate	S.E.
Intercept	7.21**	0.95	13.24**	3.67
Child-level covariates				
Fall print knowledge score	0.60**	0.03	0.47**	0.04
Age in months	0.19**	0.03	0.16**	0.03
Gender	−0.07**	0.02	−0.06*	0.03
Income-to-needs ratio	0.10**	0.03	0.08*	0.04
Ethnicity: African American	0.04	0.04	−0.08	0.04
Ethnicity: Hispanic	−0.04	0.05	−0.14**	0.05
Ethnicity: Other	0.01	0.03	−0.04	0.03
Classroom-level covariates				
Head start	−0.17	0.10	0.01	0.16
Public school	0.32**	0.11	−0.26	0.15
Teacher years of experience in Pre-K	0.11	0.08	0.05	0.14
Teacher years of education	0.30*	0.12	−0.01	0.17
Teacher ethnicity: African American	0.01	0.10	−0.10	0.17
Teacher ethnicity: Hispanic	0.16	0.11	0.08	0.20
Teacher ethnicity: Other	−0.11	0.11	−0.17	0.15
Phase I intervention status	−0.02	0.09	0.00	0.15
Phase II intervention status	0.13	0.08	−0.02	0.13
Teacher beliefs and knowledge				
Beliefs about literacy skills	0.09	0.09	0.01	0.15
Knowledge of literacy skills	0.23*	0.10	0.03	0.16

Note. Beliefs about Literacy Domains = phonological awareness, print concepts, and alphabet knowledge. Knowledge of Literacy Domains = phonological awareness, print concepts, and alphabet knowledge. Nine dummy coded site variables were included in analyses but omitted from table.
*$p < .05$. **$p < .01$.

pragmatics and social language, and narrative skills) predicted children's gains in expressive vocabulary skills over the prekindergarten year. Teachers' ability to categorize skills by literacy domain (phonological awareness, print concepts, and alphabet knowledge) predicted children's gains in print knowledge. Teacher knowledge of language domains did not predict children's receptive vocabulary and knowledge of literacy domains did not predict children's gains in phonological awareness. The results of this study suggest that a teacher's ability to observe children's skills and appropriately categorize them as markers of learning in a specific language or literacy domain is an important indicator for the teacher's effectiveness in promoting learning.

One interesting result was that teachers' knowledge was not significantly related to all child outcomes assessed. For example, there were significant and positive associations for expressive language, but not for receptive language. In the current study, we did not analyze associations between knowledge and children's skills separately by skill domain. It is possible that teachers possess greater knowledge of some domains over other ones. For example, teachers may know more about print concepts than phonological awareness. Extant research does indicate that teachers' knowledge of phonological awareness in particular is typically low (e.g. Bos et al., 2001; Moats & Foorman, 2003).

We had hypothesized that teacher beliefs about the importance of specific language and literacy skills for children as they enter kindergarten would predict children's learning, but that the associations would be less strong than those for teachers' knowledge. In fact, teachers' beliefs did not predict children's learning. It seems that teachers' knowledge of language/literacy skill domains is more important for children's learning than their beliefs in the importance of these skills. One possible explanation for finding significant associations for knowledge, but not beliefs, may be that teacher knowledge of language/literacy skill domains is more strongly related to practice of language/literacy instruction than beliefs. Prior research shows that assessments of teachers' phonological knowledge are associated with their practices of literacy instruction (McCutchen, Harry, et al., 2002). Perhaps teachers who possess knowledge of language and literacy skill domains are better able to apply that knowledge in explicit and systematic instruction to support children's development of specific language and literacy skills. There is less agreement in the literature about associations between teacher beliefs regarding language or literacy instruction and practice (Fang, 1996; Stipek & Byler, 1997). Some researchers have identified associations (e.g. Cunningham, Zibulsky, Stanovich, et al., 2009; Scull et al., 2012) but others have not (Hamre et al., 2012; McCutchen, Harry, et al., 2002). These associations may be even more complex in multi-cultural and multilingual settings where teachers must reconcile belief systems and instructional approaches related to teaching literacy which may contradict each other (Li et al., 2011; Lim & Torr, 2007). Additional research, particularly further measurement development, is necessary to elucidate whether practice mediates existing associations between knowledge and children's development, and whether specific beliefs about language and literacy are related to practice at all.

This is not to say that all beliefs that prekindergarten teachers hold are irrelevant for children's learning. Guo, Piasta, Justice, and Kaderavek (2010) found that preschool teachers' self-efficacy was a significant and positive predictor of children's gains in print knowledge. In the same study, self-efficacy was also related to children's gains in vocabulary knowledge, but only under conditions of high levels of emotionally supportive teacher–child interactions. The results of the current study as well as the findings of Guo et al. (2010) highlight that associations between beliefs, practice, and achievement are not clear-cut and should be interpreted with caution.

4.1. Limitations

The primary limitation of this study is the possible imprecision of the measures of teacher beliefs and knowledge. The measures used in this study are newly developed and have not been subject to extensive piloting. Each construct (language knowledge, language beliefs, literacy knowledge, literacy beliefs) was assessed with just six items and the reliability of the assessments was not high. It is also important to note that the relations examined here are not causal in nature. Despite these challenges, however, there were significant, positive associations for children's gains in expressive vocabulary and print knowledge. It is possible that stronger associations, or additional associations, would have been identified had the measures involved additional items and higher reliability.

We acknowledge the presence of a significant association between Phase II intervention status and children's development of receptive vocabulary skills. There are two important points to make regarding this result. First, we strongly discourage readers from interpreting this as an effect of the treatment on child outcomes. The sample used in the present study is not the same as the intent-to-treat sample in the experimental design of treatment effects and the analysis was not conducted to test those effects explicitly. The study was not designed to examine the effects of the college course or MyTeachingPartner coaching model. For further discussion of intervention effects and their implications, we refer readers to studies explicitly designed to study these effects (e.g. Hamre et al., 2012; Pianta et al., 2014). Second, in the present design, the intervention is treated as a covariate to isolate statistically the association between teacher knowledge or beliefs and children's outcomes. Because of the design of the analyses, the interpretation of results is focused solely on those associations.

4.2. Practical implications

This study makes an important contribution by identifying specific components of teachers' knowledge that are important for children's learning. Previous research has shown that this measure of teacher knowledge is responsive to teachers' involvement in a course on teacher–child interactions (Hamre et al., 2012), suggesting that these features of teachers' knowledge can be targeted during teacher training and professional development. The information is timely given efforts in the United States to implement quality rating systems for early childhood education (National Child Care Information Center, 2010) and ongoing research on professional development (e.g., Hamre et al., 2012; Brady et al., 2009; Garet et al., 2008). Indeed, these early findings tentatively suggest that teacher training intended to guide teachers in improving young children's language and literacy skills may be more effective if it emphasizes what teachers know about language and literacy in early childhood over what they believe. This still fits with a theory of change whereby professional development increases teachers' knowledge and skills, which influences change in classroom instruction, and through instruction improves children's learning (Desimone, 2009; Hamre et al., 2012).

4.3. Future research

Future work in this area should involve systematic development of measures of teacher knowledge and examination of associations with children's learning. Associations with teacher practice should also be evaluated methodically. Research on these associations is needed in multi-cultural, multilingual contexts as well as within English-speaking settings. Research should stem from ongoing efforts to build on a theoretical framework that includes pedagogical

knowledge as well as content knowledge (Ball et al., 2008; Shulman, 1987). The bulk of research on teacher knowledge has focused on elementary teachers (e.g., Carlisle et al., 2011; Cunningham et al., 2004; Hill et al., 2008; Moats & Foorman, 2003). The current study contributes to the limited literature in early childhood (Cunningham, Zibulsky, & Callahan, 2009) by examining the associations between prekindergarten teachers' beliefs and knowledge of language and literacy and children's learning of these skills.

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Appendix A

Beliefs about importance of language and literacy skills

Please circle the descriptor that best describes your rating of the importance of each skill for children entering kindergarten.

Items were rated on a scale of 1 (not important), 2 (a little important), 3 (pretty important), or 4 (essential).

1. Blend syllables into words
2. Identify all the letters of the alphabet
3. Identify the sounds that correspond to specific letters
4. Identify the front, back, and title of a book
5. Identify the first sound in a spoken word
6. Initiate a conversation with an adult or a peer
7. Maintain a conversational topic through two or more turns
8. Map spoken words to words in print
9. Organize the telling of a personal event to have a beginning, middle, and end
10. Retell a fictional story using newly-learned vocabulary
11. Use adjectives to modify nouns in conversations
12. Use motion verbs to precisely represent actions

Appendix B

Knowledge about language and literacy skills

Match each of the following child skills with the domain of language and literacy to which it belongs. If it seems that a skill might fall into several domains, select the domain that best represents the skill. Respond to each by circling the corresponding abbreviation from the list.

Domains: Phonological Awareness (PA), Vocabulary and Linguistic Concepts (VLC), Narrative Skills (N), Print Concepts (PC), Pragmatics and Social Language (PSL), Alphabet Knowledge (AK).

1. Use adjectives to modify nouns in conversations (Answer: VLC)
2. Identify all the letters of the alphabet (Answer: AK)
3. Identify the front, back, and title of a book (Answer: PC)
4. Respond appropriately to questions and requests (Answer: PSL)
5. Initiate a conversation with an adult or a peer (Answer: PSL)
6. Recognize letters in his/her name (Answer: AK)
7. Map spoken words to words in print (Answer: PC)
8. Organize the telling of a personal event to have a beginning, middle, and end (Answer: N)
9. Identify the first sound in a spoken word (Answer: PA)
10. Retell a fictional story using newly-learned vocabulary (Answer: N)
11. Blend syllables into words (Answer: PA)
12. Use motion verbs to precisely represent actions (Answer: VLC)

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